Food and Agriculture Organization of the United Nations

FAO FISHERIES AND AQUACULTURE PROCEEDINGS
39
ISSN 2070-6103

First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea

27–30 November 2013
Saint Julian's, Malta

General Fisheries Commission for the Mediterranean

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First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea

27–30 November 2013
Saint Julian's, Malta

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2015

ISBN 978-92-5-108846-3

Preparation of this document

This document has been prepared by the Secretariat of the General Fisheries Commission for the Mediterranean (GFCM) and the Fisheries and Aquaculture Department of the Food and Agriculture Organization of the United Nations (FAO). It stems from the First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea, held in Saint Julian's, Malta, from 27 to 30 November 2013, and organized by the GFCM in collaboration with the FAO Fisheries and Aquaculture Department and regional projects (AdriaMed, CopeMed, EastMed and MedSudMed), the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) – Mediterranean Agronomic Institute of Bari (MAIB), the Network of Marine Protected Area Managers in the Mediterranean (MedPAN), the World Wide Fund for Nature (WWF) Mediterranean Programme and the Government of Malta.

This publication gathers the information and outcomes of the symposium, the background documents presented by the partners as well as papers and abstracts, in their original language, submitted for the thematic sessions. It is intended as a useful collection of information on small-scale fisheries, which should contribute to further the reflection on this sector and on its sustainable development in the Mediterranean and the Black Sea.

The symposium report has been edited by FAO. All other papers and abstracts have been reproduced as submitted by the authors. All the symposium material is available on the following website: www.ssfsymposium.org.

Abstract

The First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea was organized from 27 to 30 November 2013 by the General Fisheries Commission for the Mediterranean (GFCM) in partnership with the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) – Mediterranean Agronomic Institute of Bari (MAIB), the FAO Fisheries Department and FAO regional projects, the Network of Marine Protected Area Managers in the Mediterranean (MedPAN) and the World Wide Fund for Nature (WWF) Mediterranean Programme, and hosted by the Government of Malta.

More than 170 participants gathered to share their experience and discuss the future of small-scale fisheries in the Mediterranean and the Black Sea. For the first time in the region, national administrations, international organizations, scientists, non-governmental organizations, fisher communities, stakeholders and civil society sat around the same table to address issues of common interest and challenges for building common strategies, synergies and cooperation to support the sustainable development of this sector.

The discussions enabled insights on the main issues at stake and laid the groundwork for a regional programme fostering knowledge on small-scale fisheries and involving all interested stakeholders. The event was also marked by the signature of a cooperation agreement at the regional and subregional level between fishers from the northern and southern shores of the Mediterranean. Finally, all participants concurred on the importance of organizing a second regional symposium in order to follow through on this momentum.

FAO. 2015. *First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea, 27–30 November 2013, Saint Julian's, Malta,* edited by Abdellah Srour, Nicola Ferri, Dominique Bourdenet, Davide Fezzardi and Aurora Nastasi. FAO Fisheries and Aquaculture Proceedings No. 39. Rome. 519 pp.

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Acknowledgements

Sincere gratitude is expressed to the Government of Malta, in particular the Ministry for Sustainable Development, the Environment and Climate Change, for hosting the symposium and providing valuable logistical support during the entire event.

Sincere thanks are due to all the authors who contributed to the success of the symposium bringing their knowledge and experience and presenting the papers and abstracts contained in this volume. Special gratitude is also expressed to the members of the Steering and Scientific Committee of the Symposium for their continuous technical support throughout the organization of the event. The GFCM Secretariat is particularly grateful to the donors who brought their financial contribution to this publication, namely the FAO regional projects (AdriaMed, CopeMed, EastMed and MedSudMed) and the Network of Marine Protected Area Managers in the Mediterranean (MedPAN).

Many thanks are also due to: Nicole Franz and Carlos Fuentevilla (FAO Fisheries and Aquaculture Department), Sergi Tudela and Susana Sainz-Trapaga (WWF Mediterranean), Biagio di Terlizzi (CIHEAM MAI Bari), Marie Romani and Chloë Webster (MedPAN), Juan Antonio Camiñas, Konstantina Karlou Riga and Enrico Arneri (FAO regional projects). A heartful thanks to Hélène Rizzotti, Julia Pierraccini and Stella Bartolini Cavicchi for their precious assistance to the GFCM Secretariat in collecting the material and compiling this volume.

Abbreviations and acronyms

ACCOBAMS	Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic
ACFR	FAO Advisory Committee on Fisheries Research
ADRIAMED	Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea
AECID	Agence espagnole de coopération internationale pour le développement
AIC	Akaike's information criterion
ANOVA	analysis of variance
ARMA	autoregression and moving average
ARTFIMED	Sustainable Development of Mediterranean Artisanal Fisheries in Morocco and Tunisia
ASCI	area of special conservation interest
BCM	barque côtière motorisée
BEAMPA	bioeconomic analysis of marine protected areas
BEMCOM	bioeconomic model to evaluate the consequences of marine protected areas
BIOMEX	Evaluation of Biomass Export of Marine Protected Areas and its Impact on Fisheries in the Western Mediterranean (European Project 2003-2005)
BCNM	barque côtière non motorisée
BMU	beach management unit
CAQ	GFCM Committee on Aquaculture
CBA	cost–benefit analysis
CBCRM	community-based coastal resources management
CBCP	community-based data collection programme
CBD	Convention on Biological Diversity
CFP	Common Fisheries Policy
CGPM	Commission générale des pêches pour la Méditerranée
CIESM	International Commission for the Scientific Exploration of the Mediterranean Sea
CIHEAM	International Centre for Advanced Mediterranean Agronomic Studies
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CoC	GFCM Compliance Committee
Code	Code of Conduct for Responsible Fisheries
COFI	FAO Committee on Fisheries
CMS	Convention on Migratory Species

COPEMED	Cooperation for Fishing in the Mediterranean
CPUE	catch per unit effort
CSC	Comité scientifique consultatif de la CGPM
CSO	civil society organization
CSF	critical success factor
CTA	Centre technique d'aquaculture (Tunisia)
cv	cheval-vapeur
DCF	data collection framework
DCP	dispositif de concentration du poisson
DGEDA	Direction générale des études et du développement agricole (Tunisia)
DGFA	Directorate General for Fisheries and Aquaculture (Turkey)
DGPA	Direction générale de la pêche et de l'aquaculture (Tunisia)
EASTMED	Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean
EBSA	ecologically or biologically significant area
ENGO	environmental non-governmental organization
EAF	ecosystem approach to fisheries
EARDF	European Agricultural Rural Development Fund
EEF	European Fisheries Fund
EEZ	exclusive economic zone
EMFF	European Maritime and Fisheries Fund
EMPAFISH	European Marine Protected Areas as tools for Fisheries management and conservation
EPASA	Environmental Protection Agency for Special Areas (Turkey)
EU	European Union (Member Organization)
FAO	Food and Agriculture Organization of the United Nations
FAD	fish aggregating device
FDI	foreign direct investment
FLAG	fisheries local action group
FLOUCA	Fish landing operational utility for catch assessment
FOS	Friend of the Sea
FVR	Fishing vessel register
GAFRD	General Authority for Fish Resources Development (Egypt)
GAM	generalized additive model
GAMM	generalized additive mixed model
GCC	global commodity chain
GDP	gross domestic product
GEF	Global Environment Facility
GEF/SGP	GEF Small Grant Programme
GES	good environmental status
GFCM	General Fisheries Commission for the Mediterranean
GIS	geographic information system
GLM	generalized linear model

GND	driftnets
GNP	gross national product
GT	gross tonnage
GPS	Global Positioning System
GRT	gross registered tonnage
GSA	GFCM geographical subarea
GVC	global value chain
hp	horsepower
HRBA	human rights-based approach
IBO	interbranch organization
ICCAT	International Commission for Conservation of Atlantic Tunas
ICZM	integrated coastal zone management
IMO	International Maritime Organization
IHE	Institut des hautes études (Tunisia)
INAT	Institut national agronomique de Tunisie
INRH	Institut national de recherche halieutique (Morocco)
INSTOP	Institut national scientifique et technique d'océanographie et de pêche (Tunisia)
INSTM	Institut national des sciences et technologies de la mer (Tunisia)
IOE	Institute of the Environment (Lebanon)
IPOA-IUU	International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing
ITQ	individual transferable quotas
IUCN	International Union for Conservation of Nature
IUU	illegal, unreported and unregulated (fishing)
kW	kilowatt
LGC	Local Government Code
MAB	Man and Biosphere (UNESCO programme)
MAIB	Mediterranean Agronomic Institute of Bari
MAP	Mediterranean Action Plan
MAPAMED	Marine Protected Areas in the Mediterranean
MCS	monitoring, control and surveillance
MDG	Millennium Development Goal
MEABR	management and exploitation area for benthic resources
MedartNet	Mediterranean Platform of Artisanal Fishers
MED-LME	Strategic Partnership for the Mediterranean Large Marine Ecosystem
MedPAN	Network of Marine Protected Area Managers in the Mediterranean
MedSudMed	Assessment and Monitoring of the Fisheries Resources and the Ecosystems in the Straits of Sicily
MoA	Ministry of Agriculture
MPA	marine protected area
MRCZM	marine resources and coastal zone management programme
MSC	Marine Stewardship Council
MSY	maximum sustainable yield

MSFD	Marine Strategy Framework Directive (European Union [Member Organization])
NAFA	National Agency for Fisheries and Aquaculture (Bulgaria)
NGO	non-governmental organization
NM	nautical mile
NTZ	no-take zone
OECD	Organisation for Economic Co-operation and Development
ONP	Office national des pêches
ONUDI	Organisation des Nations Unies pour le développement industriel
OP	organisation de producteurs
PCP	Politique commune des pêches
PDA	Plan directeur de l'aquaculture
PDO	protected designation of origin
PGI	protected geographical indication
PNUD	Programme des Nations Unies pour le Développement
PSSA	particularly sensitive sea area
PUE	prise par unité d'effort
RAC/SPA	Regional Activity Center for Special Protected Areas
RAMOGE	Agreement on the Protection of the Marine Environment and Coastal Zone of the Mediterranean Sea
RBE	résultat brut d'exploitation
RFMO	regional fisheries management organization
ROI	return on investment
SAC	GFCM Scientific Advisory Committee
SACs	special areas of conservation
SAD	Underwater Research Society
SCSA	GFCM Subcommittee on Stock Assessment
SCSI	GFCM Subcomittee on Statistics and Information
SEPA	special environmental protection area
SPA	special protection area
SPAMI	Special Protected Areas of Mediterranean Interest
SSF	small-scale fishery
SSF Guidelines	Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication
STECF	European Commission Scientific, Technical and Economic Committee for Fisheries
TAC	total allowable catch
TEK	traditional ecological knowledge
TGMPA	Torre Guaceto Marine Protected Area
TSG	traditional speciality guaranteed
TURFs	territorial use rights in fisheries
UEGC	unités d'exploitation et de gestion concertées
UN	United Nations

UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
UTAP	Union tunisienne de l'agriculture et de la pêche
VAT	value added tax
VCA	value chain analysis
VMS	vessel monitoring system
WFD	Water Framework Directive
WSSD	World Summit on Sustainable Development
WTA	willingness to accept
WTO	World Trade Organization
WTP	willingness to pay
WWF	World Wide Fund for Nature

Foreword

Mediterranean and Black Sea fishing fleets are made up of about 90 000 vessels, and the small-scale segment represents more than 80 percent of the entire fleet. They include a great number of fishing techniques and use more than 50 types of fishing gear to target species according to the fishing season. These figures speak for themselves: small-scale fisheries are of paramount importance for the economic development and the livelihood of populations in the whole region.

Despite their socio-economic importance, small-scale fisheries do not always receive the attention they deserve. In fact, small-scale fishworkers are often excluded from public policies and decision-making processes; they face socio-economic difficulties and strive to exploit resources that are depleting.

However, for all the activities they encompass, for their traditions and value and for the potentialities they offer, small-scale fisheries can play a crucial role in the responsible management of living marine resources. They form an integral part of the broader framework of sustainable development, the importance of which was reaffirmed by the international community at the Rio+20 Conference.

Against such a backdrop, the General Fisheries Commission for the Mediterranean has acknowledged the need to address the challenges this sector is facing and gain a better knowledge of its specificities in the Mediterranean and the Black Sea. Better knowledge means in fact better management, which implies the right for all actors to voice their opinion and participate in the development of a common approach to small-scale fisheries.

The idea of organizing a symposium at the regional level came up as an opportunity to promote a bottom-up, inclusive, participatory and transparent approach fostering the sustainable development of the sector towards better employment, food security and market incentives in the whole area.

It was a first, and the results went beyond our expectations. All participants showed an incredible level of attention and interest, which clearly demonstrates that all stakeholders, from fishers to governments, share the same concerns and vision. Discussions have laid the groundwork for a regional programme fostering the knowledge of all the components linked to small-scale fisheries and involving all interested stakeholders.

Moreover, they have provided a timely basis for Mediterranean and Black Sea participants in the final negotiations of the FAO Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication, which were adopted six months after the symposium, in June 2014.

The outcomes of this symposium have highlighted the need to pursue our common efforts to face the current and future challenges of this sector, addressing priorities such as the integration of small-scale fisheries in marine protected areas, co-management and the promotion of strategies to enhance opportunities and products for the benefit of local communities and stakeholders. We hope that the proceedings of this first symposium will offer a sound basis to make concrete steps in this direction.

Abdellah Srour
Executive Secretary
General Fisheries Commission for the Mediterranean

1. Introduction and background

SMALL-SCALE FISHERIES: A LONG-STANDING TRADITION IN THE REGION

Small-scale fisheries (SSFs) traditionally represent an important share of the fisheries sector in the Mediterranean and Black Sea, and their considerable role in the region has long been recognized. They have the potential to contribute significantly to food security, economic growth and rural development and to provide valuable employment opportunities. Small-scale fisheries are strongly anchored in local communities, reflecting often historic links with traditions, culture and values. They are a vibrant and multidimensional sector, where traditional local knowledge and cultural heritage coexist and are embedded in the surrounding environment. Moreover, they are important vectors of local knowledge and good practices, and they have a relatively low environmental impact.

DEFINING SMALL-SCALE FISHERIES

It is difficult to agree upon a clear definition of SSFs. At present, the terms "artisanal fisheries" and "small-scale fisheries" are used often interchangeably. Both refer broadly to a multifaceted segment of capture fisheries very commonly practised along the coastal areas in the Mediterranean and Black Sea and worldwide. The FAO Fisheries Glossary mentions that artisanal fisheries are "traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amount of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption […]. In practice, definition varies between countries". Small-scale fisheries are generally characterized by the use of a large number of boats of low tonnage, extremely diversified and selective low-impact fishing gear targeting a wide variety of species. Fishers exploit areas that are usually very close to the coast where they live and shelter their boats. They usually require small capital investment as opposed to industrial fishing, generate income and significantly contribute to food security, especially to coastal communities that greatly rely on this activity.

SMALL-SCALE FISHERIES IN THE MEDITERRANEAN AND THE BLACK SEA

In the Mediterranean and the Black Sea, where the fishing fleet is composed of about 90 000 vessels in total, the small-scale segment (defined as embarkations below 12 m in length overall, see example on Plate 1) represents more than 80 percent of the entire fleet (source: GFCM data). Small-scale fisheries include a great number of fishing techniques and use more than 50 types of fishing gear to target species and adapt to fishing seasons based on a rotatory system. This sector embraces the fishing gear that is not typically industrial. Landing sites are widespread along the coasts and in fishing ports, which makes it extremely challenging to perform monitoring, control and surveillance (MCS) of SSFs. At present, small-scale fishers account for the main share of the active population operating in the fishery sector in the region. Their activities

PLATE 1
An example of small-scale boats in Malta

Source: Claudia Amico/FAO-GFCM.

are often family-based and linked to other sectors such as food and tourism. It has been estimated that out of about 250 000 people employed in the fishing industry, more than half (i.e. about 55 percent) work in the SSF sector. "Small-scale fishery is not just an economic activity. It is a way of life. It greatly contributes to the progress and the flourishing of coastal communities, in a sustainable and environmentally friendly way" says Maria Damanaki, Commissioner of the European Union (Member Organization) for Maritime Affairs and Fisheries.

EFFORTS TOWARDS SECURING SUSTAINABLE SMALL-SCALE FISHERIES

In 1980, in its Resolution GFCM/15/1980/1, the General Fisheries Commission for the Mediterranean (GFCM) called for "the definition of a national strategy indicating in particular the place of artisanal fisheries in management schemes". Although regional analysis in the Mediterranean and the Black Sea has been periodically carried out since then, several issues have not been fully addressed owing to the complexity of defining strategies encompassing SSFs in terms of monitoring, management and sustainable development. This is the more so at a time when the fisheries sector is experiencing a systemic crisis and there is an urgent need for strategies focused on SSFs through existing regional fisheries management organizations (RFMOs). Since 2003, FAO and other organizations have embarked on a process of awareness raising on the key role of SSFs for marginalized communities worldwide. In 2011, the FAO Committee on Fisheries (COFI) recommended the development of an international instrument – the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) – to complement the 1995 Code of Conduct for Responsible Fisheries (the Code). The SSF Guidelines are global in scope but with a special focus on the needs of developing countries. They aim at helping address SSFs issues at the national and regional levels with a view to contributing to sustainable development and to the achievement of the Millennium Development Goals (MDGs). The SSF Guidelines outline a number of key guiding principles: human rights and dignity; respect of cultures; non-discrimination; gender equality; equity; consultation and participation; rule of law; transparency; accountability; economic, social and environmental sustainability; holistic and integrated approaches; social responsibility; and social and economic viability. The draft SSF Guidelines are currently being developed and finalized through a participatory approach and worldwide consultations. Their provisions should become an integral part of regional, national and local policies, strategies and action plans. The development of the SSF Guidelines should be introduced by the GFCM at the regional level to ensure that the actors involved in SSFs agree on management strategies to be put forth in order to give this sector the development possibilities it deserves.

CO-MANAGEMENT AS THE WAY FORWARD

Innovative and participatory management and governance approaches need to be set up in order to strengthen this key socio-economic sector in the Mediterranean and the Black Sea. Small-scale fishers' activities need to be preserved and supported, and investments into SSFs increased. This includes, for example, more sustainable and energy-efficient gear and techniques, safety measures, promoting and labelling fish products, support to participatory decision-making, including co-management, etc. Recently, the GFCM has been promoting the establishment of fisheries multiannual management plans. For this purpose, it is necessary to identify sources of information, collect data and involve stakeholders in their analysis. A sound analysis will eventually lead to efficient management plans. At the moment, there is no precise quantitative information encompassing biological and socio-economic data at the regional level, and no regional database exists to provide a complete picture of SSFs, despite the efforts deployed by the GFCM – which collects those data from its members.

Up to now, the top-down approach used for fisheries management under centralized national government's control has generally failed to avoid the decline of marine resources. Moreover, there is often a lack of government resources to enforce effective protection measures, and SSFs are in many cases excluded from management plans. In this context, decentralization and co-management seem to represent viable alternatives. Co-management covers a wide range of collaborative decision-making mechanisms between government and communities or user groups, and it allows sharing responsibility and authority at different levels of fisheries management. It is a dynamic partnership based on the capacities of both local fishers and communities and on the State's ability to provide enabling policies and legislation, enforcement and assistance with the participation of the civil society and scientists.

Co-management has proved to be essential to ensure the proactive participation of fishers in setting up fisheries management plans that account for local institutional arrangements and knowledge. Involving fishers in data collection, management measures identification, monitoring and control helps raise their awareness about the environment, enhances their sense of ownership and stewardship over the resources, and increases commitment and compliance to rules and regulations. Indeed, who would want to contest rules that they have helped to define? The co-management approach has already been adopted successfully in the Mediterranean and the Black Sea: the "Grenelle de la Mer" and "Prud'hommies de pêcheurs" in France and the "Cofradias" in Spain are already success stories. There are also examples of excellence in Spain (for the sand eel fishery), Turkey (with local cooperatives) and Italy (for the clam fishery). However, establishing co-management mechanisms requires: an enabling and supporting legislative framework and the political will to change and involve communities in policy-making (empowerment); effective linkages between institutions and organizations; devolving power to local cohesive institutions; efficient MCS mechanisms; incentives for access rights; and, finally, adequate resources.

2. Symposium overview

WHY A SYMPOSIUM ON SUSTAINABLE SMALL-SCALE FISHERIES?

Building upon the participatory approach used for the development of the FAO SSF Guidelines, the aim was to provide, at the regional level, a platform where the main recurring issues related to SSFs in the Mediterranean and Black Sea could be duly addressed and all interested stakeholders could bring their opinions, ideas and expertise to the fore.

The symposium was designed as a forum to take stock of the current situation of SSFs, identify key areas of intervention, strengthen dialogue between partners and stakeholders, raise awareness at the regional level, and find strategies for the sustainable development of the sector. It would constitute the building block to steer strategic and programmatic actions with a view to improving the livelihood of local communities engaged in SSFs in the region through the sustainable exploitation of living marine resources. Mediterranean and Black Sea governments, international organizations, scientists, non-governmental organizations (NGOs), fishers and fisher communities were thus called to join forces for the future of SSFs and marine resources.

OBJECTIVES

The main objectives of the symposium were:

- to renew and foster political commitment towards SSFs;
- to agree upon a possible roadmap for the gradual implementation of tasks in support of the sustainable development of SSFs;
- to discuss the establishment of a regional cooperation project on SSFs;
- to lay the foundations for a platform where stakeholders could be directly involved and participate in the management of SSFs.

These objectives represented the starting point for a reflection on how to ensure a common policy for sustainable SSFs, in light of existing synergies among organizations and stakeholders.

Upon the selection of their abstracts, contributors were called to present full papers, as reproduced in these proceedings.

SYMPOSIUM PARTNERS

FAO

An intergovernmental organization, FAO has 194 Member Nations, two associate members and one member organization, the European Union (Member Organization). Its employees come from various cultural backgrounds and are experts in the multiple fields of activity FAO engages in. Its staff capacity allows it, *inter alia*, to support improved governance, to generate, develop and adapt existing tools and guidelines and to provide targeted governance support as a resource to country- and regional-level FAO offices. Headquartered in Rome, Italy, FAO is present in more than 130 countries.

In support of FAO objectives, the mission of the **FAO Fisheries and Aquaculture Department** is to strengthen global governance and the managerial and technical capacities of Members and to lead consensus-building towards improved conservation and utilization of aquatic resources. The Department aims to make a significant contribution to the attainment of the Millennium Development Goals and the targets set by the World Summit on Sustainable Development and the World Food Summit.

General Fisheries Commission for the Mediterranean (GFCM)

Created in 1949 under the provisions of Article XIV of the FAO Constitution, the General Fisheries Commission for the Mediterranean (GFCM) came into force in 1952. Amendments to this agreement were approved in 1963, 1976 and 1997. Consisting of 23 member countries along with the European Union (Member Organization), the GFCM has the objective to promote the development, conservation, rational management and best utilization of living marine resources, as well as the sustainable development of aquaculture in the Mediterranean, Black Sea and connecting waters. Membership is open to both Mediterranean coastal States and regional economic organizations, as well as to United Nations Member States whose vessels engage in fishing in Mediterranean waters.

Network of Marine Protected Area Managers in the Mediterranean (MedPAN)

MedPAN brings together the managers of Mediterranean marine protected areas (MPAs) and supports them in their management activities. Its mission is to promote, through a partnership approach, the sustainability and operation of a network of MPAs in the Mediterranean. Currently, MedPAN has more than 58 members, primarily MPA management institutions, throughout the Mediterranean basin, and 32 partners willing to contribute to the creation and strengthening of the network. These stakeholders manage more than 80 MPAs in 18 Mediterranean countries. The network has existed since the 1990s. Since 2010, it has been run by MedPAN, a permanent structure with dedicated funds established in late 2008.

International Centre for Advanced Mediterranean Agronomic Studies – Mediterranean Agronomic Institute of Bari (CIHEAM-MAIB)

Founded in 1962, the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) is an intergovernmental organization including 13 Mediterranean member countries: Albania, Algeria, Egypt, France, Greece, Italy, Lebanon, Malta, Morocco, Portugal, Spain, Tunisia and Turkey. Its headquarters are located in Paris. The Mediterranean Agronomic Institute of Bari (MAIB) was established by CIHEAM as its Italian operating facility, and it enjoys the privileges of extraterritoriality attributed to international organizations by Italy. The MAIB is a centre for postgraduate training, applied scientific research and design of in loco partnership actions in the framework of the international cooperation programmes. It works in four thematic areas: land and water resources management; sustainable integrated pest management technologies for Mediterranean fruit and vegetable crops; Mediterranean organic agriculture; and sustainable agriculture, food and rural development.

FAO regional projects

The FAO Mediterranean projects act in support of the Mediterranean countries in achieving sustainable fisheries management in the region through collaboration in each Mediterranean subregion. The FAO Mediterranean projects maintain a high level of coordination and cooperation with the GFCM, facilitate the cooperation of their participating countries, provide scientific contributions for discussion, and support involvement of national experts in GFCM activities.

AdriaMed – AdriaMed "Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea" aims at promoting scientific cooperation towards fisheries management among the Adriatic countries (Albania, Croatia, Italy, Montenegro and Slovenia), in line with the FAO Code of Conduct for Responsible Fisheries

CopeMed II – Cooperation for fishing in the Mediterranean aims at maintaining the sustainability of the marine resources in the central and western subregions and its ecosystem, taking into account environmental, biological, economical, social and institutional issues, in particular through the promotion of scientific cooperation among the countries. Participating countries are Algeria, France, Italy, Libya, Malta, Morocco, Spain and Tunisia.

EastMed – The regional project "Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean" contributes to the sustainable management of marine fisheries in the Eastern Mediterranean, supporting and improving the capacity of national fishery departments to increase their scientific and technical information base. The area covered by the project concerns countries with waters included in the GFCM geographical subareas (GSAs) 19–20 and 22–28.

MedSudMed – "Assessment and Monitoring of the Fishery Resources and the Ecosystems in the Straits of Sicily" is a regional project with four participating countries (Italy, Libya, Malta and Tunisia). It aims to support scientific communities and countries in the development of a monitoring system for the studies of fisheries resources and ecosystems in the Central Mediterranean. Its main objectives are to increase the scientific knowledge on the ecosystems of the project area, strengthen national and regional expertise, and develop scientific cooperation in order to promote the standardization of the methodologies used in fisheries research to support fisheries management decisions.

WWF Mediterranean Initiative

The World Wide Fund for Nature (WWF) has launched the Mediterranean Initiative, a common strategy to scale up WWF conservation efforts in the Mediterranean basin. The WWF Mediterranean Initiative is pushing actors involved in marine protection to develop solutions, build alliances, and invigorate societies and economies across the Mediterranean region to conserve marine ecosystems that provide a wealth of resources.

ORGANIZATION

The symposium was held in English, French and Arabic. Simultaneous interpretation services were provided.

It was articulated around five thematic sessions focusing on five overarching themes outlining the main issues to be discussed. Each thematic session was chaired and coordinated by one of the symposium partners. It consisted of the presentation of a background document followed by selected contributions and discussions (see programme in Appendix 3).

Participants were invited to submit their contributions in connection with the thematic sessions. All abstracts were reviewed by a scientific committee composed of focal points appointed by each partner and responsible for selecting relevant contributions and ensuring the coordination, organization and moderation of the thematic sessions.

THEMATIC SESSIONS

The five thematic sessions of the symposium addressed the main priority issues at stake in the region as described hereafter.

Thematic session I – Current situation of small-scale fisheries in the Mediterranean and Black Sea: strategies and methodologies for an effective analysis of the sector

- Stocktaking of existing information and data on SSFs to assess their potential in production and socio-economic terms.
- Identification of key elements directly or indirectly linked to SSFs for planning and management purposes.
- Identification of existing data and information gaps at different levels (biological, socio-economic, environmental).
- Definition of common methodologies to monitor the regular collection of relevant data.

Thematic session II – Management and co-management options for small-scale fisheries in the Mediterranean and Black Sea

- Management and co-management: actual co-management versus participatory advisory schemes.
- Overview of traditional fisheries management schemes implemented by stakeholders in the region.
- Transferring executive management powers from stakeholders to state agencies: recent developments.
- Contemporary schemes including co-management elements in the field of fisheries.
- Fishers, fisheries agencies, scientists and civil society as co-managers: who should qualify to co-manage?
- A legal framework for fisheries co-management: how does co-management fit in national and regional legal frameworks?
- Relevant options for co-management: area-based management; access limitation; limitation of fishing opportunities; time/area management; MCS.
- Functioning of co-management committees (e.g. the case of the co-management committee of the Catalan sand-eel fishery).
- Identification of capacity-building needs for fisheries co-management.

Thematic session III – Integration of small-scale fisheries in marine protected areas (MPAs)

- Overview of different types of MPAs in the GFCM area: from fisheries management tools to conservation and multipurpose MPAs.
- Assessing impacts of MPAs on SSFs.
- Involving small-scale fishers in MPAs: from participation to co-management.
- Promotion of SSFs and potential of reconversion in and around MPAs.

Thematic session IV – Enhancing small-scale fisheries value chains in the Mediterranean and Black Sea

- Outline of the SSF sector, its value chains and economic accounts in the light of the current economic crisis.
- Main components of local, national and international value chains related to SSF production.
- Costs and earnings analysis of SSFs and reasons for differences.
- Analysis of SSF production through the value chain method.
- Investing in quality improvement: quality of life of small-scale fishers, etc.
- Assessing existing structural and community needs and socio-economic approaches towards diversification and multifunctionality.
- Valorization of the production from the main SSFs.
- Innovative measures to enhance production and market: capacity building and institutional strengthening.
- Options to maximize the price of SSF catches at time of sale, including specific certification requirements.

Thematic session V – Setting up a regional platform to promote the implementation of the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication

- Challenges and opportunities for the SSF sector in the Mediterranean and Black Sea.
- Human rights-based approach: current situation and needs in terms of access to basic economic, social and cultural rights.

- Social and economic development for fishers, fishworkers and fishing communities to enhance the sustainability of SSFs, including the post-harvest sector, and their contribution to food security and poverty alleviation.
- Review of national experiences in terms of collective action and organizations (e.g. fishers cooperatives and associations) and how to strengthen them, including through capacity development and the creation of regional or subregional associations.

SIDE EVENTS

Each thematic session was then followed by a poster session organized as a side event in parallel to the symposium.

The side events also included presentations, projections of films and videos, workshops and arts laboratories, food tasting as well as a visit to the Marsaxlokk port in Malta (see full programme in Appendix 3).

Moreover, a wide exhibition area was set up at the symposium venue and put at the disposal of partners and participants.

OUTCOMES

The First Regional Symposium on Sustainable Small-scale Fisheries brought together about 170 participants from Albania, Algeria, Belgium, Bulgaria, Croatia, Cyprus, Egypt, France, Germany, Greece, Italy, Lebanon, Malta, Mauritania, Montenegro, Morocco, Romania, Slovenia, Spain, Tunisia, Turkey, and the United Kingdom of Great Britain and Northern Ireland, as well as representatives of the European Union (Member Organization), international and intergovernmental organizations, NGOs, fishers associations, professionals and experts from all over the world (see Plate 2 and list of participants in Appendix 2). Thus, SSF actors in the Mediterranean and the Black Sea had the opportunity to share experiences and make steps towards a sustainable future for SSFs in the region.

Discussions have laid the groundwork for a regional programme fostering knowledge of all the components linked to SSFs and involving all interested stakeholders. The event was also marked by the signature of a collaboration agreement signed between fishers from the northern and southern Mediterranean shores (see Appendix 4). It is the first time ever that such a platform has been created to enable cooperation between fishers from both sides of the Mediterranean.

The main conclusions of the symposium (see Appendix 5) focus in particular on the following aspects: the establishment of a task force aimed at supporting Mediterranean and Black Sea countries in the implementation of the SSF Guidelines; the launch of a regional programme on SSFs; the organization of a second symposium; the integration of SSFs in MPAs; support to co-management; and the valorization of SSF opportunities and products for local communities and stakeholders.

PLATE 2
Symposium participants

Source: FAO/GFCM.

Thematic Session I

Current situation of small-scale fisheries in the Mediterranean and Black Sea: strategies and methodologies for an effective analysis of the sector

Source: Maltese boat in the harbour ©FAO/Fabio Massa.

BACKGROUND DOCUMENT

Current situation of small-scale fisheries in the Mediterranean and Black Sea: strategies and methodologies for an effective analysis of the sector

Henri Farrugio
Chairperson, GFCM Scientific Advisory Committee
in collaboration with the FAO regional projects

INTRODUCTION

In the preface of the draft Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines), it is acknowledged that the terms "small-scale fisheries" and "artisanal fisheries" are considered to relate to the same segment of fisheries. Both terms can be interchangeably used to encompass different perspectives and bearing in mind that a clear definition still needs to be established. Accordingly, the FAO Glossary recognizes that artisanal fisheries are "traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amounts of capital and energy, relatively small fishing vessels, making short fishing trips, close to shore, mainly for local consumption. In practice, definition varies between countries and they are often referred to as small-scale fisheries".

Moreover, according to the FAO Advisory Committee on Fisheries Research (ACFR) Working Group on Small-Scale Fisheries, "small-scale fisheries make an important contribution to nutrition, food security, sustainable livelihoods and poverty alleviation, especially in developing countries. Despite this significant contribution, the issues constraining the sustainable development of small-scale fisheries remain poorly understood".

ACFR has therefore developed a vision for small-scale fisheries where their contribution to sustainable development can be fully realized. More precisely, this vision aims at avoiding that small-scale fishers and fishworkers are marginalized and their contribution to national economies and food security is recognized, valued and enhanced. It also recognizes that these people should be empowered to participate in decision-making with dignity and respect through integrated management of the social, economic and ecological aspects underpinning small-scale fisheries.

Against this background, the FAO has developed the SSF Guidelines, which are intended, among others, to support the enhancement of the role of small-scale fisheries. It is envisaged that these guidelines, which are global in scope, will inform the development of custom tailored policies for small-scale fisheries at the regional level. As far as the Mediterranean and the Black Sea are concerned, this should be done through the GFCM.

1. STOCKTAKING OF EXISTING INFORMATION AND DATA ON SMALL-SCALE FISHERIES

1.1 Definition of small-scale fisheries in GFCM countries

While small-scale and artisanal fisheries clearly differ from industrial and recreational fisheries, distinctions are hard to pin down. The FAO Glossary tends to equate "artisanal" with "small-scale". From a technological point of view, however, the two are connected but also implies somewhat dissimilar concepts relating to, on the one hand, the size of the fishing unit (i.e. the scale) and, on the other hand, the relative level of technology (or "artisanality") expressed as capital investment/men-on-board.

For technologists, the term "small-scale fisheries" automatically implies a relatively small vessel size and sometimes has the added connotation of low levels of technology and capital investment per fisher.

Conversely, the term "artisanal" does not directly correspond to a category of vessel size or level of specialization in a particular fishing technique. The length of the boat is not an absolute criterion and, as a matter of fact, in some GFCM Member countries, polyvalent vessels larger than 12 m length fishing with longlines and gillnets are considered as artisanal boats. It is therefore common to find in the Mediterranean Sea fleet composed of fishing vessels less than 12 m which are committed to a given form of trawling or purse seining.

Small-scale fisheries can also be defined as a high variable activity. The fishing intensity and the fishing strategies show very rapid fluctuations in space and time. The activity and gear employed fluctuate according to the variation of accessibility of the different main target species and seasons, the meteorological conditions, the tourist seasons and other factors.

A FAO Working Group on small-scale fisheries convened in Bangkok, Thailand, in 2003 concluded that it was not possible or useful to attempt to formulate a universal definition of small-scale fisheries. The following description of the subsector was hence agreed upon: "Small-scale fisheries can be broadly characterized as a dynamic and evolving sector employing labour intensive harvesting, processing and distribution technologies to exploit marine and inland water fishery resources. The activities of this subsector, conducted full-time, part-time or just seasonally, are often targeted on supplying fish and fishery products to local and domestic markets, and for subsistence consumption".

This description seems to be fit for the case of the Mediterranean area and should be borne in mind when discussing small-scale fisheries in the Mediterranean and the Black Sea. This also applies to the case of single GFCM Members although different specificities relating to small-scale fisheries at the national levels might exist.

Legal framework

Small-scale fisheries are encompassed under national legislations on fisheries which are mainly aimed at resources conservation by means of control of the fishing effort and landings. In the Mediterranean, except for some large pelagic species fisheries there are no quotas (which are recognized as not appropriate for the regulation of Mediterranean fisheries) at the moment but a great number of technical measures apply to the various gear used by the small-scale fishermen. These measures concern the mesh sizes of the nets, the characteristics of some particular gear and, in some cases, the number of gear units deployed. Regulations fixing the minimum commercial landing sizes of fishes are also in force. Furthermore, some areas where fishing is restricted exist, including small-scale activities. On the contrary, areas have been established also for the exclusive use of small-scale fishermen. In most GFCM Member countries, small-scale boats are bound to provisions regulating the national licensing system which fix the allowances

to practice the different types of fishing, although it is not uncommon for vessels not included in any license system to operate.

The landing sites of small-scale vessels are widespread along the coasts and in fishing ports, thus rendering monitoring, control and surveillance (MCS) activities very difficult, even when the vessels have a license for landing at nearby port. There are everywhere numerous management rules, but in general very few fishermen respect their application and poaching and transgressions are regularly reported so it can be said that like in many other parts of the world the IUU fishing is very common in the field of artisanal fisheries. Unregulated boats represent a great gap in several countries statistics that makes it difficult to quantify the active small-scale fleet in the Mediterranean region.

Fleet and gear characteristics

The information regarding fishing fleets is sparse. Many small boats, in many small-scale fisheries, those without engine in particular, are not registered. The information on capacity (i.e. tonnage, power) is often missing or, in the case of bigger vessels, incorrect. Although there is no regional database providing a complete picture of the fleet and its characteristics, a synthetic appraisal of the situation could be presented on the basis of various sources, including:

- The European Commission has published annually, since 1983, the distribution by EU countries (http://ec.europa.eu/fisheries/fleet/) of the capacities and the number of units per type of *métier*. It could be argued that due to the complexity of SSFs, the information provided by the national fishery administrations might not entirely reflect the very complex situations in each country.
- The Organisation for Economic Co-operation and Development (OECD) provides online statistics on fisheries in Members of the Organisation, (http://www.oecd.org/statisticsdata/) including some Mediterranean States (i.e. Spain, France, Greece, Italy, Israel and Turkey). It is possible to extract particular information on volumes of landing, the values of landings, employment and the capacities of fishing fleets. OECD also published in 2005 general information about fisheries in all its Member countries.
- The FAO has been publishing annual statistics on the fishing fleet's bulletins globally from 1970 to 1995. FAO also compiles information on fishing fleets and their activity, provided by country in the form of fisheries country profiles (http://www.fao.org/fishery/countryprofiles/search/en). These sheets have been the main source of information used to prepare the present document.
- Since 2007, the GFCM has established a standardization of statistics on the activities and the production of fishing fleets of GFCM Members (i.e. the GFCM Task 1). Although already operational, this database is not yet complete.
- National statistics registers published each year would be in principle the most reliable sources on the status of the fishing fleets in each country. Their level of detail depends on the importance of the fishing sector in the national economy.
- Relevant and detailed information can also be found in specific academic studies on fisheries. Finally, the information on fleet characteristics of some countries can be found in the documents published by the Mediterranean FAO regional projects (AdriaMed, CopeMed (phases I and II), EastMed and MedSudMed). For instance information from most of the western and central Mediterranean countries was compiled during CopeMed phase I and is also available online.

A compilation of these available sources of data could be summarized in the following tables.

TABLE 1
Composition of the Mediterranean national fishing fleets by *métier* for 2008

Year 2008	Trwl	Pssp	Poly	Pst	Art	Total	
Albania	180	22			67	**269**	0.33%
Algeria	487	1 039		7	2 908	**4 441**	5.42%
Croatia	800	400	.	23	2 600	**3 823**	4.66%
Cyprus	8	1	28	1	628	**666**	0.81%
Egypt	1 095	238			1 791	**3 124**	3.81%
France	111	24	27	32	1 079	**1 273**	1.55%
Greece	311	281	511	2	16 250	**17 355**	21.16%
Israel	31	19			388	**438**	0.53%
Italy	3 520	305	292	46	9 258	**13 421**	16.37%
Lebanon	;	70			2 590	**2 660**	3.24%
Libya	140	165		29	4 695	**5 029**	6.13%
Malta	17		114	3	1 018	**1 152**	1.40%
Morocco	119	150	112	3	2 974	**3 358**	4.10%
Montenegro	30	18			170	**218**	0.27%
Palestinian territories	18	67			632	**717**	0.87%
Slovenia	20	9			152	**181**	0.22%
Spain	840	277	168	6	2 052	**3 343**	4.08%
Syrian Arab Republic	21	5	30		1 157	**1 213**	1.48%
Tunisia	. 399	360;	227	24	10 316	**11 326**	13.81%
Turkey	300	167	33	86	7 406	**7 992**	9.75%
Total	**8 447**	**3 617**	**1 542**	**262**	**68 131**	**81 999**	
	10.30%	4.41%	1.88%	0.32%	83.09%		

TRWL = trawlers and dredgers, PSSP = purse seiners for small pelagic, POLY = polyvalent vessels > 12 m,
ART = artisanal (small-scale) boats, PST = tuna purse seiners, MAD = traps.
Source: Sacchi, 2011.

Different data sources for small-scale fisheries at the regional level could result into different scenarios for the same country depending on the denomination or definition of each fishery. For example, in Algeria, the number of active small-scale vessels in 2003 was 2 210 according to a PESCAMED report, although other sources mentioned the existence of 1 663 "*petits métiers*". Data from CopeMed in 2003 referred to 1 646 small-scale vessels using 19 different gear.

To complete the Mediterranean picture, eight active traps for bluefin tuna or tuna-like species fishing one in Spain, one in Morocco and six in Italy should be accounted (Sacchi, 2011).

In 2008, 61 percent of the Mediterranean fishing units (50 000 boats) were based in Greece (17 355 boats), Italy (13 421 boats), Tunisia (11 326 boats) and Turkey (7 992 boats). Among the Mediterranean countries these four countries also had the largest small-scale fishing fleet at national level, where 63 percent on average of the total number of fishing vessels were small-scale. The fleets of southern countries, on the other hand, represented in 2008 38 percent of the total number of Mediterranean fishing units, 42 percent of them being small-scale fishing vessels.

As a general comment it could be affirmed that many small-scale fishing vessels operating at regional level are more or less unsafe, due to their important average age and the low engine power of part of the fleet. The situation is different from one subregion to another and from one country to another but there is, in some areas, a general trend in the small-scale fleet of not adjusting fishing gear according to fishing activities or not taking precautionary measures needed for their safety.

TABLE 2
Data from GFCM Task 1

		Gillnets & entangling nets	Hooks & lines	Traps	Miscellaneous gear	Seine nets	Surrounding nets	Other gear	Gear not known	Dredges	Trawls	Lift nets	Harvesting machines	Total
G5A1 Northern Alboran sea	B	74	5	28		3				32				142
929 Boats		616	3	135		33								787
GSA3 Southern Alboran sea	B													0
70 Boats	C		70											70
GSA5 Balearic islands	B	3	2	1						1				7
542 Boats	C	132	111	74	28		190							535
GSA6 Northern Spain	B													0
234 Boats	C	196		38										234
GSA7 Gulf of Lions	B	64	20	151	65	4	1	107	29	10	1	1		453
1346 Boats	C	306	83	97	170	12	9	119	72	13	9	2	1	893
GSA8 Corsica Island	B	12	6	3		1		7	5					34
270Boats	C	129	32	13		2	2	31	27					236
GSA9 Ligurian & North Thyrrenian	B	216	16	16	11	53								312
1437 Boats	C	718	100	7	19	260	21							1 125
GSA10 South & Central Thyrenian	B	449	249		17	79								794
2810 Boats	C	984	485			287	246				14			2 016
GSA11 Sardinia	B	112	37	107										256
1244 Boats	C	459	218	298							13			988
	A	957	215											1 172
G5Al2 Northern Tunisia	B	150	40											190
2697 Boats	C	935	300					100						1 335
	A	1 078	250											1 328
G5A13 gulf of Hammamet	B	150	20											170
2562 Boats	C	664	300	100										1 064
	A	3 885	2 000	300				200						6 385
GSA14 Gulf of Gabes	B	200	20	40										260
9776 Boats	C	2 031	300	800										3 131
GSA15 Malta island	B	323	703	332	7		1							1 366
2587 Boats	C	258	605	214		7	137							1 221
G5A16 South of Sicily	B	165	43			10					10			228
811 Boats	C	375	146				62							583
GSA17 Northern Adriatic	B	514		536										1 050
2938 Boats	C	634		1 157	93						4			1 888
	A		11											11
G5A18 Southern Adriatic	B	103	41			204								348
640 Boats	C	174	39			68								281
G5A19 Western Ionian sea	B	243	108			123								474
1559 Boats	C	564	149	13	9	227	123							1 085
	A	61	32			1								94
GSA20 Eastern Ionian sea	B	1 001	438	8		2								1 449
4051 floats	C	1 748	630	13		115				2				2 508
	A	98	71	2						1				172
GSA21 Aegean sea	B	2 494	1 593	57	340	1				14				4 499
14447 Boats	C	4 022	2 279	258	2 950	233				34				9 776
	A	2	12											14
GSA23 Crete island	B	157	152											309
892 Boats	C	311	247			11								569
G5A24 North Levant	B				71									71
904 Boats	C				833									833
Total = 52746 boats		**27 767**	**12 181**	**4 798**	**4 613**	**1 736**	**792**	**564**	**133**	**107**	**51**	**3**	**1**	**52 746**
		52.64%	**23.09%**	**9.10%**	**8.75%**	**3.29%**	**1.50%**	**1.07%**	**0.25%**	**0.20%**	**0.10%**	**0.01%**	**0.00%**	

A. Polyvalent small-scale vessels without engine (<12 meters), B: Polyvalent small-scale vessels with engine (<6m), C: Polyvalent small-scale vessels with engine (6–12 meters).

TABLE 3
Estimated values of average power (Kw) of the vessels

Year 2008	Trwl	Ps	Plv	Art
Albania	280	200		80
Algeria	280	110		30
Croatia	400	200		70
Cyprus	630	270	180	70
Egypt	400	110	50	40
France	310	320	150	70
Greece	300	190	430	40
Israel	240	90	0	30
Italy	650	280	330	200
Lebanon				50
Libya	270	120		30
Malta	430	260	70	60
Morocco	230	180	0	30
Montenegro	170	140	0	40
Palestinian territories	240	80	0	30
Slovenia	780	150	0	40
Spain	190	180	80	40
Syrian Arab Republic	240	80	50	20
Tunisia	400	110	50	20
Turkey	400	200	80	50

Source: Sacchi, 2011.

Small-scale fisheries encompass a great number of fishing techniques as more than 50 types of fishing gear are used and include all the *métiers* that are not typically industrial, such as the following trawl nets, large seines for large and small pelagic, large longliners and hydraulic dredges for shellfish. The most common fishing gear used in the Mediterranean small-scale fisheries remain static nets, particularly trammel nets and gillnets. At the beginning of the 1980s, thanks to the introduction of cheaper synthetic material coming from Asia, their use spread out quickly in the region. Because they are easy to set, less cumbersome than traps, safer than longlines and, above all, much more efficient, gillnets and trammel nets progressively replaced various other static gear. Nearly all gillnets and trammel nets now in use are made of nylon. Monofilament nylon for making these nets proved in many cases to increase effectiveness compared to multifilament. However, it is now forbidden in some countries such as Greece.

The gillnets and trammel nets are usually set before sunset and hauled after dawn, generally remaining for less than 10 hours at sea. Depending on the target species, these static nets may be used from very shallow waters to deeper bottoms ones. The length of net set obviously depends on the size of the vessel, the space available on board and the number of the crew.

The FAO country profiles and the annual national reports collected by the GFCM give some additional information on the SSF fleets in selected Mediterranean GFCM Members, as broken down below.

ALBANIA

Seventy percent of the Albanian active fishing fleet account for small-scale fisheries, according to the data of the National Fishing Fleet Register for 2012. Of these vessels 95 percent belong to the polyvalent passive gear segment and the remaining to polyvalent gear. According to the socio-economic survey carried out in 2012, the total volume of landings of these segments is more than 900 tonnes which resulted in a total value of approximately 4 million USD.

In the Albanian Adriatic coast the most used gear are trammel nets, gillnetters, entangling nets (with a different mesh size according to the targeted fish/size), uncovered fishing ponds, concrete/metallic-like pots, while in the Ionian Sea coast the main fishing

gear are longlines and gillnetters. About 90 percent of fishing boats use engine of 5-40 hp, 10 percent of them are without engine. Generally, the fish product is sold directly by the fishers on the boat, especially during spring-summer time, when the prices/revenues are rather high in respect to those that can be earned if the fish is sold at the local wholesale points. In winter and autumn time, with limited fishing days at sea, the fish is mainly used for personal consumption by the fishermen families. The most important species are: *Dentex spp. Soleidae*, *Diplodus* spp., *Parapenaeus longirostris, Octopus vulgaris*, *Mugilidae, Platichthys flesus*, *Sepia officinalis* in the Adriatic coasts while etc. *Sciaena* spp., *Diplodus* spp., *Sarda sarda*, *Dicentrarchus labrax*, *Xiphias gladius*, *Lepidopus caudatus*, *Scomber* spp, *Pagellus* spp, etc. on the Ionian coasts.

Among the conflicts, some are reported between small-scale vessels operating along the coasts and those operating in the coastal lagoons, which although managed by a different licenses system also operate on the coasts.

ALGERIA

The Algerian small-scale fleet is mainly composed of vessels less than 12 m long and gross tonnage from 01 to 10-ton boat. The main range of sizes varies from 3 to 9 m with power ranging from 5 to 40 hp and a crew of 2 to 8 fishers based on the gear used. These vessels spend from 2 to 16 hours at sea and they use different gear according to the seasons. Artisanal fisheries are carrying out along the continental shelf and in the coastal areas. The total number of sites practicing the SSF identified by CopeMed (Sahim and Bouaicha, 2003) is approximately 64 with 32 ports, 23 beaches and 9 natural sites; there were identified a total of 1 646 active boats providing direct employment to 4 012 fishers.

The most frequently used gear includes various types of gillnets, trammel nets, longlines and hand lines. Some small purse seiners also exist, as well as vessels specialized in the catch of certain target species like swordfish.

CROATIA

Marine fisheries have a significant small-scale character and the Croatian fleet is mainly made of small and relatively old fishing units, averaging 66 kW engine power and 11 GRT. This corroborates the large predominance of very small coastal units. A major proportion of the fleet is represented by multipurpose vessels exploiting mainly sardine, European anchovy, hake, red mullets, Norway lobster, octopus species, breams and various flatfish. The catch is landed at numerous small landing places along the coast.

CYPRUS

Small-scale fisheries in Cyprus concern the inshore use of small wooden boats between 6 to 12 m, which mainly fish with bottom set nets, longlines and fish traps. A multipurpose fishery operates with boats of about 16 m in the waters of Cyprus and in international waters in the Eastern Mediterranean[1]. Nets and bottom longlines are mainly used but, periodically, fishing with surface longlines and fishing for swordfish and tuna also occurs. In 2003, 105 fishers worked fulltime on 38 boats licensed for multipurpose fishing. The main species caught include *Spicara smaris, Boops boops, Mullus surmuletus, M. barbatus, Octopus,* cuttlefishes and a lessepsian immigrant *Siganus sp*. Large pelagic species are targeted by the multipurpose fishery in national and international waters of the Eastern Mediterranean and include *Thunnus thynnus,*

[1] http://stecf.jrc.ec.europa.eu, gives information on the EU countries. The 2012 report mentions that in Cyprus, 20 vessels belonging to PGP segment (polyvalent) are betweeen 12 and 24 m. If the length is not the criterion to define SSF, but the gear, given that those 20 vessels use only nets and longlines, could be categorized as SSF vessels.

Xiphias gladius and *Thunnus alalunga.* Monofilament nets are banned and trammel nets must have a minimum stretched mesh size of 32 mm. The timing for setting nets is also regulated. Fishing licence limitations also control the multipurpose fishery.

EGYPT

The total number of Egyptian registered fishing vessels operating at sea including the Mediterranean and Red Sea is 6 480 fishing boats; 4 089 of these vessels are equipped with inboard engines, with more than 50 up to 1 000 hp, using different fishing gear such as trawl, purse-seine, long-lines, trammel and gill nets (PESCAMED, 2011). In the Mediterranean, the 2008 fleet was composed of 4 509 fishing boats with 1 379 sail boats, and 3 190 motorized vessels, which use different fishing gear as above. There were 1 095 trawlers, 238 purse seines, 1 267 pelagic long-liners (tuna and swordfish) and 529 trammel nets. While the number of trawlers and purse seiners has been stable in the last five years, the number of long liners has doubled. It is very likely that most of the 1 379 sail boats operate mainly in the lagoons and in other costal semi-closed water bodies (EastMed 2013, in press).

The small-scale fishing vessels vary between 7 to 15 m in length and are powered by small outboard or inboard engines from 8 to 150 hp. The fishing trip usually takes from 1 to 5 days and the number of crew employed ranges from 2 to 8 fishers per vessel. The main fishing gear includes hand lines, longlines, gillnets and trammel nets. They target both demersal and pelagic species depending on the fishing season.

Egyptian fisheries have seen a drastic change in the last decades, with a considerable expansion of the trawl fishery. The landings of the Egyptian fleet in 2011 amounted to 39 307 tonnes with a value of 143 840 million dollars (EastMed, 2013, in press). Egyptian Mediterranean capture fisheries are important for local coastal communities, providing employment opportunities (about 32 000 fishers and about 150 000 indirect beneficiaries were estimated in 2009). Along the Mediterranean coast the fishing grounds exploited by Egyptian vessels were mainly located in the central front part of the Nile Delta, were the continental shelf is wider compared to eastern and western coastlines. Fishing in this area is limited to 100 m depth, due to the relatively small dimensions of the majority of the fishing vessels operating and the lack of information on deep-sea resources. Official reported landing sites from west to east include: Salum and Mersa Matruh (Matruh province) Al Max, Al Anfoushy, Mena Sharki and Abu Qir (Alexandria province) Meadea and Rashid (Behera province) Borge Al Burollus and ElJezera ElKhadra (Kafr Al Sheakh province) Al Borge (Dumyat province) Port Said (Port Said province) and El Arish (North Sinai province). In addition, there are several other small landing sites.

FRANCE

The small-scale fleet is the most important component of the overall French fleet in terms of fishing units as it represents more or less 90 percent of the total number of the French fishing boats operating in the Mediterranean Sea. The French fleet composed of boats less than 18 m long correspond to the administrative definition of "artisanal fisheries" (Farrugio and Le Corre, 1993). All the boats are engine-powered and usually perform less than 24-hours fishing trips, using simultaneously several different gear according to the seasons and the regions The gillnets and the trammel nets are the most used gear, but small trawls, dredges, driftnets, trolling lines, handlines, beach seines, set nets of several kinds, longlines, pots and traps, purse seines are also used. Their catch is composed of a great number of species which also varies from one season to another. It must be noted that in the Mediterranean the small-scale French fleet is split between the sea coastal area and a chain of lagoons representing a total of 50 000 hectares and communicating with the sea (in these lagoons an important aquaculture activity also exists). In the Gulf of Lion, the small-scale fleet decreased of

roughly two thirds during the last decades. However, this activity is still consistently practiced, with 769 registered active entities and 81 percent of total fishing manpower in 2008. A total of 171 boats where registered in Port-Vendres, 222 in Sète, 175 in Martigues and 201 in Marseille. In 2010, the small-scale fleet of the Languedoc-Roussillon region was composed of 897 boats (Table 4).

TABLE 4
Composition of the fleet of the French Languedoc-Roussillon region in 2010

Type	N° boats	Ratio	Total GT	Total KW
Gill & trammelnetters	669	74.58%	2 077.10	49 510.00
Lonliners	180	20.07%	247.3	8 499.00
Dredges	45	5.02%	116.2	3 143.00
Beach seines	2	0.22%	3.9	220
Liners	1	0.11%	40	316
Total	**897**		**2 484.5**	**61 688**
Trawlers	90	89.11%	8 914.10	27 957.00
Purse seiners	11	10.89%	374	2 603.00
Total	**101**		**9 288.1**	**30 560.00**

GREECE

Greece has a typical multi-gear and multi-species fishery and there are more than 16 000 gillnetters and bottom longliners employed in the fishery sector, mostly vessels smaller than 12 m. From a national survey carried out between 2002 and 2006 in 147 fishing ports (www.inale.gr), a total of 1 737 registrations were performed for gillnets and trammel nets, 5 registrations for veranda nets, 78 for combined nets, 57 for small surrounding nets, 616 for long lines, 36 for vertical lines, 47 registrations for trolling lines, 30 for traps, 23 for fyke nets, 3 for pound nets and 8 registrations for various methods of fishery. The technical characteristics that were recorded referred to the followings: length, heighth, mesh size, net material and twine thickness, material and diameter of ropes, number, diameter and material of floats and weights, number and size of hooks, way of rigging, dimensions of traps and coastal trawl gear. Data on the fishing technique (fishing season, depth and type of bottom, soaking time, number of gear used simultaneously) were also recorded. The records were used to create a database. It is noted that the gillnetters are largely predominant in number and this underlines the importance of shore fishing even nowadays, when the activity continues to be one of the most important among those practiced in the coastal zone.

ISRAEL

In 2005, 519 small (up to 11 m) boats were licensed. The fishermen owning the licenses could switch between gillnets and bottom or floating longlines, depending on the availability of fish and the season. Their boats landed catch along the entire Israeli coast, on the beaches or in small protected inlets, as well as in major ports and/or marinas.

ITALY

In the Mediterranean Sea Italian small-scale fishing areas cover about 8 000 km of coastline; about 800 landing points are operating and the fishing fleet is distributed all along the national shores. Out of the 800 landing sites, only 198 are strictly considered harbours (PESCAMED 2011). According to a PESCAMED analysis, in 2008 the prevalence of small-scale and trawling fishing was evident. The first category of vessels accounted for 8 831 units from a total of 13 683 vessels. The bulk of the fleet, (around 70 percent of the total) hence consisted of small-scale vessels, generally

<12 m LOA and <6 GRT, deploying various fixed gear (nets, longlines, traps, etc.) on the continental shelf.

LIBYA

The fleet (MedSudMed country profile: http://www.faomedsudmed.org) is mainly composed of artisanal vessels (92.5 percent). Most of the catch is taken by small-scale boats working with trammel nets and gillnets or longlines and handlines and by the *lampara* fleet fishing for small pelagics. These crafts call to roughly 150 landing sites, including beaches, anchorages and harbours. Small-scale units include roughly 4 695 vessels (Sacchi, 2011). Approximately two-thirds of the smaller crafts are motorized, usually with outboard engines in the 10–35 HP range. The larger units are decked vessels and are all fitted with inboard engines.

Types of small-scale fishing boats in Libya (Lamboeuf, 2000):

Batah: 7–8 m flat-bottomed boat used to fish gillnets and pots (octopus) in shallow lagoon waters; propelled by outboard engine for commuting then with a pole during work.

Gaïk: double-ended boats of 4–6 m, derived from traditional craft that were propelled by oars, now often adapted for outboard engine propulsion; more common in the western part of the country.

Flouka: small fishing craft of varied sizes ranging from 2 to 7 m; shapes are diverse but generally with a flat transom and no deck; powered by outboard engines.

Mator: generally greater than 5–6 m in length running up to 18 m or more, with deck and roof for the smallest units, wheel house, fish hold, and net hauler for the largest; shape and design similar to units found in Tunisia, Greece and Egypt.

Lampara: usually 12–13 m with deck, inboard engine, a small roof and a purse seine winch; associated with one to three *Dghaissas* carrying kerosene or butane gas lights to catch small pelagic fish using light attraction at night; some units may convert to net and/or line fishing during the off-season; only present in the western part of Libya.

Dghaissa: 7–8 m, without deck and engine; serves as light boat in association with the *lampara*.

LEBANON

Fishing activities in Lebanon have always been considered at small-scale level, traditionally based on bottom stationary gear (trammel nets and longlines), purse seine nets and beach seines (PESCAMED, 2011; Sacchi and Dimech, 2011). In 2004, the Lebanese fishing fleet was made up of 2 662 operational fishing vessels calling to 44 fishing ports along the 220 km of coast. These fishing vessels are typical small-scale vessels of less than 12 m, with 60 percent of the fleet less than 6 m. The average gross tonnage of the boats and the average power are 2.52 tonnes and 22.68 hp respectively, with 71 percent of the vessels having an engine power less than 30 hp. Most of the vessels (92 percent) are motorized, usually with inboard diesel engines of 20 to 50 hp (often a truck engine). Only few vessels have a global positioning system (GPS), while the rest have very limited navigational or safety equipment, with 20 percent of the vessels having small electronic fish finders. Although the construction of the vessels is quite good, they are not built to face rough seas, fish in offshore waters and are not equipped to keep the catch in good conditions, for example they lack facilities for ice packaging. The crew on board of each vessel is made up of 2 to 4 fishers usually, with most of the boats being individually owned (80 percent). Equipment for the preservation of fish is very basic. Some of the vessels have insulated fish holds and use ice for longer trips. The main fishing techniques used are mostly based on passive gear such as gillnets, trammel nets, longlines, purse seine nets and *lampara* nets. Fishing operations, with the exception of longlines, are mostly carried out at depths of up to 50 m. The national fleet is built almost exclusively for small-scale and inshore activities,

with some vessels equipped with old low quality echo sounders to detect fish. Their net winches are not fitted to haul gillnets deeper than 50 m, without the risk of damage or loss of the gear.

MALTA

Maltese fisheries are of a typically Mediterranean artisanal type, mostly small-scale, employing full and part-time fishers switching from one gear to another several times throughout the year. The number of active vessels, including small-scale vessels, varies according to fishing season, with minor ports having practically no active vessels during the winter period and major ports having only a quarter of the registered vessels landing fish in the same period. With the exception of trawlers, the average Maltese fishing vessel is less than 10 m. Most vessels are traditionally crafted (i.e. the wooden *luzzu* and *kajjik*), although more than 35 percent of the fleet is composed of multi-purpose fiberglass units. The main engine power of small-scale fishing vessels is generally very low. They use mainly various forms of hook-and-line, different types of gillnets and entangling nets and traps (i.e. bogue and octopus traps). The most common method of fishing is set bottom longlining, which is seasonally carried out by over half of the active fishing vessels, especially those belonging to the fleet segment less than 6 m and those belonging to the 6 to 12 m fleet segment. Other frequent methods of fishing are drifting longlines, trammel netting and hand trolling with lines, which are locally known as "*rixa*" and target mainly dolphin fish, frigate mackerel and amberjack. Apart from these activities, an important share of small-scale vessels (i.e. less than 6 m) also participates in the traditional dolphin fish, or *lampuki* fishery, which relies on fish aggregating devices (i.e. FADs, locally known as "*kannizzati*").

MONTENEGRO

The legal framework in Montenegro recognizes small-scale (commercial) fisheries, which differ from large-scale fisheries in vessel size, type and number of fishing gear permitted. There is only limited data available on the size and catch of the current small-scale fishing fleet. The number of licensed vessels (70 in 2012) as recorded by the Ministry of Agriculture, represents only part of the total small-scale fleet, as no national monitoring system on these fisheries is in place and, apart from some estimations, poor data on catch are available.

Gillnets are the most common type of fishing gear, followed closely by trammel nets and beach seines targeting pilchard (*Sardina pilchardus*) and anchovy (*Engraulis encrasicolus*). Out of the 70 vessels registered, 71 percent operate in the Boka Kotorska bay (ports of Herceg Novi, Zelenika, Kotor and Tivat), the area where small-scale fisheries, particularly those involving beach seines, have been present for centuries, and are part of the cultural identity of the people from the region. Around 61 percent are vessels with length overall below 6 m, and the rest (39 percent) are in the 6–12 m segment.

MOROCCO

The fishing production in Morocco significantly increased since 1990, mainly owing to Atlantic landings of small pelagic and demersal fishes. In the Mediterranean region the most important species landed are small pelagics. The number of Mediterranean ports (PESCAMED, 2011) is 6, plus 3 additional landing sites (i.e. Sidi Hussaine, Cala Iris and Finideq). In addition, a high number of landing sites are known to exist for small-scale fisheries and they are distributed across the Mediterranean shores of Morocco. In 2003, an inventory of small-scale fishing communities done by CopeMed reported the existence of more than 90 landing sites, used by roughly 2 600 active boats. Small-scale fisheries in Morocco encompass small vessels, usually under 6 m length, with or without engine and using a great variety of gear (i.e. from 2 to 5 per

vessel). The number of different artisanal gear used accounts for some 20 *métiers*. The small-scale fleet usually operates in proximity of the coasts during the whole year in the case of trammel nets, longlines and beach seines, or seasonally, in the case of trolling lines targeting bluefin tuna and bottom longlines targeting blackspot seabream in the Gibraltar Strait region.

SPAIN

Eighty percent of the Spanish fleet is small-scale (Camiñas, Baro and Abad, 2004) and more than half of the vessels have no inboard engines and interchangeably use gillnets, bait or traps, according to their target species and the different ecological environments accessible to them. The management of this fleet falls under the competence of autonomous governments that regulate fishing activities and landing and are responsible for the collection of statistics. A study of the Spanish small-scale fleet in each autonomous region was carried out during the 1980s, with the support of the European Commission (Camiñas, Baro and Reina, 1990). Additional information was collected during the phase 1 of CopeMed (available online). The Spanish small-scale fleet fish mainly with static nets namely gillnets and trammel nets. A more specialized segment of this fleet relies on dredges targeting bivalves and a high number of octopus pots is also deployed. Other gear used includes bottom longlines, trolling lines, handlines and other lines. In some fishing grounds and during some fishing seasons small-scale driftnets targeting medium pelagic species (i.e. bullet tuna, bonito, etc.) are also used. The total number of different gear used is about 50. The diversity in small-scale vessels construction is witnessed by the traditional Phoenician jábega (between 7 to 9 m length), small boats (between 5 to 7 m length) without deck, boats without keel, with and without inboard engine (i.e. chalana, patera), boats between 6 to 8 m length with inboard protected engines and a GRT of 90 hp. Small-scale vessels built in fiberglass are also used, mainly those of larger length and higher engine power.

SYRIAN ARAB REPUBLIC

The fishery sector plays a minor role in the Syrian economy (http://www.fao.org/fishery/facp/SYR/en), due not only to the scarcity of resources and the low natural productivity of fishing grounds, but also to technical, administrative and legislative constraints.

It comprises some 1 200 coastal fishing vessels licensed to fish within the territorial waters (12 nm) along a coastline of 183 km. Real industrial marine fisheries barely exists, except for 21 comparatively small offshore vessels operating beyond the 12 nm zone.

Artisanal fisheries are the only capture fisheries in inland waters with 1 283 small fishing boats, of which 436 have an engine.

The main inland water resources are located in the south and southeast of the country. Other resources in the western, central and coastal areas are considered marginal. Fishing communities are distributed accordingly.

Capture fishery has been traditionally a source of living for poor and more-or-less illiterate people in coastal and lacustrine areas. The low output of capture fishery, particularly in inland waters, does not secure more than a minimum living for artisanal fishers.

TUNISIA

Since antiquity, the history of Tunisia is closely linked to the sea and the coastline that has been the site of intense human activity and that is a major component of its territory. Small-scale fisheries in Tunisia (FAO-ArtFiMed 2011), is the most important sector in terms of employment, value of production and contribution to the exportation.

This sector employs about 33 500 fishers and 5 000 seasonal workers which represent around 75 percent of direct employees in the fisheries sector. Small-scale fisheries produce about 28 000 tonnes of high value products (27 percent of the quantities fished in Tunisia) and contribute to 40 percent of the value of total production at the national level.

There are around 10 500 small-scale boats (93 percent of the total fleet in Tunisia) with size ranging from 5 to 15 m. Most part of the fleet (57 percent) is not motorized (rowing boats and sailboats).

There are many fishing techniques and gear used, but most of them are passive gear (gill nets, lines, traps and pots, traditional fixed fiheries *charfia*). However some traditional active gear is used, such as small beach seines (*tilla*, *damask* or *sautade*, *hlig* and *kiss*).

It is important to notice the existence of several specific fisheries, assimilated to small-scale fisheries. These are the lobster fishery, which is practiced mainly with trammel nets, the coral and sponge fisheries, and the clam fishery, mainly practiced by women, without vessels.

TURKEY

By far, the largest numbers of Turkish fishers are employed in the small-scale fisheries sector. As much as 85 percent of the Turkish fleet is composed of small vessels under 10 m length. A typical "two-men operation" uses an open boat of 8 m length with a 10–25 hp diesel engine (http://www.fao.org/fishery/facp/TUR/en). Larger fishing vessels of 10 m may have three fishers onboard. Some are equipped with depth recorders or fish finders. Most small-scale fishing vessels use basic gear, such as trammel nets and longlines. These small boats are operated by a mix of professional (i.e. full-time), subsistence (i.e. part-time) and recreational fishers.

Target species and production

Small-scale fisheries are basically a "species driven" activity and the gear used is very selective. In many cases, fishers report the targeting of more than one species at the same time.

Thus, it could be affirmed that national small-scale fleets operating in the Mediterranean region are oriented towards the catch of a high variety of species, up to one hundred different demersal fishes, crustaceans and some small and large pelagic species. What species are targeted depends on the distance from the coast of the fishing grounds, depth, bottom characteristics and the different periods of the year. In any case, small-scale fisheries production is of high economic value as the catch is generally sold fresh in local markets or directly to private consumers or restaurants. In some countries, parts of the production of small-scale fishing are almost entirely exported. Examples include clams production in Tunisia (ArtFiMed, 2009) or blackspot seabream captures in Morocco (ArtFiMed, 2010).

An important aspect of small-scale fisheries is that they target most of the priority species listed by the GFCM. Many times, small-scale fleets capture those species which are evaluated by the scientific working groups on demersal and small pelagic species of the GFCM Subcommittee on Stock Assessment (SCSA). Regardless, these captures are in many cases not included in the assessments because they are not reported in the national statistical systems. To improve the status and knowledge of the main stocks, it is hence necessary for the GFCM to evaluate the contribution of small-scale fisheries in the Mediterranean based on the total annual landing by species and country.

Fishing areas and periods

Due to the extreme variability of the fisheries and to the multispecificity that are typical of the region, the definition of fishing grounds cannot be easily made. However, it is

generally possible to geographically determine a certain number of distinct and well localized fishing grounds. Small-scale vessels mainly operate from small ports and landing sites relatively close to the resources which are fished. They mainly exploit inshore areas and areas that would be difficult targets for trawlers, like the rocky bottoms or the canyons on the continental shelves.

They are generally very small areas and correspond to those where the exploitation of a species or a group of species by a local or regional group of fishermen using the same fishing technique during a certain period of the year occurs. There is generally a total or partial overlapping among these areas and their complete topographic illustration results in a complex patchwork. This is the direct consequence of the said multispecificity of the region and the distribution of patterns and seasonality, but also of the polyvalence of small-scale fishing units.

Although fishing grounds exploited by small-scale fisheries are mainly located in the continental shelves, in many countries there are also important coastal lagoons separated or connected with the sea where small-scale fisheries, normally very specialized, take place. Coastal lagoons, and also delta rivers, are hence hubs for the development of small-scale fisheries due to the high biodiversity and productivity of this areas and their proximity with locations and sites of relevance to fishermen. An inventory of fishing grounds based on coastal morphological features (e.g. lagoons, deltas and others) and small-scale fisheries interconnected with them would have to be undertaken.

Some examples of the different national situations are as follows:

- In Albania the fishing activities take place at sea but there are also several lagoon areas where fish capture occur (i.e. Lagoons of Patok, Karavasta, Nartë, Vlorë, Gulf of Drini River and Lake Butrint). The same situation is known to occur, among others, in French coastal lagoons.
- The French marine small-scale fishery is operated near the coast (generally within 12 miles) and about 60 percent of the activities of the fleet are operated in the shallow waters of the coastal zone, between 0 and 20 m depth. Some of the biggest boats also fish at depths of more than 100 m and even in the canyons of the continental slope, in particular the gillnetters targeting hake.
- In Egypt, the fleet is concentrated mainly in the coastal area of the Nile delta region. There is a closed season in May and June.
- In Lebanon the fishing area is usually limited within 6 nautical miles from the shoreline (Sacchi and Dimech, 2011), with 78 percent of the fishers fishing within this limit, and less than 10 vessels operate beyond the 6 nm.

Number of fishworkers and associated employment

At present, small-scale fishers represent the largest part of the population active in the fishery sector in the Mediterranean Sea. Usually, small-scale fisheries revolve around family-based businesses as the owner of the boat goes himself at sea, often times together with other members of the family. Many fishermen are also known to run other businesses on land (i.e. part time activities focusing on fishing and agriculture). Many small-scale vessels fish only for a few months during the year and it is not uncommon for them to be operated by retired people who are legally licensed as fishers.

The availability of data on crew members depends largely on the existence of public services in charge of monitoring the fishermen for social, economic or security purposes. The inclusion or the exclusion of a sailor in the crew list of is directly linked to the activities of the fishing vessel concerned. In periods of inactivity (i.e. repair, winter) some members of the crew may remain be “landed”, so the employment rate is variable and not always well known.

Combining various sources available, it can be estimated that approximately 250 000 people have been employed in 2008, in the sole Mediterranean fisheries sector.

More than half of the fishers (55 percent) were working in the small-scale fisheries sector. This distribution, however, understated the strength of small-scale fisheries as national statistics do not usually account for fishers without a boat, not motorized and, especially, the large population of occasional fishers.

Ancillary activities such as processing, net/gear making, ice production, boat building/maintenance, fish processing equipment, packaging, marketing distribution, engine repair and maintenance, etc. can also provide additional fishery related employment and income opportunities in fishing communities.

TABLE 5
Number of fishers by group of *métier* and country

2008	Trwl	Ps	Plv	Pst	Mad	Art	Total	
Albania	729	97				158	984	0.40%
Algeria	4 480	20 780		112		13 480	38 852	15.60%
Croatia	4 000	5 600				5 200	14 800	5.94%
Cyprus	48	12	112			754	926	0.37%
Egypt	3 675	2 206	647	96	70	2 152	8 846	3.55%
France	455	240	95	512		1 101	2 403	0.97%
Greece	1 866	2 529	1 789	32		15 138	21 354	8.58%
Israel	248	399				776	1 423	0.57%
Italy	10 965	2 277	1 153	736	420	14 953	30 504	12.25%
Lebanon		840				8 194	9 034	3.63%
Libya	560	1 320		464		5 313	7 657	3.08%
Malta	68		460	48		1 527	2 103	0.84%
Morocco	1 785	3 900	1 568		70	8 922	16 245	6.52%
Montenegro	120	135				255	510	0.20%
Palestinian territories (Gaza Strip and West Bank)	90	670				2 528	3 288	1.32%
Slovenia	100	108				228	436	0.18%
Spain	8 760	4 760				4 478	17 998	7.23%
Syria	252	100	165			3 471	3 988	1.60%
Tunisia	5 426	5 508	1 249	384		36 106	48 673	19.55%
Turkey	1 500	3 340	149	1 376		12 590	18 955	7.61%
Total	**45 127**	**54 821**	**7 387**	**3 760**	**560**	**137 324**	**248 979**	
	18.12%	**22.02%**	**2.97%**	**1.51%**	**0.22%**	**55.15%**		

TRWL: trawlers; PS: purse seiners for small pelagics; POLY: polyvalents boats > 12 m; ART: artisanal fishing; PST: large purse seiners; MAD: traps.
Source: Sacchi, 2011.

Conflicts (between SSF, with other fisheries, with aquaculture, with other activities)

Small-scale fisheries often compete and conflict with industrial fisheries. The pros and cons of the one or the other depend on local contexts and are difficult to generalize. When there is competition for the resource, this can lead to the overexploitation and the demographic imbalance of certain stocks or to illegal (IUU) fishing. This type of competition often leads to mutual allegations of destruction of juveniles or spawners between small-scale and industrial or semi-industrial fleets. Competition for the resources (Charles, 1992) could contribute to illegal activities as the use of illegal gear, fishing in prohibited areas etc. Despite the wide range of possible conflicts, they can be organized in a relative small number of categories. They are mainly related to competition for target species, space and markets, but also with local aquaculture, coastal users (e.g. tourism industry, pollutant industries) and administrations (e.g. construction of big ports and other infrastructures). Four categories of conflicts are cited by the referenced author:

i Fishery jurisdiction: involving fundamental conflicts over who owns the fishery, the management form and what should be the role of the administrations in the fishery;

ii Management mechanisms: concerning the implementation of fishery management plans, involving fishers/government conflicts over harvest levels consultative processes and enforcement;
iii Internal allocation of fishery resources: involving conflict within the fishery system, different groups or gear types, as well as between fishers, processors and other players;
iv External allocation of fishery resources: incorporating the wide range of conflicts arising between fishery and "outsiders", including foreign fleets, aquaculture farmers, non-fishing industries (such as tourism and forestry) and indeed the public at large.

Each conflict appears to fit under at least one of the four headings although some will fall under more commercialization of fishing products out of the legal channels, etc. Another conflict is related to "gear wars", namely the identification by the fishers of certain gear as more selective than others and, as consequence, more sustainable.

There is often a competition for space: many fishing areas are exploited jointly by several fleets which often causes the destruction of the fixed gear used by the small-scale vessels. Otherwise, illegal or derogative incursions of trawlers in the coastal strip whose exploitation is generally authorized only for the small-scale vessels are a very common source of conflict between the two activities. The traditional places for casting fish nets are everywhere a point of dispute and most of the times fishworkers communities end up as losers of this battle.

In general, it has been observed that the productivity of the small-scale fisheries is strictly linked to the importance of the offshore semi-industrial fisheries. All the scientific studies dealing with the interactions between fisheries show that a decrease in the fishing effort of the large boats – particularly the trawlers – will result in a substantial increase of the small-scale vessels catch per unit effort. In fact, many of the species targeted by the small-scale fishers are also exploited by the offshore fleets which apply an intensive fishing effort on the stocks.

Incompatibilities between fish farming and small-scale fisheries potentially exist and conflicts are more common than synergies. Conflicts can increase fishing pressure if wild sources of seed and feed (low value/trash fish) are accessed. Intensive cage fish farming can restrict local access to fishing grounds, modify the marketing flow by the introduction of new products from aquaculture and the possibility to introduce or transfer diseases to the natural resources.

1.2 Production of small-scale fisheries

Small-scale fisheries traditionally represent an important share of the fish caught in the GFCM area, although no information at the regional level exist neither on the captures nor on its socio-economic dimension. Official fisheries statistics generally do not distribute the production by type of fleet. Since fishing operations and vessels vary in so many different ways there are numerous criteria that can be used to divide a fishing fleet into sectors, contributing to the lack of consensus on how to classify the fishing operations. Different countries use different criteria in their national statistics. The FAO, through its Fisheries and Aquaculture Department, has never attempted to allocate systematically world catches to one or the other of the two categories. Hence, it is very difficult to evaluate precisely the proportion of the catches and/or landings which come from the small-scale component.

In general, it can be said that small-scale fisheries production is a high quality one, composed of species of fish, crustaceans and molluscs which are much sought after by national consumers and have the major economic value on national markets although some important species as octopus or clams in Tunisia are mainly exported. Their high

quality is mainly due to the shortness of the delay between fishing and landing and to the use of selective and non-harmless gear. This allows avoiding to spoil the fishes and to bring them on the market in a very condition of freshness and conservation.

Individual productivity is highly variable from one boat to another. Differences also exist between areas, seasons and gear. As an example, it has been calculated from scientific samples that the daily production of a small-scale vessel can vary from 10 to 90 kg, with an average of 45 kg/day for the April to October period in the coastal area of the Gulf of Lion. The same variability is observed in Mediterranean lagoons where the daily catch of a fisher can be comprised between zero and 200 kg over a six-month period. A CopeMed study has shown that the landings of the Tunisian site of Ghannouch could vary from 0.88 to 3.2 kg by pieces of net on average (considering 12 months from January–December). The same analysis gives an average in landing for vessels with engines or using oars of 50.03 kg and 42.58 kg by fishing day, respectively. The different methods and units used in the different countries and studies to indicate the productivity also complicate the possibility in giving a figure of global production for small-scale fisheries in the Mediterranean Sea.

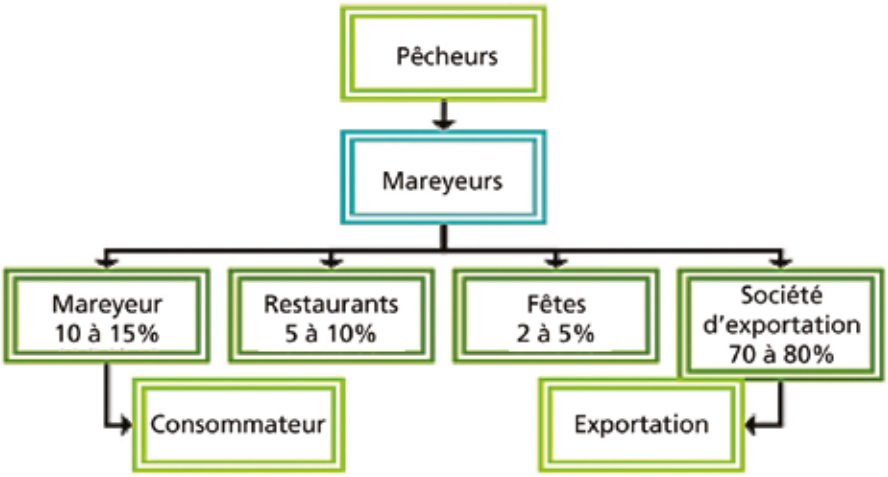
Landing, commercialization and marketing channels

The landing places of small-scale vessels are widespread all along the Mediterranean coast because they generally ignore classical infrastructures (e.g. auctions, fish markets) which are quite exclusively used by the larger boats. Apart from some rare exceptions in the south and eastern countries and in most of the EU countries, the catches are landed directly in the place where the fishermen live or keep their vessels (small ports or beach). As a result, the fish is often sold immediately on the dock/beach. This production is almost never frozen or transformed before the commercialization. First fish buyer or fish mongers are on the beach where the vessels arrive after fishing. Often, the buyers are also the providers of fishing material and baits, having a close relationship with the local fishermen and sometimes with fishermen from other landing sites. The buyers are really those who set the first selling price of the fishing products in most occasions.

All kind of direct sellings can be met: some fishers own their balance, others weight their fish in a friend's shop on the beach, and others stock it in a cooler and sell it after some hours. In some places, direct selling to regular customers is the main way of marketing. In other places, the fishers are traditionally accustomed to sell their production in the surrounding markets. Direct marketing to restaurants or to tourists is also a very common and important practice. Often, the commercialization of the catch is organized within the family of the fishermen whose wife or parents own a restaurant or a small shop or distribute the fish in the villages. But the marketing channels can also be more complex and involve several intermediates (e.g. retailers, wholesalers).

In some cases, the marketing of some small-scale fisheries products is well advanced. In Morocco, the production of blackspot seabream (*Pagellus bogaraveo*) for instance, is a valuable product used for exportation mainly to Spain. Prices and channels for marketing (internal and exportation) are under a strict control by the main actors of the system (Figure 1).

FIGURE 1
Marketing circuits of the artisanal products landed in Dikky (Morocco)



Source: FAO-ArtFiMed, 2010.

1.3 Social elements

Small-scale fisheries are granted special recognition by the 1995 FAO Code of Conduct for Responsible Fisheries, and are, in fact, the only fisheries subsector specially mentioned in the Code. Article 6.18 of the Code states: "*Recognizing the important contributions of artisanal and small-scale fisheries to employment, income and food security, States should appropriately protect the rights of fishers and fishworkers, particularly those engaged in subsistence, small-scale and artisanal fisheries, to a secure and just livelihood, as well as preferential access, where appropriate, to traditional fishing grounds and resources in the waters under their national jurisdiction*".

For many small-scale fishers and fishworkers, the sector represents a way of life and it embodies a diversity and cultural richness that is of global significance. The sector is diverse and dynamic and its characteristics vary from one location to another. It tends to be strongly rooted in local communities, reflecting their traditions and values. Many small-scale fishers and fishworkers (employed in associated jobs, in particular in fish processing, distribution and marketing) are self-employed and engaged both in directly providing food for their household and in commercial fishing, processing and marketing. The family is not only the support to the fishers but many times the manpower needed for basic fishery-related activities. The importance of small-scale fisheries and their role as a contributor to social cohesion, poverty alleviation, food and nutrition security, and economic growth are increasingly being recognized, although fairly unknown in the Mediterranean.

Small-scale fisheries provide food for local, national and sometimes international markets and make important contributions to nutrition. In addition to full and part-time works, seasonal or occasional fishing and related activities, they often provide vital supplements to livelihood activities of coastal communities.

In small-scale fisheries, the know-how is generally transmitted via the activity at sea. Many fishers still prefer this empirical knowledge, but several procedures of professional training exist in various countries to obtain basic qualifications to enter the profession, and there is a significant increase in the number of people directed at the artisanal activities after a professional training course.

Gender equity: role and situation of women

While men are typically engaged in fishing and women in fish processing and marketing, women are known to engage in near-shore harvesting activities and men deal with fish marketing and distribution.

In some GFCM countries, women have an important active role in small-scale fishery production. In Tunisia, the clam fishery in the Gulf of Gabès has been developed from 1960 onward. Initially, women caught some clams to add some revenues to the family traditionally based on agriculture (ArtFiMed, 2009). This fishery is a clear example of women's participation in the fishery capture process, although men are main actors in the commercialization and control the women activity. For instance, the clam producers organizations (local) have an important role in the organization, commercialization and export of the products under the direction of a committee composed of six members where the chair and the treasurer are men.

Improved policies for small-scale fisheries and appropriate attention to the post-harvest sector could have the benefit of mainstreaming women and gender concerns in development policy and planning.

Fishers' organizations

The fishers generally belong to professional syndicates and structures, some of which are very old and quite obsolete in some areas. On the contrary, they are still active in other countries, like in France where "*prud'hommies*", which are professional organizations created by the fishermen themselves and directed by elected members of the regional communities, exist. Their main roles are the representation of the fishers during negotiations with people, the regulation of the internal relations between fishermen during the exercise of their professional activity and the application of the fisheries policies.

Small-scale fishers sometimes also belong to modern socio-economic structures, like cooperatives and organizations of producers. Several kinds of cooperatives exist: some of them are oriented at providing goods and supplies, others specialized in the organization of the distribution of the landings or in the administrative and technical organization of ship-building and repair, as in the following examples.

The case of the Egyptian General Cooperatives Union for Fisheries Resources is worth mentioning. This is a non-governmental organization bringing together roughly 100 local cooperatives, each one counting up to 100 members under the umbrella of the General Authority for Fish Resources Development (GAFRD). It was created in 1959 and encompasses four subunions whose main objective is to protect the interests of the Egyptian fishers. The union deals with many social and technical aspects and has a great importance in the sector of financing the building of fishing boats. The union plays also an important role in the management of the fisheries, encouraging the fishers to apply regulations. It regularly publishes an informative newsletter, including scientific information regarding the sector. The union is a member of the GAFRD board and also cooperates with the Egyptian social fund project for the realization of small and medium projects in support to the decision-making process in the fishery sector. Money is currently managed through a bank although talks are ongoing now on a possible system to be put in place to allow the union to be directly funded. The union also manages an insurance fund for ships and manpower. The fishing boats have to own an individual fishing license which is linked to a type of fishing activity. According to the union, out of 210 000 individual licenses in the country, 80 000 are for the aquaculture sector.

Lebanon is another interesting case as the fishing community is organized into 29 cooperatives and 5 syndicates, although cooperative membership covers only some 43 percent of those involved in the industry (Pinello and Dimech, 2013). Most of the cooperatives are based in their respective ports, with usually more than one cooperative in larger cities. The majority of fishers is in the northern region of Lebanon, where the breadth of the continental shelf is broader and fishing grounds are more abundant. There is neither a contract of employment in Lebanon for fishers nor any social security cover in place, which could protect them in case of disability, loss of employment and

retirement. Salaries are generally low, with approximately 13 USD per day and per crewman (i.e. for a crew of three men and one captain) and with some fluctuations depending on the fish prices.

There are two fishers cooperatives in Malta and all professional fishers are affiliated to either one or the other (i.e. Ghaqda Koperattiva tas-Sajd Ltd. and Koperattiva Nazzjonali tas-Sajd). These cooperatitves offer various services to all professional and part-time fishers, including fish purchasing and sales (e.g. exports and imports), supply of ice, fishing gear and other inputs, cold storage facilities, insurance coverage, and facilities for packing and processing of fish.

In Tunisia, 60 percent of small-scale fishers in Ghannouch are affiliated to the Union Tunisienne de l'Agriculture et de la Pêche (UTAP), a syndicate whose purpose is to defend the interests of its affiliates, to supervise them and to solve the problems among various fishing sectors.

In Croatia, coastal areas, and particularly the islands, are characterized by numerous fishers communities, where the majority of the population is employed in the fishery sector. In some areas, fishers are organized in cooperatives (e.g. two large cooperatives are based in Istra). With the development of tourism, traditional fishers' communities are difficult to identify and generally there is a low number of larger fishers' organizations such as cooperatives.

2. IDENTIFICATION OF KEY ELEMENTS DIRECTLY OR INDIRECTLY LINKED TO SMALL-SCALE FISHERIES FOR PLANNING AND MANAGEMENT PURPOSES

The SSF Guidelines recognize the need for a wide range of information in support of decision-making, including bio-ecological, social, cultural and economic data in order to apply the ecosystem approach to fisheries (EAF) and integrated development approaches. They also promote the use of combined scientific data and local, traditional or indigenous knowledge and research for enhancing the understanding of small-scale fisheries governance, development needs and opportunities.

For several years, the GFCM has been highlighting the necessity to elaborate fisheries management plans that should identify the salient traits of the fisheries concerned, including major stakeholders, agreed objectives, covering the economic, social and ecological components of the fishery, and specific rules and regulations that would apply.

A first step should be the improvement of the knowledge on Mediterranean small-scale fisheries. At the same time, it would be necessary to improve the quality of the statistics in general. It requires also, for a number of species, improving knowledge on the biological and biogeographical parameters. Studies on interspecific and trophic relationships seem also to be of paramount importance, as well as the understanding of the mechanisms of biomass fluctuations in space and time. Still at the fundamental level, the works enabling to explain the determinism of recruitment linked to the environment and the fleets' dynamics become of principal importance too. Last but not least, a particular attention is needed for new alien species in the Mediterranean both of Atlantic and lessepsian origin that are extending their distribution, as in some cases they are targeted by small-scale fisheries.

For planning and management purposes, a first necessary action should be to determine where the information on small-scale fisheries is stored, who is collecting this information at national level and who should participate in its analysis at regional level (e.g. national administrations, research institutions, stakeholders, NGOs, etc.). Part of the information needed can be qualified as temporal in nature: inventory of small-scale fisheries communities by country, inventory of ports, landing sites, vessels, gear,

fishers, etc. It is also necessary to collect spatial information, such as spatial analysis of the activities of national fleets and resources distribution. Finally, information on the social and economic aspects is fundamental for planning and management.

In general terms, basic data that can be used to analyze small-scale fisheries include some elements directly linked with the characteristics of the fleets, gear and resources:

- Type of craft/vessel
- Size of fishing craft/vessel and engine
- Fishing gear/techniques
- Ownership
- Fishing grounds
- Knowledge and technology

A number of socio-economic indicators would be also needed. The main indicators should include:

- Production
- Commercialization
- Income
- Employment
- Wages
- Productivity per investment
- Prices and profits

The data collected should then help provide a snapshot on the dimension of the effort (defined as investment and employment) and measure the impact in the socio-economic domain as a consequence of changes in the state of the resources. They should also allow evaluating the cost of transition from an unbalanced situation to an equilibrium, in case of demonstrated situation of overexploitation of resources.

Key data collection for small-scale fisheries in the Mediterranean Sea. An example

The FAO regional project CopeMed offered the possibility of starting a programme of work to study the small-scale fishery sector in depth in Algeria, France, Italy, Libya, Malta, Morocco, Spain, and Tunisia.
The first step of this project was to establish a preliminary inventory survey by country of all the small-scale fisheries communities in the region by collecting the following data:

Characteristics of fishing ports: Name of the port where small-scale activities occur; region or province (administrative) where they are located; geographical localisation of the port (latitude and longitude); brief description identifying the port or locality; expected number of small-scale fishing units present in the port; expected number of small-scale fishers present in the port; any additional relevant information.

Description of *métiers* by port: Target species, associated species, fishing zones.

Fishing season by *métier*: Periodicity and seasonality in use.
These data were collected in all the participating countries with a varying degree of coverage. A relational database management system (the "ArtFiMed Database") was developed for data editing and a CD-ROM was published to present all the information collected.

Source: CopeMed FAO Regional Project, 2000.

Identifying the questions that need to be addressed in acquiring information about small-scale fisheries:

	Questions
Needs	• What are the information needs at the different levels (macro, meso, micro), under different management approaches? How are these needs communicated and linked?
	• How does the information system serve to describe the value and social importance of small-scale fisheries?
Process	• How do you integrate data from different sources (biological, economic, social), different sectors, different time and spatial scales and different frequencies of collection?
	• How do you ensure feedback to the source group from the "processor" and "user" (e.g. macro to micro levels)?
	• How do you handle (process and store) qualitative data as it moves from micro to macro levels?
	• How do you disassociate it from the person?
	• How do you introduce it to policy and institutional memory?
	• How do you turn qualitative data to quantitative data, or data useful to policy?
	• What is the best technique for moving information? How do you move it without moving people?
	• What is the link between "statistical" systems and research project data?
	• How do you ensure continuity in the collection of small-scale fisheries data?
	• How do the different information sources get "weighted" in the use of the data and what is the impact of this?
	• What are the limitations of information systems?
Input	• What is the reliability of the data and how do you verify and ensure this?
	• What are the "barriers" to people providing data or reliable data.?
	• What are the constraints to data collection – confidentiality, legal?
	• How do you capture qualitative and traditional/indigenous knowledge?
	• What are the appropriate data collection techniques for small-scale fisheries?
	• Can you design and implement one information system?
	• What information system/data collection is already in place and how can we modify these for fisheries?
	• Who collects what sort of data? e.g. how do you adapt national census data to support fisheries?
	• How do you disaggregate data with respect to gender?
	• How do we go back and retrieve and use old data?

Source: ACFR Working Party.

3. DATA AND INFORMATION GAPS AT DIFFERENT LEVELS (BIOLOGICAL, ENVIRONMENTAL AND SOCIO-ECONOMIC)

In order to provide a full picture of small-scale fisheries in the GFCM area, some information is still missing and/or requiring to be further elaborated for some GFCM Members. As it has been already pointed out, no precise quantitative information at regional level exist, neither on the captures nor on the socio-economic dimension of small-scale fisheries, although in some subregions in depth analysis are carried out with the support of the FAO subregional projects. The need to improve knowledge about this sector has been underlined on many occasions.

It is worth recalling that in 1980 already, the GFCM in its Resolution GFCM/15/1980/1 was calling for "the definition of a national strategy indicating in particular the place of artisanal fisheries in management schemes". As of then, a few regional analyses of small-scale fisheries in the Mediterranean and the Black Sea have been periodically carried out. However, there are issues which have not been fully addressed due to the complexity inherent in defining strategies for encompassing small-scale fisheries in terms of monitoring, management and sustainable development actions. Studying the biological and dynamic parameters of the most important stocks as well as the fleets dynamics and interactions, catch and effort statistics remain the weakest link. In several countries suggestions have been made to improve those data. But the majority of the statistical data are still often very far from reflecting the reality.

Depending on the situation, underestimations of catches are detected in that they could possibly represent more than a third of the real quantities, as well as overestimations of some productions. This is directly linked to the fact that an important part of the small-scale fisheries production often eludes traditional circuits created for gathering information (e.g. auctions, markets, etc.).

As for the inventory of small-scale fleets, sparse information is available. Statistics do not describe precisely the structure and the capacity of the fleets, which depend on heterogeneous factors such as the depth of fishing grounds, the type of fishing activity, the economic level of fishers, shipbuilding, traditions, etc. Particularly in connection with small-scale fleets, the files available in national administrations are quite incomplete. An underestimation of about 50 percent, compared to the real figures could not be far-fetched and, of course, important biases in the analysis would follow.

At present, there is often a lack of biological data collection systems for small-scale fisheries along the Mediterranean coast. Pilot projects on biological sampling, like the ones developed by the EastMed, AdriaMed and CopeMed FAO regional projects, are aimed at training staff and field samplers and at preparing the elements for the setting up of biological sampling networks covering the main landing ports, with the participation in the process of the fishworkers. In certain cases, FAO projects cover sampling on specific fisheries and target species during limited periods; nevertheless the main problem in the region is the lack of continuity in these activites which cannot be carried out only with the efforts of the regional projects.

Environmental data related to reproduction, nursery areas and recruitment of main target species are still far from what would be required to understand the relationship between marine ecosystems and exploited resources, including those targeted by small-scale fisheries. Information on the effects of climate change in the ecosystem and the associated marine exploited resources and the effects in the Mediterranean ecosystems and fish populations of the new species of lessepsians or Atlantic origin in the Mediterranean basin are other significant gaps. Further socio-economic research is required in order to understand the links between macro-economics, fisheries and development policies and livelihoods. Socio-economic studies related to fisheries, like the regular survey of several indicators as the evolution of investments and capital, seem indispensable. Future research should also deal with studies about the price of the production factors and the profitability of fishing which are in general unknown.

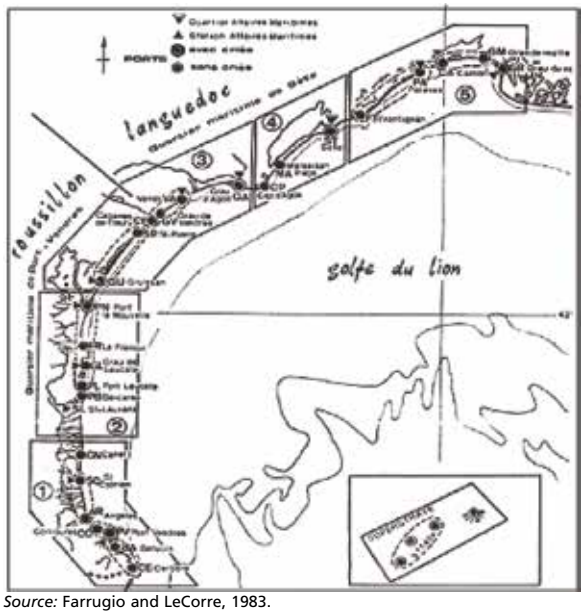
Knowledge at post-harvest stage, which enhances the value of the product or the working conditions of the fishermen, is generally poor and its improvement should be encouraged based on better research, as it has a great socio-economic importance. For example, improved efficiency in small-scale fisheries post-harvest systems, marketing and the promotion of exports of small-scale fisheries products could provide greater returns. Food quality and food safety, both in terms of impact on price as well as risks for human health, will also continue to be a major issue.

4. COMMON METHODOLOGIES TO MONITOR THE REGULAR COLLECTION OF RELEVANT DATA

The most recent works on small-scale fisheries have focused on improving sampling and assessment strategies particularly tailored for Mediterranean fisheries. This kind of investigation has developed in several countries and the basic principle is that of applying methods of stratified random sampling in space and time.

The stratification criterion will not necessarily be a quantitative variable, but can be a qualitative one too. The spatial stratification of given areas is often realized considering the geographical constraints and the relative importance of existing ports. Such elements are usually collected on the basis of appropriate frame surveys. As an example, for the 1983-84 study of small-scale fisheries of the French Gulf of Lion these considerations led to define 15 spatial strata, each including a single port or a group

FIGURE 2
Stratification of the French Languedoc Roussillon coast for random sampling of artisanal fisheries activities



Source: Farrugio and LeCorre, 1983.

of 2 or 3 smaller ones. These strata have then been grouped in 5 superstrata, each of them being assigned to an investigator (Figure 2).

In order to extrapolate the total yields and efforts from the samples, such a method should also include an exhaustive knowledge of the total number of boats existing in the whole area. This could be defined as the potential fishing fleet, which is generally different from the observed active fishing fleet. Such information could be obtained by compiling administrative files or through a series of field observations. It could offer the possibility of estimating the weight of each stratum in order to permit a consistent rebuilding of the total sample.

A sampling strategy and methodology for assessment and monitoring of small-scale fisheries. An example

In order to reach a quantitative assessment of the French Mediterranean small-scale fisheries, a strategy established in 1983 by the French research institute Ifremer consisted in the evaluation in space and time of the elementary fishing efforts and yields of every stratum and their corresponding variations, in order to evaluate the global productions and efforts. This strategy has been successfully applied along the French coast and after some light amendments to the Moroccan, Tunisian and Caribbean small-scale fisheries. The sampling strategy has been based on two types of inquiries aimed at the production of independent data series which concern essentially efforts and landings for each one of the space-and-time stratum.

The basic principles of such a strategy are the following:

- Within a given stratum, the fishing effort should be sampled in terms of activities of the fleets in order to define the number of active boats and of fishing days per gear or group of gear within a stratum.
- Within the same space-and-time stratum the landings should be sampled in weight and value per species, gear and boat (these samplings will not necessarily take place during the same day the fishing effort of the fleet is sampled. In practice these two operations are generally very difficult to realize simultaneously).
- The descriptors of the fishing effort linked to the landings samples concern the types, quantities and fishing times of the gear, the crew numbers and the trips durations.
- The spatial distribution of the effort is described by the location of the fishing grounds (when known).
- The economic descriptors are the types of commercialization of the fish.
- The catches are detailed by gear, species and eventually by commercial categories accompanied by the corresponding weights and prices (considered as rough primary economic descriptors).

Source: Farrugio and Le Corre, 1993.

The distances between ports and landing sites, the traveling times necessary to visit them and the money allocated to field operations are the main elements that govern time stratification. In the French Languedoc Roussillon region for example, these elements allowed to plan on a weekly basis, for each investigator, three different port samplings of five-hour duration. Otherwise, at least two independent samples would be necessary to calculate a variance for a single parameter. Based on this and on the number of ports to visit, it was possible to share the time for each investigator in three-week strata.

Improving the expertise of the team involved in field surveys and analysis is important to obtain sound results. The gathering of information entirely depends on the installation of networks of samplers on the coasts. This requires a considerable investment in human and financial resources and the scientists are faced with the problem of elaborating routine strategies, which would enable them to obtain information at a lower cost. In order to increase the quality of such systems the harbor facilities and access should be improved in the strategic landing sites.

Collecting data without some idea of the models to be used is generally not a very productive exercise, but it may be necessary as a first step in order to provide the "snapshot" which defines the system to be studied. However, it has to be kept in mind that the bio-economic models which are sometimes used for the study of fisheries traditionally refer to unsophisticated fisheries, or are simplified by a game of suitable hypotheses, most of the time considering the exploitation of a single species by a homogenous fleet, and are poorly suited for the analysis of the composite fisheries, common in the region. The development of an original conceptual approach is requested.

A standard methodology to collect socio-economic data in the Eastern Mediterranean: experience from Egypt, Gaza Strip, Lebanon and Turkey

The methodology proposed was based on a statistical design. The sampling unit was the single licensed fishing vessel and it was based on a stratified random sampling without replacement. Each sampling unit was chosen avoiding the possibility to be chosen more than once. The sample size was determined in order to have a large sample and to minimize as much as possible the variance. Since in all the countries such a survey was convened for the first time, the appropriate sample size could not be determined a priori, and hence a coverage rate from 15–50 percent was used depending on the number of vessels in each fleet segment.

The stratification was carried out according to the GFCM Task I fleet segmentation which is based on the technical and dimensional characteristics of the vessels. The statistical design was the most important step in order to maintain a standard methodology in all the areas sampled. Subsequently, a questionnaire was designed to evaluate the socioeconomic circumstances (costs and revenue) and activity of fishing vessels. The selected vessels were surveyed by means of direct interviews and the technical data on the fleet were obtained from the respective fisheries department. The socio-economic variables were those defined in the GFCM Task 1, however some additional variables were also collected which were specific to the area concerned. The quality of the data was assessed using the coefficient of variation and modified for small populations. The methodology was successfully used in all the areas, where in general the data gathered had a low coefficient of variation showing that the statistical quality of the data was good.

Source: Pinello and Dimech, EastMed FAO regional project.

CONCLUSIONS AND SALIENT ISSUES FOR THE MALTA SYMPOSIUM

The vision developed by the FAO ACFR for small-scale fisheries stresses their contribution to sustainable development. More precisely, it is a vision whereby:

- small-scale fisheries are not marginalized and their contribution to national economies and food security is recognized, valued and enhanced;
- fishermen, fishworkers and other stakeholders have the ability to participate in decision-making, are empowered to do so, and have increased capability and human capacity, thereby achieving dignity and respect; and
- poverty and food insecurity do not persist; and where the social, economic and ecological systems are managed in an integrated and sustainable manner, thereby reducing conflict.

Although fisheries in the GFCM area meet only a small part of the demand for food products, they have an important role to play in terms of sustainable development in the region, with a high value in terms of cultural identity (owing to the great diversity in their *savoir-faire* and fishing methods as well as in terms of employment).

In order to provide a full picture of small-scale fisheries in the GFCM area, various actions at the regional level should be undertaken, consistent with a clear political mandate and within an agreed framework that encompasses all interested stakeholders. Some of the elements that should be taken into account to promote sustainable SSFs in the GFCM area are the following:

- Identify main gaps in national and regional statistics related to SSFs and elaboration of a common regional data base is a priority for the future of the SSFs;
- Develop a quantitative information system to collect at regional level data and information on the fleets and their activities, their production and the biological parameters of their target species, as well as the socio-economic dimension of small-scale fisheries (the methods of stratified random sampling in space and time should be recognized as being particularly fit for the appraisal and the assessment of the artisanal Mediterranean fisheries);
- Draft a regional programme to compile the technical and cultural information related with SSFs in the Mediterranean Sea including: a description of all the types of gear and vessels, disappeared and existing fisheries and target species, their habitats and the characteristics of the exploited ecosystems; it is of considerable importance to indicate how the artisanal fisheries relate to, and are affected by, the large number and variety of human activities in the Mediterranean;
- Elaborate national catalogues of highly sensible areas for SSFs, including reproduction areas, eggs, larvae and juvenile's concentration, recruitment areas and periods and non take zones and MPA to protect and improve the status of the main SSF target fishing stocks;
- The main lessons that can be drawn from the studies realized so far are similar, regardless of the area in which they have been carried out. Those studies have demonstrated the possibility of underpinning the statistical demand. Abundant flows of valuable information should hence be obtained and their generalization could enable to envisage a complete approach of the dynamics of the main stocks exploited by small-scale fisheries, as well as their interactions;
- The SSF Guidelines are intended to support the enhancement of the sector's already important role. The SSF Guidelines intend to support small-scale fisheries governance and were developed through a participatory and consultative process, involving representatives of small-scale fishing communities, civil society organizations, governments, regional organizations and other stakeholders. They are consistent with, complement and support other international instruments and commitments such as the FAO Code of Conduct for Responsible Fisheries. Users

of the SSF Guidelines – including States, small-scale fisheries actors and other stakeholders – are encouraged to consult these and other relevant instruments for their applicable obligations, voluntary commitments and additional guidance.

- SSF communities and local SSF organizations may feel the need to defend their interests and socio-economic status *vis-à-vis* other community groups, including industrial and semi-industrial fishermen, in the pursuit of assurance of viability – of the community, if not of life itself. The analysis of the role of SSF organizations and communities as fundamental bricks to structuring the countries is needed. The influence of SSF organizations in the fisheries management and decision-making processes has also to be taken into account.;
- In this connection, building up on the existing organizations to create a Mediterranean Networking of SSF organizations is important and should need the support of the GFCM for: the identification of members, priorities, needs and organizational options. Links among the Mediterranean and international SSF organizations;
- Socio-economic circumstances and investment needs: some fisheries are carried on year round (often with a change in the target species and/or the fishing gear deployed) and the present small-scale fisheries are mainly seasonal, rapidly subject to changes in the economic climate, hence precarious. Many artisanal fishers are active only on a part-time basis, depending largely on the seasonal availability of other, easier, more remunerative work and on the seasonal availability of many fish species. This inherent precariousness has always hampered investment and development. And the widespread failure of the general population and governments to recognize the small-scale fishery community as a specific socio-economic entity – a valuable stakeholder in the coastal zone – has also slowed down investment.
- Finally, the necessity of periodically updating the information has to be highlighted and it should be of paramount importance not to lose the benefit of the training by the pilot projects and to ensure the continuity of the sampling of biological and socio-economic aspects of the SSF in the long term after its end in order to make available longer historical series of data for the fisheries assessment analyses.

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FULL PAPERS

Risks associated with lagoon and coastal small-scale fisheries in the Gulf of Amvrakikos, western Greece

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ABSTRACT
Risks associated with fisheries conducted by professional fishermen in lagoons and open sea (along the coast) was investigated in the area of Amvrakikos Gulf (western Greece; N38°58"–E20°58'). Amvrakikos Gulf is a fjord-like elongated gulf with an area of 405 km² and a maximum depth of 55 m (though most of the marine area has depths below 25 m) located in western Greece. Along the coastline of the Gulf there are more than 20 large and small brackish water lagoons, from which the north lagoon complex is the largest in the Balkans with an area of 55 km². The lagoons are exploited for fisheries by local professional fishermen cooperatives while there are other professional fishermen who fish along the gulf coastline outside the lagoons. The information on coastal fishery typology and risks was collected directly from the fishers using a face-to-face approach for the completion of structured questionnaires suitable to build mental maps. The paper presents the results of the risk perception study of the lagoon and coastal fishers groups, the analysis of the data and the comparison of the two groups.

Keywords: small-scale fisheries, risk perception, Amvrakikos Gulf, Ionian Sea, Greece

INTRODUCTION
The Greek small-scale fisheries is the most important segment of the national fisheries sector comprising 15 407 vessels out of the 15 921 vessels in the national fleet (EU fleet register, accessed 30 September 2013) which mainly fall under the LOA category of 0–6 m. The fleet, according to the EU fleet register, is rather old with small engines and according to the fishermen, in most cases, rather unsafe to use due to the coastal weather conditions in Greece. Moreover, for the same reason, most of the vessels operational range does not exceed 5–10 miles around the home ports (Conides *et al*., 2004).

The coastal fisheries sector is valuable for the Greek fisheries production as it supports rural communities with high dependency on fisheries for job and income security and it supplies with high market quality fishery products the tourism industry, eventhough the gross product of the sector is very low (less than 1 percent; national statistical survey in Greece 2009–2010).

Small-scale fisheries are subject to uncertainty and risks related to issues such as economics (both national and international; for example oil prices), weather,

environmental quality (that affects fishing grounds) and social issues. At the same time, the small-scale fisheries sector faces a very strong competition from the sport fisheries sector in terms of sharing the same fishing grounds. The Greek sport fisheries sector has more than 200 000 active vessels. On the contrary, lagoon fisheries are differently structured as lagoons are exclusively rented by local professional coastal fishermen cooperatives for fisheries production.

Risk perception in the fisheries sector is strongly related to their common understanding of the resource status, the concern expressed on the resource state by the scientists and the subsequent management regimes enforced by the administration (Minnegal and Dwyer, 2008; Arnasson, 2009). As the fishermen are low level stakeholders, the management regime has the greatest impact on their risk perception (Edvardsson *et al.*, 2011). The main principle of the Greek fisheries management system is "open access" and as such contains the principles of the tragedy of the commons (Hardin, 1968) while the fishermen, due to intense competition between them as well as with the sport fishermen, tend to substitute restricted inputs with increased landings (Campell, 1991).

This paper aims to the identification of risks related to coastal fisheries, the quantification of the perceived links between risks and the comparison between risks related to lagoon professional fisheries and coastal water professional fisheries.

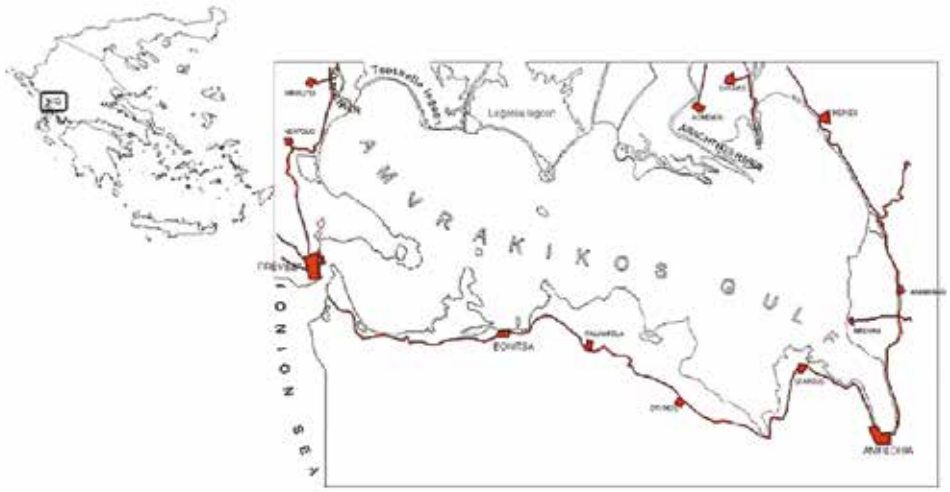
MATERIALS AND METHODS

Study area

Information on the risks perception by the small-scale fishermen was collected using structured questionnaires and face-to-face interviews with professional small-scale fishermen from the area of Amvrakikos Gulf, western Greece (Ionian Sea; Figure 1). The Amvrakikos Gulf is the largest gulf in western Greece covering an area of approximately 405 km² and one of the largest enclosed gulfs of Greece (fjord–type gulf; about 40 km long and 15 km wide; Figure 1).

Along the north shoreline, there is a major lagoon complex composed of the Logarou lagoon (26 km²), the Tsoukalio lagoon (16 km² with Avleri lagoon) and the Rodia lagoon (13 km²). The entrance to the gulf is a narrow passage between the peninsula of Aktio and the city of Preveza, 600 m wide and with a depth range between 5 and 15 m. This is a closed inland sea with an average depth of 26 m and a maximum depth of 65 m.

FIGURE 1
Map of the Amvrakikos Gulf location in western Greece



Target group

Questionnaires were collected through face-to-face interviews with a population of 20 fishermen members of the cooperatives that rent the Tsoukalio and Logarou lagoons (Figure 1) as well as 30 coastal fishermen operating in the gulf. The members of both cooperatives are today 130 fishermen while the coastal fishermen in the gulf are estimated to be 500 vessel owners and around 250 workers. The age distribution of the interviewees was 30–60 and all were males. The interview took place in a coffee shop where the fishermen usually gather every day close to the home port. The main prerequisites for the selection of suitable interviewees are to be active the last three years and to own a fishing vessel themselves. The interview procedure was developed to elicit interviewee's perceptions of risk and the strength of these perceptions in relation to the coastal and lagoon fisheries sector. The methodology was also designed to capture explanatory information in relation to perceived linkages between risk factors, e.g. ranking. The interviewees were requested according to their experience to identify the risks and describe the dependencies between them as means to provide possible explanations on the cause-effects of the various risks (Johnson-Laird, 2004).

Analysis

Statistical comparisons were carried out using the principal components analysis and k-means clustering techniques. Risk modeling is a qualitative analysis technique used by social scientists, cognitive psychologists and decision-making theorists to explain an individual's thought in relation to a system operation in real world conditions and examine how people perceive reality (Taylor-Gooby and Zinn, 2006; Taylor-Gooby 2006).

Results and discussion

The results of the risks identified for the coastal fishermen and the lagoon fishermen, are summarised in Tables 1 and 2.

TABLE 1
Risk register: summary of key risks identified by coastal professional fishermen

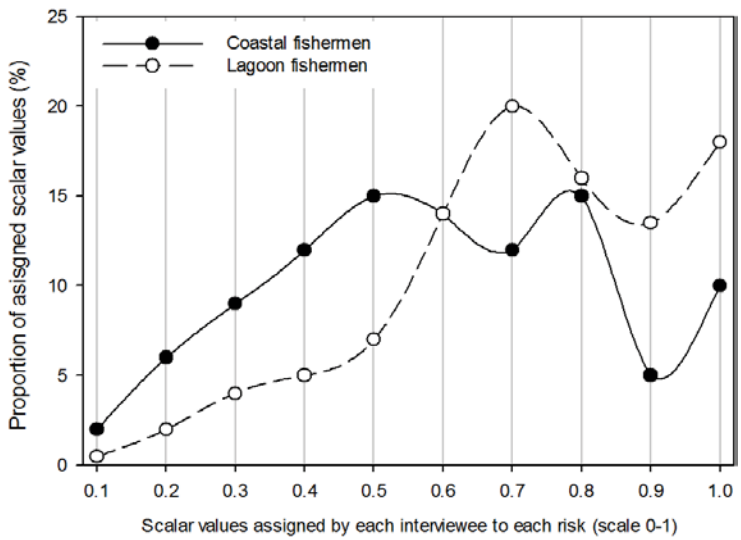
RISK	FREQUENCY	AVERAGE	VARIANCE	STANDARD DEVIATION	RANK
Fishing costs	26	0.864	0.011	0.103	1
Conflicts with sport fishing	20	0.764	0.087	0.294	2
Reduction of stocks	17	0.618	0.084	0.289	3
Application of legislation	15	0.400	0.024	0.155	4
Safety at sea	15	0.318	0.062	0.248	5
Problems with central administration	14	0.282	0.088	0.296	6
Inappropriate national legislation	12	0.273	0.052	0.228	7
Pollution	12	0.264	0.075	0.273	8
Illegal fisheries	12	0.227	0.052	0.228	9
Conflicts with aquaculture	6	0.227	0.054	0.233	10
Inappropriate infrastructure	5	0.164	0.047	0.216	11
Reduction of fishing grounds	5	0.155	0.037	0.192	12
Impact from protected species	4	0.145	0.051	0.225	13
Climate changes	4	0.136	0.045	0.211	14

TABLE 2
Risk register: summary of key risks identified by lagoon professional fishermen

Risk	Frequency	Average	Variance	Standard deviation	Rank
illegal fishing by poachers	20	0.864	0.011	0.103	1
Low annual production levels	19	0.318	0.062	0.248	2
Impact from protected species	19	0.789	0.077	0.345	3
Environmental state of lagoons (especially salinity)	18	0.764	0.087	0.294	4
Market (local and international)	16	0.400	0.024	0.155	5
Inefficient cooperation between state agencies - bureaucracy	12	0.618	0.084	0.289	6
Minimal budget for supporting works	10	0.282	0.088	0.296	7
Lack of experienced staff	8	0.273	0.052	0.228	8

The analysis of the frequency of the scalar values set by the fishermen show similar patterns between the two groups (Figure 2). However, the lagoon fishermen show higher percentages of values between 0.6 to 1 than the coastal fishermen indicating higher probabilities to propose few and targeted risks than the coastal fishermen who may propose many risks and assign similar probabilities to all.

FIGURE 2
Proportion of scalar values assigned to the individual risks by the interviewees



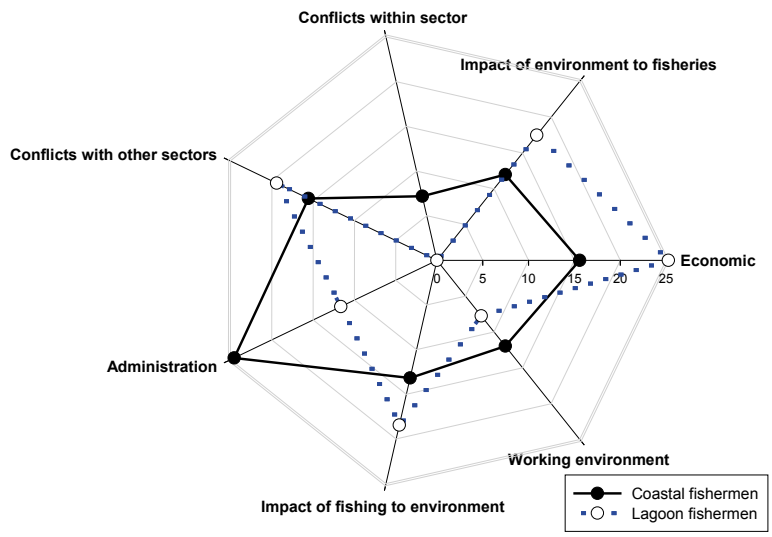
Grouping the risks proposed by the two groups of interviewees in 8 risk categories – conflicts within the sector, conflicts between fisheries and other sectors, impact of environment on fisheries, impact of fisheries on the environment, economic risks, administration risks and working environment – we obtain Figure 3. It is evident that both fishermen groups show interest in different risks.

Professional coastal fishermen are more interested in the conflicts with the administration (coast guard and regional fisheries authorities) as well as conflicts within the fisheries sector (sport fishermen, other fishing segments such as medium fisheries, illegal fishing in the same grounds).

On the contrary, lagoon fishermen are more interested in the environmental quality of the lagoons and its effects on production, conflicts with poachers (within the sector) and the economic value of their products for the market and exports. Lagoons are also geographic locations usually adjacent to other intensive human economic activities

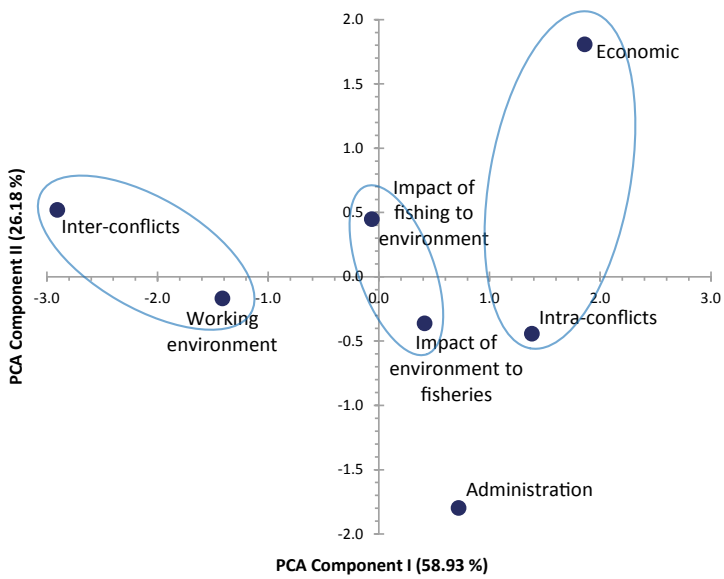
such as agriculture and livestock production and therefore in constant conflict with landscape alterations, use of chemicals and potential pollutants and inappropriate waste management.

FIGURE 3
Proportion of major risk groups identified by the interviewers (as percentage of total)



The results of a principal component analysis between the risk categories based on the average scalar values provided by the fishermen are illustrated in Figure 4. According to k-means clustering, there are three clusters formed: between economic and conflicts between sectors, impact of environment to fisheries and vice versa and between conflicts within the sector and the working environment risks.

FIGURE 4
Clustering of risks based on the reported frequency and average scalar value assigned to each risk category by the interviewees



Eventhough these groupings are more or less independent, there are some explanations. The economic risks and the conflicts among different sectors can be explained by the fact that conflicts, in general, create negative economic externalities mainly through competition for the same space and resource.

The interaction of fishing and the environment is more or less self-explanatory. Fishing is regarded as a human activity that affects the environment in terms of changes in biodiversity and reduction of resources, among others. At the same time, the changes of the environment, the weather and the global climatic changes affect directly fishing with changes on the water quality and the habitats.

Finally, risks related to the conflicts within the sector (for example professional fishermen, sport fishermen and poachers) may affect indirectly the working environment (primarily safety at sea) when the fishermen will attempt to exploit different fishing grounds or make inefficient use of their vessels which are not as safe as they should be.

ACKNOWLEDGEMENTS

The information related to this paper was collected within the 7FP research project ARCH-Architecture and roadmap to manage multiple pressures on lagoons, Grant Agreement 282748 (2011) coordinated by Norges Geotekniske Institutt (NGI, Norway).

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La pêche côtière artisanale dans le golfe de Gabès: caractérisation des moyens de productions et activité des métiers de pêche

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RÉSUMÉ

Ce travail s'inscrit dans le cadre de l'étude de l'impact de la pêche sur la biodiversité dans le golfe de Gabès qui constitue une composante du projet «Protection des ressources marines et côtières du Golfe de Gabès». Financé par la Banque mondiale (GEF), ce projet a pour objectif de permettre un développement économique et social basé sur l'exploitation rationnelle et durable des ressources marines et côtières.

On s'intéressera à la présentation de l'activité de la pêche côtière artisanale en termes de caractérisation des unités et engins de pêche et des espèces cibles ainsi que d'activité des métiers de pêche (associations engins-barques). Pour ces derniers, l'étude a notamment concerné l'analyse spatio-temporelle des captures, de l'effort de pêche et des prises par unité d'effort (PUE). Les données de base sont collectées à partir de 445 enquêtes sur le terrain réalisées dans les trois gouvernorats de Sfax, Gabès et Médenine. La méthode d'échantillonnage adoptée est celle stratifiée en prenant comme niveaux de stratification la zone et le type de l'unité de pêche. Le taux d'échantillonage réalisé est de 5 pour cent pour les barques côtières, 6 pour cent pour les pêcheries fixes et 2,5 pour cent pour la pêche à pied.

La majeure partie des barques côtières non motorisées (BCNM) ont une longueur inférieure à 6 m. Pour les barques côtières motorisées (BCM) c'est la catégorie de longueur 6-12 m qui domine. Les barques côtières opérant dans le golfe de Gabès sont relativement vieilles. La catégorie d'âge >20 ans est la plus fréquente. La catégorie de puissance ≤50cv est la plus représentée.

Outre la pêche à pied, les pêcheries fixes et la pêche aux éponges, sept engins de pêche sont utilisés à bord des unités de pêche côtière: filets encerclants, sennes, pots à poulpe, pierres creuses à poulpe, filets maillants, filets trémails et palangres. Parmi ces engins, les filets trémails présentent l'éventail d'espèces le plus large. En effet, 37 espèces et groupes d'espèces sont présents dans les captures de ces filets dont 23 sont considérées par les pêcheurs questionnés comme espèces cibles totalisant 81,6 pour cent des réponses totales. Les plus importantes espèces et groupes d'espèces cibles sont la seiche commune (*Sepia officinalis*), le poulpe commun (*Octopus vulgaris*), les crevettes, les soles et les spars (*Diplodus sp.*).

Pour les BCNM et les BCM, nous avons identifié respectivement 17 et 28 métiers de pêche. Pour les deux types de barques, l'association d'engin la plus utilisée est TM (trémail-maillant) avec 45 pour cent des réponses collectées pour chacun. Nous avons

noté une grande variabilité de l'activité spatio-temporelle des différents métiers, aussi bien en termes de captures, d'effort que de prise par unité d'effort. En moyenne :

- Une BCNM est active durant toute l'année, elle réalise 166 sorties/an, sa PUE est de 22 kg/sortie et elle opère dans les zones de profondeurs inférieures à 30 m;
- Une BCM est active durant toute l'année, elle effectue 167 sorties/an, sa PUE est de 44 kg/sortie et elle exploite les zones de profondeurs inférieures à 50 m.

INTRODUCTION

Le golfe de Gabès se situe dans le bassin oriental de la Méditerranée entre le parallèle 35°00'N et la frontière tuniso-libyenne. Il correspond à la principale zone de pêche en Tunisie. En effet, cette zone comprend environ 60 pour cent de la flottille de pêche nationale et 44 pour cent des ports et sites de débarquements. La plupart des ressources marines exploitées du golfe de Gabès soufrent d'une surexploitation chronique depuis la fin des années 80 (Anonyme, 1980; 2002a et b; 2006 a et b; 2010; 2011 a et b; 2012a, entre autres), et les différents biotopes sont de plus en plus dégradés (Anonyme, 1997; 1998; 2002b; 2008; 2010; 2011b; 2012 entre autres).

L'étude de l'impact de la pêche sur la biodiversité dans le golfe de Gabès s'inscrit dans l'objectif général de doter le Gouvernement tunisien des mesures nécessaires pour assurer la durabilité de la pêche dans la région. La première phase de cette étude correspond à une synthèse bibliographique qui a touché les différentes composantes de l'écosystème marin du golfe de Gabès (Anonyme 2012a). La seconde phase est dédiée à l'évaluation de l'activité de pêche en termes de flottille, de pratiques et d'engins de pêche et de leurs impacts sur la biodiversité marine et à l'élaboration des actions qui permettent une exploitation des ressources halieutiques compatible avec la préservation de l'écosystème et la maximisation des revenus des pêcheurs (Anonyme, 2012b). Cette étude a été confiée par la Direction générale de l'environnement et de la qualité de la vie du Ministère de l'environnement au Bureau d'études ingénierie de l'hydraulique, de l'équipement et de l'environnement.

Le présent travail s'intègre dans l'étude susindiquée qui constitue une composante du projet «Protection des ressources marines et côtières du Golfe de Gabès» financé par la Banque mondiale (GEF). On s'intéressera à la présentation de l'activité de la pêche côtière artisanale en termes de caractérisation des unités, des engins et espèces cibles et de l'activité des métiers de pêche.

Il convient de noter qu'il ne sera fait référence qu'à certains travaux qui ont servi à l'élaboration de la méthodologie. Pour une bibliographie exhaustive sur l'activité de pêche et les ressources marines vivantes du golfe de Gabès, il est possible de consulter le rapport bibliographique sur l'état des connaissances des espèces à valeur patrimoniale et des espèces introduites du golfe de Gabès (Anonyme, 2010), le rapport de la phase 1 de l'étude de l'impact de la pêche sur la biodiversité dans le golfe de Gabès (Anonyme, 2012a), ainsi que le rapport de la première phase de l'étude stratégique de préservation et d'exploitation durable de la biodiversité dans le golfe de Gabès (Anonyme, 2012b).

MATÉRIEL ET MÉTHODE

La partie inventaire bibliographique a fait ressortir que les unités de pêche opérant dans le golfe de Gabès ont été recensées deux fois, la première par l'Institut national des sciences et technologies de la mer (INSTM) en 1997 dans le cadre du projet national mobilisateur «Évaluation des ressources halieutiques en Tunisie» et la seconde par la Direction générale des études et du développement agricole (DGEDA) en 2003 dans le cadre du projet de renforcement des structures agricoles (RGP 2003/2004). Officiellement, à partir de 2004, c'est le RGP 2003/2004 qui a été adopté par les autorités compétentes comme base dans l'élaboration des annuaires des statistiques de pêche de la Direction générale de la pêche et de l'aquaculture (DGPA). La comparaison

de ces sources d'information avec les résultats de certains projets et études réalisés au cours de la dernière décennie tels que le projet FAO ArtFiMed (Ghannouch-El Akarit, 2007/2010), l'étude de diagnostic du système de suivi statistiques de la pêche artisanale en Tunisie (DGPA/FAO-CopeMed II, 2011) et le projet TCP/FAO «Renforcement du rôle de la femme dans la filière pêche à pied de la palourde» (2009/2011) a permis de remarquer:

- que le RGP, comme tout inventaire exhaustif, est une image instantanée des années 2003-2004 non actualisée depuis sa réalisation;
- une grande variabilité des engins employés à bord de la même barque;
- une acquisition de moteurs hors bord pour plusieurs barques non motorisées comptabilisées jusqu'à présent comme barques côtières motorisées.

Ainsi, compte tenu de ces remarques, seuls ont été considérés les effectifs des barques de pêche et des pêcheurs à pied issus de l'Annuaire des statistiques de pêche de l'année 2010 ainsi que les effectifs des pêcheries fixes ressortis par le RGP 2003/2004. Les catégories de barque et/ou de mode pêche côtière artisanale pris en considération dans cette étude sont:

- les barques côtières motorisées (BCM);
- les barques côtières non motorisées (BCNM);
- les pêcheries fixes;
- la pêche à pied.

Pour la définition et la catégorisation des engins de pêche, des métiers de pêche, de l'effort de pêche et des prises par unité d'effort, on s'est référé, entre autres, aux travaux de Nedelec et Prado (1990), Cochrane (2005), Coppola (2006), ArtFiMed (2009a, 2009a, 2009c, 2011a, 2011b) et aux recommandations du Sous-comité des statistiques et de l'information (SCSI) du Comité scientifique consultatif (CSC) de la Commission générale des pêches pour la Méditerranée (CGPM).

Les informations de base sont collectées par enquêtes directes en se basant sur un schéma d'échantillonnage stratifié dont la zone est la strate primaire et l'unité de pêche est la strate secondaire. Les enquêtes sont réalisées dans 20 ports/sites de débarquements moyennant des questionnaires spécifiques à chaque mode de pêche. Elles ont intéressé, entre autres, les différents aspects relatifs à l'activité de pêche avec comme éléments spécifiques le pêcheur, l'unité de pêche, l'engin de pêche, la production et la commercialisation.

Dans le golfe de Gabès, l'exploitation halieutique côtière artisanale est assez variée, aussi bien du point de vue des engins employés que de pratiques de pêche (saison, zone, espèces cibles). Ceux-ci nous ont conduits à retenir l'association «barque et/ou mode de pêche/engins» comme métier de pêche.

Pour assurer à la fois une bonne représentativité des échantillons et une meilleure gestion des contraintes budgétaires et du temps, nous avons opté pour un taux d'échantillonnage de 5 pour cent pour les barques côtières, 6 pour cent pour les pêcheries fixes et 2,5 pour cent pour la pêche à pied. Au total, 445 enquêtes ont pu être réalisées, soit un taux de réalisation global de 96 pour cent (Tableau 1).

TABLEAU 1
Nombre d'enquêtes réalisées et taux de réalisation par type d'unité de pêche et par région

Région	Unité de pêche				Total	Taux de réalisation (%)
	BCM	BCNM	Pêche à pied	Pêcherie fixe		
Sfax	102	60	18	21	201	**102**
Gabès	28	18	40	0	86	**98**
Médenine	52	51	54	1	158	**89**
Golfe de Gabès	182	129	112	22	445	**96**
Taux de réalisation (%)	**114**	**91**	**84**	**81**	**96**	

RÉSULTATS

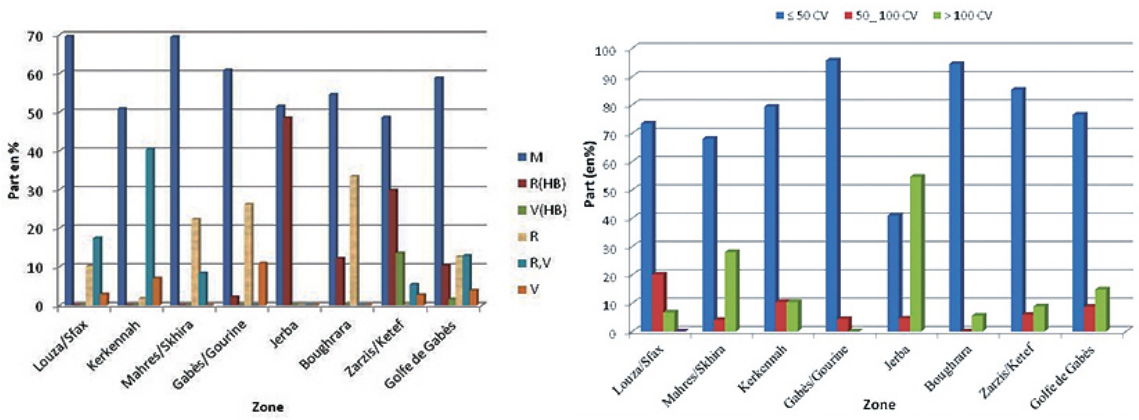
1. Caractérisations des barques de pêche

a. Mode de propulsion et puissance du moteur principal

Dans le golfe de Gabès, les barques côtières-artisanales sont réparties en fonction de leur mode de propulsion en six types. La majorité de ces barques sont motorisées. Les barques à voiles sont les moins représentées. On enregistre une augmentation du nombre des BCM aux dépens des BCNM par l'acquisition de moteurs hors bord; la part de ces barques est de l'ordre de 12 pour cent de la flottille côtière artisanale active dans le golfe de Gabès. Ces dernières seront considérées comme des BCM.

La puissance du moteur des BCM échantillonnées dans le golfe de Gabès est comprise entre 4 et 315 cv. La classe de puissance ≤50 cv représente la majorité des observations soit de l'ordre de 75 pour cent des cas. Dans la zone de Djerba, les barques équipées de moteur dont la puissance est supérieure à 100 cv sont les plus abondantes. Dans les autres zones du golfe de Gabès, les unités dont la puissance du moteur est inférieure à 50 cv sont prédominantes (voir Figure 1).

FIGURE 1
Répartition des barques côtières par mode de propulsion et par région (à gauche) et des BCM par classe de puissance du moteur par zone (à droite)



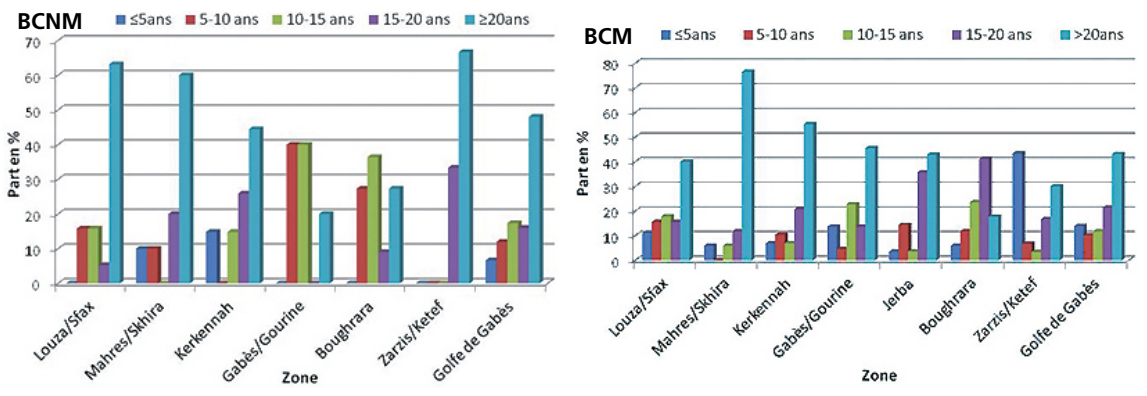
Avec M: motorisée; V: à voile; R: à rames; R,V: à rames et à voile; V (HB): à voile avec moteur hors bord; R (HB): à rames avec moteur hors bord.

b. Age

Les BCM et les BCNM actives dans le golfe de Gabès sont anciennes; leurs âges moyens sont respectivement de 19 et 21 ans. En outre, environ 43 pour cent des BCM ont un âge supérieur à 20 ans; c'est également le cas pour 48 pour cent des BCNM. À l'échelle régionale :

- les BCNM dont l'âge est supérieur à 20 ans représentent plus de la moitié des BCNM dans les zones de Louza/Sfax, Mahres/Skhira et Zarzis/Ketef. Les BCNM dont l'âge est inférieur à 10 ans sont les plus fréquentes dans les zones de Gabès/Gourine et Boughrara.
- Les vieilles BCM, âge supérieur à 20 ans, sont les plus abondantes dans les zones de Mahres/Skhira et Kerkennah. La plus jeune flottille des BCM, âge inférieur à 10 ans, est enregistrée dans les zones Zarzis/Ketef et Louza/Sfax.

FIGURE 2
Répartition des BCNM et des BCM par classes d'âge par zone

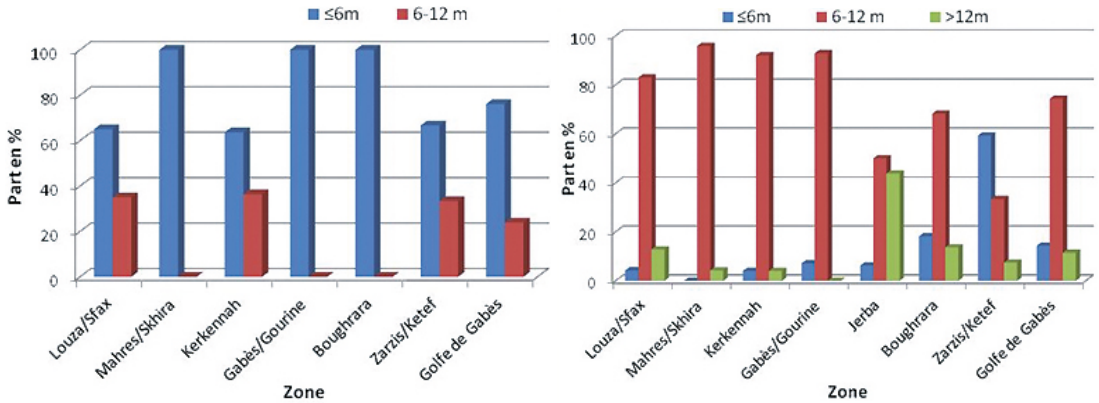


c. *Longueur*

La longueur des BCM du golfe de Gabès est comprise entre 3,2 et 18 m avec une moyenne de 7,2 m. Pour les BCNM ces valeurs sont respectivement de 3,5, 12 et 5,8 m. Les BCNM du golfe de Gabès sont de petite taille alors que les BCM sont globalement de longueur moyenne.

Les BCNM de longueur inférieure à 6 m représentent la quasi-totalité des observations dans les zones de Mahres/Skhira, Gabès/Gourine et Boughrara. Dans les autres zones, la classe de longueur inférieure à 6 m représente plus de 60 pour cent des BCNM.

FIGURE 3
Répartition des BCNM (à gauche) et des BCM (à droite) par classes de longueur et par zone



2. Caractérisation des engins de pêche

2.1 Engins actifs

a. *Filets encerclants*

Les filets encerclants rencontrés dans la zone d'étude sont soit des sennes tournantes pour la pêche des coryphènes dans les zones de Djerba et Zarzis/Ketef soit un assemblage de filets maillants utilisé pour encercler les espèces de petits pélagiques et de muges dans la zone de Gabès/Gourine.

La longueur du filet est en moyenne de 325 m avec un minimum de 50 m et un maximum de 1 500 m. Le maillage varie entre 16 et 35 mm avec une moyenne de 27 mm (Tableau 2).

TABLEAU 2
Valeurs moyennes, minimales et maximales de la longueur totale, du maillage et de la hauteur des filets encerclant par zone

Zone	Longueur totale (m)			Maille (mm)			Hauteur
	Moyenne	Min	Max	Moyenne	Min	Max	Moyenne (m)
Gabès/Gourine	600	300	1 500	20	16	28	3
Djerba	300	300	300	35	35	35	50
Zarzis/Ketef	200	200	200	25	24	26	2
Golfe de Gabès	**325**	**50**	**1 500**	**27**	**16**	**35**	**22**

b. La pêche à pied

C'est une technique artisanale qui se pratique dans les zones où le marnage est important. La pêche à la clovisse est la seule technique de pêche à pied rencontrée durant le travail d'enquête sur terrain. Cette pratique est faite essentiellement par des femmes qui se déplacent le long des étendues Estran du golfe et collectent les clovisses à l'aide d'un faucillon appelé localement «el menjel». Le nombre de faucillons utilisés par an et par personne varie de 1 à 3.

c. Engins prohibés

Le mini-chalut, ou kiss, et la senne de plage sont déclarés être utilisés respectivement par 15 pêcheurs de la région de Sfax et 11 pêcheurs de la région de Gabès. Cependant, les pêcheurs n'ont pas voulu donner d'informations sur les caractéristiques techniques de ces engins prohibés.

2.2 Engins passifs

a. Les filets droits

Les filets maillants

Les filets maillants à une seule nappe sont en général utilisés dans toutes les zones du golfe de Gabès avec une légère prépondérance pour les zones de Mahres/Skhira et de Gabès/Gourine.

Maillage: Pour les 226 observations enregistrées, le maillage des filets utilisés a été marqué par une grande variabilité en passant d'un minimum de 20 mm à un maximum de 55 mm avec une moyenne de 28 mm. En moyenne, les plus faibles maillages sont enregistrés dans les zones de Louza/Sfax et Gabès/Gourine alors que les plus grands sont observés dans la zone de Djerba. En outre, on signale que la catégorie de maillage la plus fréquente dans le golfe de Gabès est 20-24 mm alors que la moins représentée est la catégorie ≥36 mm.

Hauteur: La hauteur des filets maillants est également, marquée par une grande variabilité soit de 0,9 à 15 m. La hauteur moyenne correspondante est 2,8 m. Les filets maillants employés par les pêcheurs de la zone Mahres/Skhira sont les moins hauts alors que ceux observés dans la zone de Djerba sont les plus hauts. En outre, les filets de hauteur inférieure à 2 m sont les plus fréquents dans le golfe de Gabès.

Longueur totale: Dans le golfe de Gabès, la longueur totale moyenne des filets maillants à bord de la même barque est de 2 880 m avec un minimum de 200 m et un maximum de 17 000 m. En moyenne, les pêcheurs de la zone Gabès/Gourine utilisent des filets maillants relativement plus longs que ceux des autres régions, tandis que ceux des zones Louza/Sfax et Boughrara emploient des filets généralement plus petits.

TABLEAU 3
Principales caractéristiques des filets maillants par zone

	Côté de maille (mm)			Hauteur (m)			Longueur totale (m)		
Zone	**Min**	**Moyenne**	**Max**	**Min**	**Moyenne**	**Max**	**Min**	**Moyenne**	**Max**
Louza/Sfax	20	25	35	1,0	2,1	15,0	500	1 464	5 600
Mahres/Skhira	24	26	40	1,0	1,7	3,0	1 000	2 789	10 000
Kerkennah	22	28	36	0,9	2,3	5,0	200	2 246	10 000
Gabès/Gourine	20	25	36	1,2	3,7	15,0	500	6 982	10 000
Boughrara	22	26	40	0,9	3,3	15,0	200	1 488	10 000
Jerba	28	34	55	1,0	3,5	12,0	400	3 076	10 000
Zarzis/Ketef	22	31	40	1,0	2,6	15,0	240	2 541	17 000
Golfe de Gabès	**20**	**28**	**55**	**0,9**	**2,8**	**15,0**	**200**	**2 880**	**17 000**

Filets trémails

Les filets trémails sont observés dans toutes les zones du golfe de Gabès avec des fréquences relatives régionales d'environ 14,5 pour cent pour chaque zone.

Maillage: Pour les 200 cas enregistrés, le côté de maille de la voile varie entre 20 et 40 mm avec une moyenne de 28 mm, donc la même valeur enregistrée pour les filets maillants. Les maillages employés le plus fréquemment dans le golfe de Gabès sont respectivement 30 mm (33 pour cent des cas) et 24 mm (22 pour cent des cas). En moyenne, les maillages observés dans la zone Gabès/Gourine sont les plus grands. En revanche, ceux enregistrés dans les zones de Boughrara et Louza/Sfax sont les plus faibles.

Hauteur: La hauteur des filets trémails observés dans le golfe de Gabès varie entre 0,3 et 3,5 m avec une moyenne de 1,6 m. On note que les filets de 1 et 1,5 m de hauteur sont les plus employés, et les filets les moins utilisés ont une hauteur de 3,5 m. Les filets de faible hauteur sont enregistrés dans les zones de Boughrara et Zarzis/Ketef alors que les plus hauts filets sont employés dans la zone de Gabès/Gourine.

Longueur totale: La longueur totale des filets trémails employés à bord de la même barque côtière varie entre 750 et 22 500 m avec une moyenne de 5 590 m. En moyenne, les pêcheurs de Djerba emploient les filets trémails les plus longs alors que ceux de Gabès/Gourine utilisent les filets de longueur totale relativement plus faible.

TABLEAU 4
Principales caractéristiques des filets trémails par zone

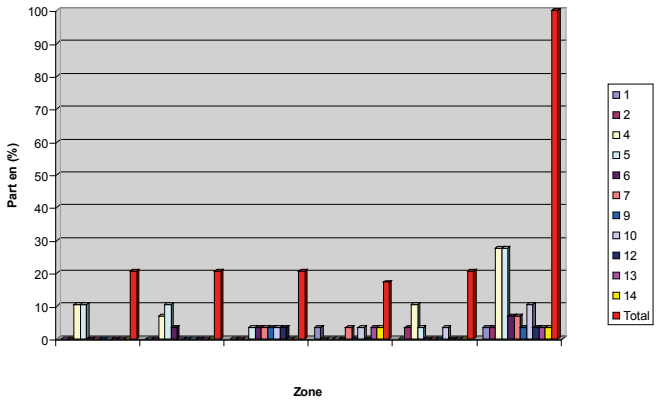
	Côté de maille de voiles (mm)			Hauteur des filets (m)			Longueur total des filets (m)		
Zone	**Min**	**Moyenne**	**Max**	**Min**	**Moyenne**	**Max**	**Min**	**Moyenne**	**Max**
Louza/Sfax	20	26	35	1	1,5	2	750	3 638	22 500
Marhes/Skhira	24	28	35	1	1,5	3,5	1 000	6 534	22 500
Kerkennah	24	27	30	1	1,4	2	750	6 365	20 000
Gabès/Gourine	22	35	40	1,2	2,3	2,4	1 600	2 039	2 100
Jerba	28	29	30	1	2,4	3	3 000	9 172	20 000
Boughrara	20	25	30	0,3	1,3	3	1 000	6 032	15 000
Zarzis/Ketef	20	28	30	0,5	1,1	3	760	4 337	10 000
Golfe de Gabès	20	28	40	0,3	1,6	3,5	750	5 590	22 500

b. Les palangres

Les palangres sont observées dans les zones de Louza/Sfax, Kerkennah, Djerba, Boughrara et Zarzis/Ketef avec des parts peu différentes de 20 pour cent pour chaque zone.

Numéro d'hameçons: Les numéros des hameçons des palangres employés dans le golfe de Gabès varient entre 1 et 14. Dans la zone de Boughrara on n'a observé que des hameçons de numéro 4 et 5. Pour les autres zones les numéros d'hameçons sont hétérogènes (Figure 4).

FIGURE 4
Répartition des palangres par zones en fonction du numéro des hameçons



Nombre d'hameçons: Dans le golfe de Gabès (résultats récapitulés dans le Tableau 5) le nombre d'hameçons par panier s'échelonne entre 150 et 600. C'est dans la zone Djerba que cette dernière valeur est enregistrée, pour les autres zones le nombre maximal est de 400 hameçons par panier. Le nombre moyen de panier par barque est de 3 avec un minimum de 1 et un maximum de 6. Le nombre moyen d'hameçons par barque est de l'ordre de 1 200. On note que ce nombre est voisin de 630 dans le gouvernorat de Sfax et qu'il est compris entre 1 200 et 1 450 dans les autres zones.

TABLEAU 5
Principales caractéristiques des palangres par zone

	Louza/Sfax	Kerkennah	Djerba	Boughrara	Zarzis/ketef	Golfe de Gabès
Nombre d'hameçons par panier						
Moyenne	325	288	350	313	367	326
Min	300	150	200	200	300	150
Max	350	400	600	400	400	600
Nombre de paniers par barque						
Moyenne	2	2	4	4	4	3
Min	2	1	3	3	3	1
Max	2	3	6	6	5	6
Nombre total d'hameçons par barque						
Moyenne	650	625	1 450	1 238	1 450	1 196
Min	600	300	600	600	900	300
Max	700	900	2 400	2 400	2 000	2 400

c. Les pièges

La charfia

La *charfia* est une technique ancestrale utilisée dans le sud du pays particulièrement dans les îles Kerkennah. Le nombre de pêcheries fixes échantillonnées s'élève à 21 unités localisées toutes à Kerkennah. Du point de vue type de *charfias*, 73 pour cent d'entre elles sont de type simple (un mur principal et deux murs de rabattement), 23 pour cent de type composé (assemblage de deux charfias simples) et 4 pour cent de type simple renversé. Il est clair que la *charfia* composée renferme plus de chambres de captures que les autres modèles et que la longueur des murs est plus importante. En effet, le mur principal de la *charfia* composée dépasse 1 km contre 513 m pour la *charfia* simple et 400 m pour la *charfia* simple renversée. Les engins de capture effective dans les *charfias* sont les nasses. Le nombre de ces dernières varie en fonction du modèle de *charfia*. Il est de 27 nasses pour les *charfias* composées, 8 pour les *charfias* simples et 6 pour les *charfias* simples renversées. Leur diamètre varie entre 0,43 et 0,8 m. Le

maillage des nasses varie à son tour entre un minimum de 16 mm et un maximum de 24 mm. Concernant les barques utilisées dans les *charfias*, elles sont généralement au nombre de deux, une BCM et une BCNM (Tableau 6).

TABLEAU 6
Principales caractéristiques des *charfias* par modèle

Modèle		Composé	Simple	Simple renversé
Nombre de chambres	Grandes	4	2	1
	Petites	6	3	3
Longueur de mur (m)	Principal	1 113	513	400
	Secondaire	215	60	50
Nombre de nasses		27	8	6
Diamètre des nasses (m)		0,43	0,58	0,80
Taille maille (mm)	Min	18	16	22
	Max	20	24	22
Nombre de barques associées	BCM	1	1	
	BCNM	1	1	1
Modèle		Composé	Simple	Simple renversé
Nombre de chambres	Grandes	4	2	1
	Petites	6	3	3
Longueur de mur (m)	Principal	1 113	513	400
	Secondaire	215	60	50
Nombre de nasses		27	8	6
Diamètre des nasses (m)		0,43	0,58	0,80
Taille maille (mm)	Min	18	16	22
	Max	20	24	22
Nombre de barques associées	BCM	1	1	
	BCNM	1	1	1

Les pièges à poulpe

La pêche au poulpe à l'aide de pièges spécifiques est une technique traditionnelle rencontrée dans les zones de Kerkennah, Djerba, Louza/Sfax et Zarzis/Ketef. Le nombre moyen de pièges à poulpe par barque de pêche est de 2 812 unités de diamètre moyen égal à 16,9 cm. Les pierres en ciment caractérisent la zone de Kerkennah. Par zone, les pêcheurs de Djerba utilisent un nombre important de pots (4 292 unités) alors que ceux de la zone Louza/Sfax emploient un minimum de pots (1 100 unités). Ces derniers compensent ce fait par l'utilisation de pots de diamètre plus important. Enfin, pour ce qui est de la distance entre deux pots, le minimum est enregistré à Kerkennah (pierres en ciment) et le maximum est observé dans la zone de Djerba. La moyenne pour la zone d'étude s'élève à 7 m (Tableau 7).

TABLEAU 7
Caractéristiques des pièges à poulpes par zone

Zone	Matière	Nbre moyen	Diam. moyen (m)	Distance entre deux pots (m)
Jerba	Argile	4 292	17,1	10
Kerkennah	Argile	1 400	15,0	6
	Ciment	3 938	17,5	5
Louza/Sfax	Argile	1 100	22,5	6
Zarzis/Ketef	Argile	1 727	15,6	7
Golfe de Gabès		**2 812**	**16,9**	**7**

La bordigue

Dans le golfe de Gabès, la seule bordigue se trouve dans la lagune de Biban. Il s'agit d'un barrage construit en panneaux métalliques grillagés dans la zone de communication entre la lagune et la mer. Ces panneaux sont amovibles verticalement, ils sont installés en forme de V, avec des chambres de capture aux extrémités. L'unité de pêche de

cet engin se compose d'une chambre principale et de deux chambres de retour. Les poissons qui remontent le courant pénètrent dans 36 chambres de capture où ils seront piégés et retirés à l'aide d'épuisettes.

3. Espèces cibles

Pour la seule bordigue échantillonnée dans la lagune d'El Bibane, les espèces cibles par ordre d'importance telles que mentionnées par le patron de pêche sont les spars, la daurade, le sargue et la saupe. Les espèces accessoires sont la liche, le marbré, la sériole, les soles et la sardine. Concernant les pots et pierres à poulpe, une seule espèce est considérée par tous les pêcheurs questionnés en tant qu'espèce cible: c'est le poulpe commun. Pour les autres engins employés par les pêcheurs côtiers du golfe de Gabès, l'occurrence (en pourcentage) des espèces cibles et accessoires est récapitulée dans le Tableau 8. Ce dernier permet de conclure que :

- Les filets trémails comportent l'éventail d'espèces et groupes d'espèces capturées le plus large de tous les engins de pêche utilisés dans le golfe de Gabès. En effet, 37 espèces sont présentes dans les captures des filets trémails dont 23 sont considérées par les pêcheurs questionnés comme espèces cibles. Les plus importants espèces et groupes d'espèces cibles sont la seiche, le poulpe, les crevettes, les soles et les spars. Les espèces capturées par les filets trémails considérées par les pêcheurs comme exclusivement accessoires sont principalement les raies, les bigorneaux, les rascasses, les saurels et les poissons bleus. Parmi les espèces et groupes d'espèces cibles de première importance, on compte trois en état de surexploitation, trois pleinement exploités et deux non pleinement exploitées. La quasi-totalité des espèces et groupes d'espèces en état de surexploitation fait partie des captures des filets trémails.
- Les espèces et groupes d'espèces présentes dans les réponses des pêcheurs aux filets maillants sont au nombre de 33, dont 28 sont considérés par les pêcheurs questionnés comme cibles. Les filets maillants concernent donc un éventail d'espèces et de groupes d'espèces des catégories cibles parmi les plus larges des engins de pêche utilisés dans le golfe de Gabès. Les principales espèces et groupes d'espèces cibles sont les spars et les muges avec une part de 17 pour cent. La seiche et le serre viennent ensuite avec 6,4 et 6,1 pour cent. Les espèces telles que les pagres, la baliste, le corbeau, les gobies et les labres sont signalées uniquement en tant qu'espèces accessoires. Pour les principales espèces et groupes d'espèces cibles, cinq sont surexploitées, une pleinement exploitée, trois non pleinement exploitées et deux non étudiées. La majorité des espèces et groupes d'espèces cibles de première importance sont donc dans un état de surexploitation.
- Les palangres employées dans le golfe de Gabès sont considérées parmi les engins les plus sélectifs. En effet, les espèces cibles, qui sont au nombre de 15, totalisent 89 pour cent des captures. Les espèces accessoires sont représentées par les muges et l'oblade. Les catégories d'espèces ou groupes d'espèces cibles sont essentiellement les mérous, les chiens de mer, les pagres et les raies. La majorité des espèces et groupe d'espèces ciblées par les palangres sont dans un état de surexploitation.
- Les espèces et groupes d'espèces capturées par les *charfias* sont au nombre de 21 dont 11 sont considérées par les pêcheurs interrogés comme espèces cibles. Le spars est de loin le groupe d'espèce le plus ciblé par les *charfias* avec 23,8 pour cent des réponses, suivi par la seiche (16,7 pour cent), le poulpe (11,9 pour cent) et la daurade (7,1 pour cent). Les espèces considérées comme accessoires sont par ordre d'importance le loup, les mérous et les saurels. Parmi les espèces et groupes d'espèces cibles dont l'état d'exploitation est évalué, la daurade et les rougets sont dans un état de surexploitation.

TABLEAU 8

Occurrences (%) des espèces et groupes d'espèces cibles (Cib) et accessoires (Acc) par types d'engins dans le golfe de Gabès

Espèces	Maillant		Trémail		Palangres		Charfias		Filets encerclants		Kiss		Senne de plage		Pêche à pied	
	Cib	Acc	Cib	Acc	Cib	Acc	Cib	Acc	Cib	Acc	Cib	Acc	Cib	Acc	Cib	Acc
Seiche	6,4	0,9	33,0	0,0			16,7	1,2			25,0	0,0				
Poulpe commun	2,8	0,2	12,5	1,0			11,9	1,2			18,0	3,9	0,0	2,3	3,0	0,0
Crevettes	2,6	0,0	7,5	0,2							8,0	3,9				
Soles	0,7	0,9	7,5	2,2			0,0	1,2	4,3	0,0	2,0	0,0				
Spars	17,0	3,1	6,1	1,4	3,2	0,0	23,8	0,0	17,4	4,3	10,0	3,9	2,0	2,3		
Daurade	4,3	0,0	2,4	0,6	3,2	0,0	7,1	0,0	8,7	0,0	2,0	0,0				
Rougets	4,9	1,2	2,0	0,0			2,4	1,2			0,0	2,0				
Crevette blanche			1,8	0,0												
Gobies	0,0	0,2	1,4	0,4												
Muges	17,0	0,5	1,2	0,8	0,0	1,6	2,4	0,0	13,0	0,0	0,0	3,9	27,0	0,0		
Pageots	4,9	0,7	0,8	0,8	7,9	0,0					2,0	0,0				
Saupe	1,4	0,2	0,8	0,6			1,2	0,0	0,0	4,3	0,0	2,0				
Loups	0,5	0,0	0,8	0,2	3,2	0,0	0,0	4,8								
Pagres	0,0	0,3	0,8	0,0	14,3	0,0										
Marbré	4,0	1,4	0,6	0,8									2,0	0,0		
Chien de mer	1,4	0,9	0,6	0,6	23,8	0,0										
Petit Poulpe	0,7	0,0	0,6	0,0							4,0	5,9				
Mendole	1,9	0,0	0,4	0,0	1,6	0,0										
Serre	6,1	0,7	0,2	0,2			0,0	1,2					0,0	15,9		
Oblade	0,3	0,0	0,2	0,0	0,0	1,6	2,4	0,0								
Baliste	0,0	0,2	0,2	0,8	1,6	0,0										
Mérous			0,2	0,0	20,6	0,0	0,0	3,6			0,0	2,0				
Crabe			0,2	0,0											2,0	0,0
Clupéidés	2,6	0,0	0,0	0,2			0,0	1,2	17,4	0,0			20,0	0,0		
Saurels	1,2	0,9	0,0	0,8			0,0	3,6	4,3	0,0						
Petits thons	1,0	0,5	0,0	0,2									18,0	0,0		
Raies	0,3	0,5	0,0	3,4	4,8	0,0	0,0	1,2								
Serrans	0,3	0,5	0,0	0,2			2,4	0,0			2,0	0,0				
Labres	0,0	0,2	0,0	0,2			3,6	1,2								
Anguille			0,0	0,2	3,2	0,0										
Poissons bleus			0,0	0,4	1,6	0,0										
Bigorneaux			0,0	1,0											0,0	1,6
Calamar			0,0	0,2												
Grondins			0,0	0,2												
Liche			0,0	0,2			0,0	1,2								
Rascasses			0,0	0,8												
Bogue	1,4	0,2					1,2	0,0								
Athérine	0,7	0,0														
Maquereaux	0,3	0,2														
Baudroie	0,2	0,0														
Brochet de mer	0,2	0,0														
Denté	0,2	0,0														
Corbeau	0,0	0,2														
Coryphène					1,6	0,0	0,0	1,2	8,7	0,0						
Espadon					1,6	1,6										
Sériole					1,6	0,0	0,0	1,2	4,3	0,0						
Caranx													0,0	2,3		
Congre									4,3	0,0			5,0	2,3		
Palourde															88,0	0,0
Pintadine															0,0	5,5
Thon									8,7	0,0						
Nombre espèces	**33**		**36**		**17**		**21**		**11**		**13**		**9**		**5**	

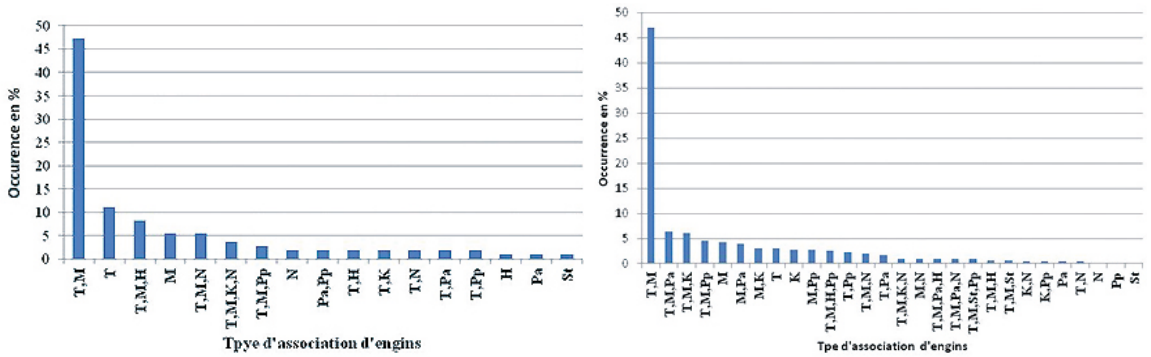
- L'éventail des captures des filets encerclants comporte 11 espèces et groupes d'espèces dont les plus importants sont les clupéidés, les spars et les muges. Un deuxième lot est représenté par la coryphène, les petits thonidés et la daurade. Seule la saupe est considérée comme espèce accessoire par les pêcheurs au filet encerclant interrogés. Les espèces et groupes d'espèces cibles en état de surexploitation, pour lesquelles des études ont été réalisées, sont les spars, le thon et la daurade.
- Selon les réponses des pêcheurs au *kiss* échantillonnés, les captures sont constituées de 13 espèces et groupes d'espèces dont 9 sont considérées comme cibles. La seiche est l'espèce cible par excellence (25 pour cent). Elle est suivie respectivement par le poulpe, les spars et les crevettes. Les espèces considérées comme accessoires sont par ordre d'importance les muges, les rougets, les mérous et la saupe. Parmi les captures déclarées par les pêcheurs au *kiss,* 7 espèces et groupes d'espèces sont dans un état de surexploitation.
- L'éventail des captures de la senne de plage est constitué de 9 espèces et groupes d'espèces dont 6 sont considérées comme cibles. Les muges sont le premier groupe d'espèces ciblé avec 27 pour cent des réponses, suivis par le groupe des clupéidés et le groupe des petits thonidés. Les espèces accessoires sont composées du serre, des caranx et du poulpe.
- Pour la pêche à pied, l'espèce ciblée par excellence est la palourde avec une part de 88 pour cent des réponses. Cependant nous avons noté dans les réponses des collectrices et des collecteurs de palourdes que le petit poulpe et le crabe font aussi partie des espèces cibles. La pintadine et les bigorneaux représentent cependant des espèces accessoires pour la pêche à pied.

4. Caractérisation des métiers de pêche

4.1 Définition

Dans la figure 5 sont représentées les différentes associations d'engins de la même barque et leurs occurrences (en pourcentage). Le nombre d'engins et de groupes d'engins s'élève à 17 pour les BCNM et 28 pour les BCM. On observe que la même barque peut utiliser jusqu'à quatre types d'engins. Indépendamment du type de barque, les filets trémails T et les filets maillants M sont les plus employés par les pêcheurs côtiers artisanaux. L'association TM est la plus répandue, elle représente environ 45 pour cent des observations. Pour les BCM, les engins et groupes d'engins les moins observés sont les St, les TN, les Pa, les KPp et les KN. Pour les BCNM, les engins les moins utilisés sont les St, Pa et H.

FIGURE 5
Occurrences (%) des types d'association d'engins des BCNM (à gauche) et des BCM (à droite)



En plus des métiers identifiés ci-dessus, on a considéré:
- deux métiers pour les pêcheries fixes: les *charfias* (CHAR) de Kerkennah dont les dispositifs de capture finale sont les nasses (N) et la bordigue d'El Bibane (BOR) dont les dispositifs de capture finale sont les chambres de capture.
- un seul métier pour la pêche à pied (Ppied) puisque les pêcheurs à pied (collecteurs et collectrices de palourdes) utilisent tous le faucillon.

4.2. Activité

a. Barques côtières

Zones de pêche: Indépendamment du type de barque, le métier le plus fréquent au cours de l'année est le TM. Pour les BCNM, ce métier est pratiqué particulièrement dans la zone de Boughrara et à un moindre degré dans les zones de Gourine, Skhira, Kerkennah et Sfax. Pour les BCM, outre ces dernières zones, ce métier est également répandu dans les zones de Zarat, Djerba, Kneiss, El Aoubed, Mahres et El Bibane. L'éventail des zones fréquentées par les BCM est donc plus large que celui des BCNM (Tableaux 9 et 10).

TABLEAU 9
Occurrence (%) des zones de pêche fréquentées par les BCNM par métier durant une année

Zone de pêche	TM	M	N	Pa	PaPp	T	TH	TMH	TMKN	TMN	TMPp	TN	TPa	Total
Ellouza				1					1,4					**2,9**
El Aouabed	2,5					2,9								**5,4**
Sfax	4,3													**4,3**
Est Kerkennah			1								2,9	1,4	1,4	**7,2**
Kerkennah	4,3	3												**7,2**
Ouest Kerkennah			1		1,4					2,9		0,7	0,7	**7,2**
Mahres	2,9													**2,9**
Kneiss	2,9													**2,9**
Skhira	5,7													**5,7**
Zarat			0				2,9	8,6						**11,5**
Gourine	8,6													**8,6**
Boughrara	27					4,3								**31,5**
El Biban						2,9								**2,9**
Golfe de Gabès	**58**	**3**	**3**	**1**	**1,43**	**10**	**2,9**	**8,6**	**1,4**	**2,9**	**2,9**	**2,2**	**2,2**	**100**

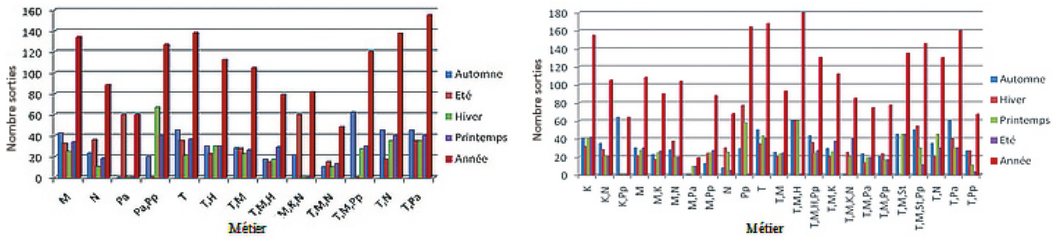
TABLEAU 10
Occurrence des zones de pêche fréquentées par les BCM par métier durant une année

Zone	TM	TMPp	TMK	MK	K	MPp	TMPa	TMHPp	TPp	TMStPp	MN	M	TMH	TMKN	KN	T	TN	TPa	Total
Kerkennah	3,6	0,9	0,9			1,8	0,4		0,9		0,9	0,4			0,9		0,9	0,4	12,4
Boughra	8,9						1,3												10,2
Gourine	9,3																		9,8
Zarat	7,6												1,3						8,9
Sfax	6,7		1,3		0,4													0,4	8,9
Jerba	5,8	1,8																	7,6
Ketef		1,3						3,1	0,9	1,8									7,1
Sidi Mansour			1,3	3,6	1,3														6,2
Ouest Kerkennah	1,8	0,9			0,9	0,4					0,9					0,4			5,3
Kneiss	4,4																		4,4
El Aouabed	3,1		0,9																4,0
Mahres	3,1																		3,1
Ellouza	0,4						1,3							1,3					3,1
Skhira		0,9			0,9				0,4										2,7
El Biban	1,8															0,4			2,2
Bouées			0,9			0,4													2,2
Zarzis						0,4						0,9							1,3
Zabboussa	0,4																		0,4
Golfe de Gabès	**56,9**	**5,8**	**5,3**	**3,6**	**3,6**	**3,1**	**3,1**	**3,1**	**2,2**	**1,8**	**1,8**	**1,3**	**1,3**	**1,3**	**0,9**	**0,9**	**0,9**	**0,9**	**100,0**

Nombre de sorties: L'évolution du nombre moyen de sorties par saison et par an des métiers des BCNM et des BCM est représentée dans la figure 6. Cette dernière permet de dégager les conclusions suivantes:

- Pour les deux types de barques, le nombre moyen de sorties/an par barque est comparable, de l'ordre de 167 sorties/an, avec une forte activité en automne.
- Pour les BCNM, le métier qui effectue le plus de sorties par an est le TPa, il est suivi par le TN, le T, le M et le TMPp. En revanche le métier qui effectue en moyenne le moins de sorties/an est le TMN.
- Pour les BCM, le métier TMH réalise le plus de sorties/an. Il est suivi par ordre d'importance par le T, le Pp, le TPa et le K. Le métier MPa réalise le moins de sorties/an.

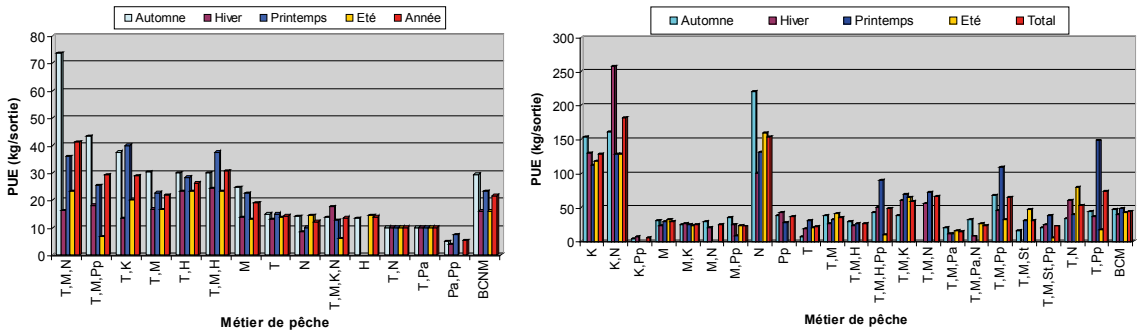
FIGURE 6
Répartition saisonnière du nombre moyen de sorties des métiers des BCNM (à gauche) et des BCM (à droite)



PUE (prise par unité d'effort): On note que la standardisation des PUE entre les différents métiers est impossible avec les données dont on dispose. Les évolutions saisonnières et annuelles des PUE par métier sont illustrées dans la figure 7. On observe principalement les éléments suivants:

- Une barque BCM débarque en moyenne 44 kg/sortie, soit le double de la PUE moyenne d'une BCNM.
- Pour les BCNM, la PUE de la quasi-totalité des métiers est maximale en automne (soit 29 kg/sortie) et elle est la plus faible en été et au printemps, avec une valeur de 16 kg/sortie. En hiver, la PUE moyenne est de 22 kg/sortie. Les PUE du métier TMN sont les plus élevées.
- Pour les BCM, la PUE moyenne est maximale au printemps et en automne (48 kg/sortie) et elle est minimale en hiver et en été (41 kg/sortie). Cette variation saisonnière des PUE se retrouve chez la quasi-totalité des métiers des BCM. Les métiers, dont le *kiss* est l'un des engins de pêche, ont les PUE les plus élevées.
- Pour les deux types de barques, la PUE du métier St, active en été, est de l'ordre de 200 kg/sortie.

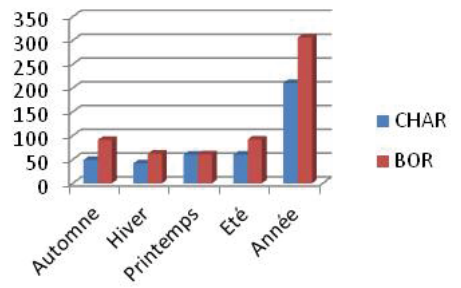
FIGURE 7
Répartition saisonnière des PUE (kg/sortie) pour les métiers des BCNM (à gauche) et des BCM (à droite)



b. Les pêcheries fixes

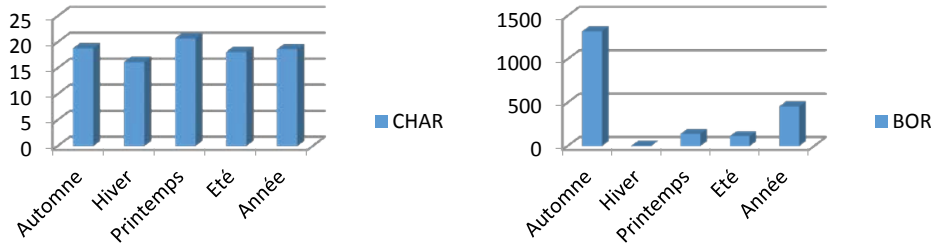
Nombre de sorties: Les pêcheries fixes du type *charfia* sont installées durant toute l'année. Le nombre moyen de sorties par saison est plus important durant le printemps et l'été. Pour la bordigue, elle est désinstallée durant les mois de février et mars, pour le reste de l'année les sorties sont effectuées chaque jour. Le nombre annuel de sorties pour la bordigue est donc supérieur à celui des charfias dont l'activité est relativement tributaire des conditions météorologiques (Figure 8).

FIGURE 8
Répartition saisonnière du nombre moyen de sorties pour les pêcheries fixes



PUE (prise par unité d'effort): Les pêcheries fixes du type *charfia* (CHAR) débarquent en moyenne 18 kg/sortie sans grande variabilité saisonnière. Le maximum des PUE est enregistré au printemps avec 21 kg/sortie. Pour ce qui est de la bordigue (BOR), la PUE moyenne est beaucoup plus importante avec 455 kg/sortie. Il est à signaler qu'une grande variabilité saisonnière est enregistrée pour ce métier. Le maximum des PUE est atteint en automne avec 1 321 kg/sortie. Cette saison coïncide avec la période de migration des espèces du lac vers la mer (Figure 9).

FIGURE 9
Répartition saisonnière des PUE (kg/sortie) des métiers des pêcheries fixes

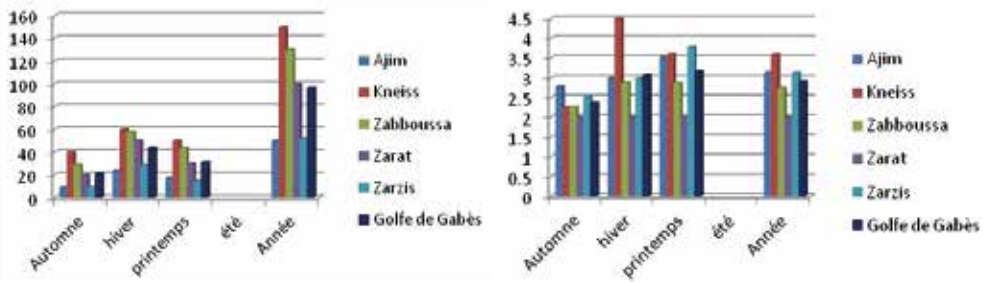


c. La pêche à pied

Le nombre moyen des sorties des collecteurs (Ppied) présente une variabilité saisonnière. L'hiver est la saison d'activité la plus importante. Indépendamment des saisons, le nombre moyen des sorties est plus important dans les zones de Kneiss et Zabboussa suivies de Zarat (Figure 10).

Abstraction faite des saisons et des sites de collecte, la PUE moyenne dans le golfe de Gabès est de 2,9 kg/sortie. Généralement, le printemps correspond à la saison de grand rendement de pêche, sauf pour la zone de Kneis où le maximum des PUE est enregistré en hiver.

FIGURE 10
Occurrences (%) des types d'association d'engins des BCNM (à gauche) et des BCM (à droite)



CONCLUSION

Dans le tableau ci-dessous, on a synthétisé les principales données relatives à l'activité des principaux métiers et/ou modes de pêche pratiqués dans le golfe de Gabès. L'objectif principal de cette synthèse est de montrer l'impact que peuvent avoir les barques côtières (BCNM et BCM) sur les ressources exploitables par rapport aux autres modes de pêche. En effet, outre la diversité de leurs métiers de pêche, ces unités, en excluant les pêcheries fixes:

- représentent environ 94 pour cent des unités actives;
- opèrent dans la frange la moins profonde;
- réalisent le plus de sorties/an;
- ont une période d'activité qui s'étale sur toute l'année;
- ont les débarquements les plus diversifiés en espèces ou groupes d'espèces cibles et accessoires. Ces débarquements représentent environ 45 pour cent des débarquements des modes de pêche retenus.

TABLEAU 11
Synthèse des données relatives à l'activité des principaux métiers et/ou modes de pêche du golfe de Gabès

	BCNM	BCM	CHB	CHP	P Feu	PJ	CHAR	BOR
PUE (kg/sortie)	22	44	962	1 070	1 362	413	19	456
Nombre sorties/an	166	167	25	20	138	159	211	306
Nombre mois d'activité/an	12	12	9	11	12	12	12	10
Nombre espèces/groupes d'espèces cibles	42	42	15	11	6	6	11	4
Nombre d'espèces/groupes d'espèces accessoires	8	8	5	1	3	5	10	5
Profondeurs (m) minimale - maximale	1-30	1-50	10-600	20-400	20-140	20-100	-	-
Nombre total d'unités	4 131	2 369	261	4	34	94	420	1

BCNM: barque côtière non motorisée; BCM: barque côtière motorisée; CHB: chalutier benthique; CHP: chalutier pélagique; P Feu: unité de pêche au feu; PJ: unité de pêche à la petite senne; CHAR: charfias; BOR: bordigue.

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Small-scale fisheries in the Adriatic Sea: information gaps at the biological, socio-economic and environmental level

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ABSTRACT

In the Adriatic Sea a wide range of small-scale fisheries (SSFs) are engaged in various set of gear fisheries over the year. SSFs in the region target a pool of species using a high number of fishing methods mainly depending on season (e.g. only in Croatia a total of 55 different fishing gears are officially listed and currently used). Many small-scale fisheries are effectively unregulated, unreported and poorly monitored. An overview of SSFs as per 2012 data is provided.

Within the framework of the Working Group on Small-Scale Fisheries in the Adriatic Sea of the FAO AdriaMed Project, the major knowledge gaps and priorities for the small-scale fisheries sector in the Adriatic have been identified. The lack of appropriate and complete statistics is one of the main constraints identified for most of the Adriatic coastal countries (EU countries have in place routinely monitoring programs while others are mostly dealing with estimates). Moreover, when dealing with data requirements, the social and economic component of small-scale fisheries should be addressed; in particular basic data on level of employment, catch quantity and value, fleet composition, fishing season, area and, ideally, on by-catch should be collected. In the Adriatic context, when dealing with shared stocks and subregional management processes, attention should also be paid at national management plans to tackle issues like territorial access rights. Adriatic SSFs management processes strongly require the harmonization of the information available, the data collection and data requirements. Management of SSF in the subregion has often been targeted to fishing gear, whereas individual species are caught with a variety of gear types, so any future management indication needs to be based on all gear types used.

Full participation of fishing communities in decisions on the sustainable use of natural resources should be facilitated as well as monitoring and surveillance through innovative approaches to marine conservation (co-management) should be considered.

1. STUDY AREA: ADRIATIC SEA

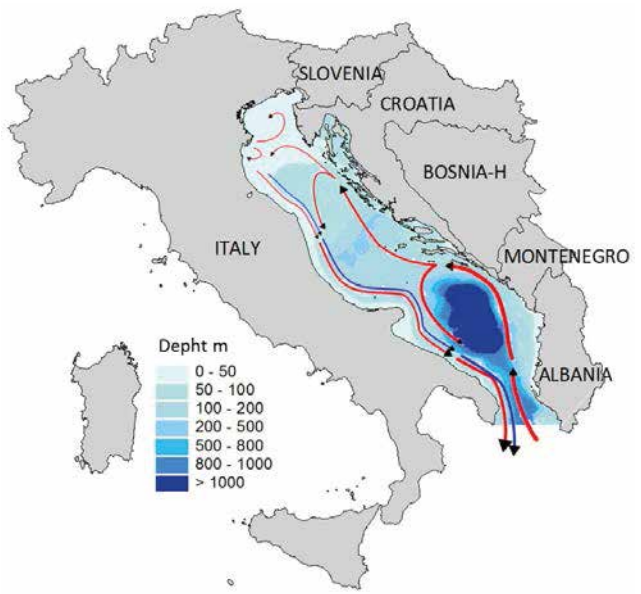
The Adriatic Sea is a semi-enclosed basin (main axis: 800 km; surface: around 140 000 km^2) divided into two GSAs, the northern one (GSA 17) being the shallowest and the southern one (GSA 18) being the deepest, with a maximum depth of 1 233 m. Prevailing currents flow counterclockwise from the Strait of Otranto along the eastern coast and back to the Strait along the Italian coast (Figure 1). The Adriatic Sea acts as

dilution basin, collecting a third of the freshwater flowing into the Mediterranean. The surface temperature ranges from 24°C (summer) to 12°C (winter).

The coastline is 7 800 km and more than 1 300 islands are located in the eastern coast. The coastal area reflects the peculiar oceanographic and morphological features of the basin. The north and central western coast is mostly sandy and muddy (Italian side of GSA 17), while the south-western (Italian side of GSA 18) and the eastern coasts are mostly rocky, including sensitive marine habitats as seagrass meadows and coralligenous.

The above characteristics of the Adriatic Sea strongly influence the activities of the small-scale fishery (hereafter SSF), in terms of target species, fishing gear and seasonality.

FIGURE 1
Map of the Adriatic Sea reporting the bathymetry and the main current circulation (red arrows indicate bottom currents and blue arrows indicate surface currents)



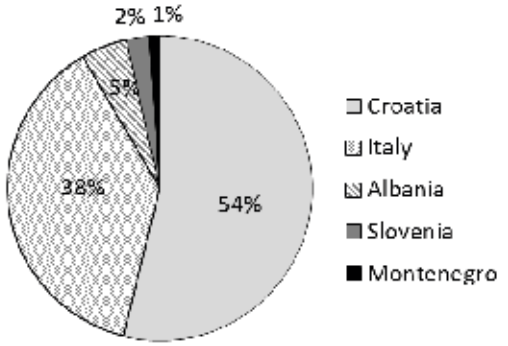
2. SSFs IN THE ADRIATIC SEA

During the AdriaMed Technical meeting on Adriatic Small-Scale Fisheries held in Croatia in 2012 (AdriaMed, 2013) a common working definition of SSF was settled down and adopted: commercial fishing carried out by all gears excluding trawlers, purse seiners targeting small pelagic and tunas fisheries.

In the Adriatic Sea, in 2012, a total of 6 238 fishing vessels belong to this definition: 3 360 vessels in Croatia, 2 351 in Italy, 306 in Albania, 151 in Slovenia and 70 in Montenegro (Figure 2).

SSF is a dynamic sector, whose characteristics vary from one location to another. The activity is strongly linked to local communities, reflecting their traditions. In the Adriatic Sea the small-scale fishers use a wide number of gears on a seasonal basis following the eco-ethology of the main target species. A summary of the SSF in the Adriatic countries, as per 2012 data, is reported hereunder.

FIGURE 2
Number of vessels (%) belonging to the SSFs in the Adriatic Sea, in 2012



Italy - The definition of small-scale and/or artisanal fisheries currently adopted in Italy is the fleet segment including vessels with total length (LOA) smaller than 12 m allowed to use only passive gears. The fleet is segmented according to the main fishing gear of the vessel, as per the Council Regulation (EC) n.199/2008, which created a Community framework for the collection and management of the data needed to implement the Common Fishery Policy (CFP), and the Commission Regulation (EC) n. 26/2004 of 30th December 2003, regarding the Community fishing fleet register – annex I "definition of data and description of a registration".

Small-scale fishing is the most relevant sector from a social and job-related point of view. Nevertheless, fishing activities, which have represented traditional working opportunities in fisheries dependent areas, are not attracting young generations anymore; indeed the lack of recruitment is one of the most important factor of weakness for the segment.

The production of vessels operating in the Adriatic Sea in 2011 was around 10 000 t (Irepa, 2012) generating 94.4 million euro. The gastropod *Nassarius mutabilis*, a traditional product in the area, is the main species amounting to 19.6 percent in catch, followed by *Sepia officinalis* (13.7 percent) and *Squilla mantis* (10.5 percent). Revenue is generated by *S. officinalis* (15 percent), *Solea solea* (14.7 percent), *N. mutabilis* (13 percent) and *S. mantis* (11.4 percent). The main fishing gears used to seasonally target coastal resources following their eco-ethology are: gillnets (*S. solea*, *S. mantis* and other demersal species), trammel nets (*S. officinalis* and other demersal species), pots and fyke nets (*S. officinalis*), traps (*N. mutabilis*) and longlines (*Merluccius merluccius*).

At this moment, a new and coherent management approach is needed which will make use of the various available tools in an integrated way; some "key factors" of small-scale fisheries such as flexibility, high level of knowledge and experience of fishermen, the complexity of the fisheries, in terms of species and diversity of fishing techniques and practices should be considered in order to identify the priorities concerning management issues.

In order to overcome the main gaps related to the management of SSFs, the expected management measures concerning SSFs will be centred on the possibility of enforcing property rights on the country's actual situation. Territorial use rights could be successfully enforced in case of fisheries exploited by small artisanal vessels fishing in the very close coastal areas (Shotton, 2000). For SSFs, it is difficult to establish a system of "strong" property rights because of the multi-specificity of the activity, but it is possible to introduce the principle of "exclusivity", moreover a rights-based fishery management system is able to combine resources protection with economic and social objectives.

In recent years there has been a significant global development of co-management experiences regarding coastal resources. The Italian experience in the area of property rights is, at present, very limited; aside from the management of the hydraulic dredge division by the Bivalve Mollusc Management Consortia, there are few experiences in Italy involving co-management systems or assignment of territorial property rights. Recently, through the provision of Article 37 of Regulation (EC) 1198/06 on the European Fisheries Fund (EFF), which provides for the possibility of financing the drafting of local management plans, local communities have been provided with an intervention tool that is totally innovative in relation to presently available management instruments.

Local Management Plans are a completely innovative intervention tool in the range of available management tools. The novelty introduced by this specific type of plan lies in the fact that it will be possible to introduce self-management rules thereby attributing local ownership rights in favour of these consortia. A non-marginal novelty associated with implementing Local Management Plans concerns the possibility of envisaging a strategy that harmonises coastal fishery resource conservation needs with socio-economic and structural requirements, within the framework of a local area development approach.

Slovenia - SSFs is the most numerous fishing segment of the Slovenian fishing fleet. The division between small-scale and large-scale fishery is mainly based on the length overall (LOA) of the vessels and on the use of fishing gears for performing fishing operations. The fishing grounds of small-scale fishing units occur mostly in the Slovenian territorial waters. Data series on SSF in Slovenia are available from 2004. As per 2012, for the purpose of the implementation of the European Fisheries Found (EFF) (Council Regulation (EC) No 1198/2006 of 27 July 2006) the definition from Article 26 of the EFF Regulation has been used: "small-scale coastal fishing means fishing carried out by fishing vessels of an overall length of less than 12 metres and not using towed gear as listed in Table 3 in Annex I of Commission Regulation (EC) No 26/2004 of 30 December 2003 regarding the fishing vessels register of the Community". Slovenian list of fishing gears is based on the fishing gears as listed in Commission Regulation No 1799/2006 of 6 December 2006, amending Regulation (EC) No 26/2004 on the Community fishing fleet register.

According to the data from the Fishing Vessel Register (FVR) for the year 2011 the Slovenian fishing fleet consists of 182 fishing units, out of this number approximately 151 units, considering their LOA and main fishing gears, can be considered as part of SSF.

Main gears used in the SSF are gillnets and entangling nets. Landings of SSF vessels are composed of different species. Slovenian small scale fishermen are not targeting only one species. Main target species are *Merlangus merlangus*, *Sparus aurata*, *Platichthys flesus*, *Pagellus erythrinus*, *S.* solea and many other species with a lower share in the total landings.

One of the key priorities is the sustainability of the fishing activities in the Slovenian fishing area through an integrated approach to the management of the fisheries at regional level. Such approach is strongly needed since the majority of the stocks in the Adriatic are shared and therefore a global management plan should be prepared. Within the process of preparation of multiannual management plans, particular attention should be devoted to sub-regional characteristics and specificities of the marine environment as well as traditional fishing techniques. Therefore, within the process of preparation of regional multiannual management plans, Slovenia sees the opportunity of considering alternative treatment of the fisheries in specific sub-regions such as the Bay of Trieste due to their particularities.

Key priorities for Slovenian SSFs are the collection of scientific data on fisheries and accurate assessments of shared stocks, data on these stocks need to be shared

or joint assessments need to be prepared. The process of scientific data collection and assessments needs to be prior to making actual management decisions, as good decisions can only be made on the basis of reliable data. This is particularly important in the conditions of the current economic crisis.

Croatia - Croatia accounts for nearly 9 percent of the total Mediterranean coastline (5 835 km, mainland 1 777 km, islands 4 058 km). The Croatian people have traditionally been oriented towards the sea, and fisheries have always played a role in their lives. The main features of Croatian marine fisheries are: the widespread presence of artisanal and subsistence fishery, which has great importance for the local socio-economy; the very old fishing fleet and old technology and the high number of small polyvalent boats with licenses for different types of fishing gear. Fisheries are particularly significant to island and coastal communities, and they are an important element of national policy to stimulate development of these communities.

According to 2012 data from the Ministry of Agriculture, Fisheries Directorate and the Institute of Oceanography and Fisheries (Split) the largest percentage of the fleet (over 80 percent) is comprised of vessels less than 12 m LoA, which also constitute the largest segment of the fleet capacity in terms of power (some 50 percent kW). Four types of fisheries are defined by Croatia's Sea Fisheries Act: commercial, subsistence, recreational and sport fishing. Commercial fishing is a profit-making activity, while fish and other marine organisms caught in the course of subsistence, recreational or sport fishing are not to be placed on the market and are intended solely for fishers' and their families' own consumption (daily catch limit is 5 kg). In Croatia, subsistence fishing is still considered 'a socio-cultural activity for most of the island and shoreline inhabitants, but this activity will be banned from 2015. Issuing of new licenses stopped in 2008 and official statistics of the Fisheries Directorate (FD) – Ministry of Agriculture, for the period 2009-2010 counted around 4 000 vessels (number of vessels approximately corresponds to number of licenses) in the professional fishery sector, of which 3 360 vessels are under 12 m indicating their artisanal character, and 12 000 vessels registered under the subsistence category. In Croatia more than 50 different fishing gears are used by SSFs.

Gillnets and trammel nets are probably the most commonly used fishing gear in the eastern coast. Regional differences, conditioned by the distribution of target species, exist in the frequency of their use. While on the west coast of the Istria peninsula (northern Adriatic) the main gear is the trammel nets for *S. solea*, in the area of the outer middle Adriatic islands from Dugi otok to Lastovo fishers also commonly use gillnets for *Scorpaena scrofa* and *Palinurus elephas* at greater depths (>60 m). Trammel nets have traditionally been the favoured fishing gear of Croatia's artisanal fishermen as they regard it as the most efficient one providing them with catches that are as rich as possible. The coastal beach seine is designed primarily for day time picarel fishing. Other species are mostly represented by *Boops boops*, fish of the genus Diplodus, *Oblada melanura* and *P. erythrinus*, and they constitute about 27 percent of the catch. «Tramata» is the way of fishing with gillnets using ropes for fish scaring and the target species are mostly sparids.

A lack of the appropriate and complete statistics could be identified as one of the main gaps in knowledge of Croatian fisheries. For example, Croatia has no statistical data regarding supposedly 18 000 small-scale fishermen. It could be pointed out that a distinction needs to be made between the types of statistics needed, such as biological and economic statistics; the latter should, among other things, include data on parameters such as level of employment, catch quantities and value. Furthermore, data on number of vessels, fishing season, area, and quantitative composition of by-catch should be collected. As one of the priorities which could be considered would be to conduct a case-study on small coastal communities mostly dependent on

fishery. There may be never enough resources to do a proper statistical analysis with appropriate coverage. Case-study is a realistic approach to collecting data on SSFs. It should be pointed out that a lack of knowledge on distribution, behaviour and biomass of several common species is also one of the main gaps. Furthermore the importance of recovering available historical time series of data that are often lacking should be taken into account. Due care should be used in the interpretation of these data since different data collectors may have been involved (fishermen, technicians, scientists) and collected species are sometimes misidentified. In terms of small-scale fisheries management, it should be remarked that, currently, management is mainly based on single fishing gears while individual species are caught with variety of gear types. Management would need to be based on all gear types that are used. For example, in Croatia lobster management is based on traps while lobsters are currently mostly exploited by gillnet and trammel net fisheries which are not considered in this case. However, it could be observed that such complex management should be a second step and that first is what is needed to know about the species distribution in the whole Adriatic Sea since we presently lack basic information. A further need would be the quantitative evaluation of interaction between the different fishing gears employed in Croatian SSFs.

Montenegro - Seven main landing ports for SSFs are located in Montenegro: Herceg Novi, Zelenika, Kotor, Tivat, Budva, Bar and Ulcinj. Out of the total 70 vessels registered for SSF in 2012, 50 (71 percent) are from the Boka Kotorska Bay (ports of Herceg Novi, Zelenika, Kotor and Tivat), where this sector represents the cultural identity of the people from this area. Around 61 percent of the total number of vessels have a length overall below 6 m, and the rest (39 percent) are in the 6–12 m category (the largest vessel in the small–scale fishery fleet is 9,76 m LoA). Kotor has the greatest number of registered vessels (17), while Ulcinj has only one registered vessel. This, however, does not reflect the actual situation in the field, as the exact number of unlicensed fishing vessels in Montenegro remains unknown.

Most of the vessels are equipped with more than one type of fishing gear. Only about 23 vessels (33 percent of the fleet) use a single type of gear, 27 (39 percent) use two types, 13 (19 percent) three, 4 (6 percent) use four types, and only 1 vessel (1 percent of the fleet) uses five types of fishing gears. Therefore, 45 vessels in the fleet could be considered multipurpose (polyvalent) vessels (Ikica *et al*., 2013). Gillnet is the most used gear, followed by trammel net and beach seine. Set (bottom) longlines are slightly less common than drift longlines.

SSF in Montenegro is poorly known and not monitored. No specific studies of Montenegrin small–scale fisheries have been carried out and no catch data are available. However some figures can be estimated from the results of several research projects. Traditionally, emphasis is given to bottom trawl catches, as the most significant field of marine fisheries in the country. In a study done for the Centre for ecological planning, Regner and Joksimović (2000) provided a theoretical estimate of 1 174 tonnes of yearly catch from coastal fisheries, with most of that estimate attributed to longlines (908 tonnes), followed by beach seines (156 tonnes), gillnets and trammel nets (50 tonnes), Chinese nets (for mullets) (50 tonnes) and fyke nets (for eels, *Anguilla anguilla*; around 10 tonnes).

In 2012, the Ministry of Science of Montenegro approved a new national project to be carried out by the Institute of Marine Biology in Kotor under the name of "Monitoring of small–scale coastal fisheries and composition of fish fry with the aim of conservation and management of marine fishery resources" (MORMONT; 2012-2014). The first part of the project consists of landing data retrieval from 6 landing ports (Herceg Novi, Tivat, Bigova, Budva, Bar and Ulcinj). The second part includes the collection of biological data (length, weight, maturity stages, gonad weight) from a few species targeted by the SSF. This is the first study dedicated to SSFs in Montenegro.

The establishment of a basic monitoring system would be the first step for a proper management of this sector. The monitoring should also include some economic parameters to allow the estimation of the economic performance of SSF (in terms of employment, incomes, etc.). All these data could in turn facilitate the comprehension of the possible interactions/conflicts that SSF may have with the other fisheries activities/ or coastal activities and be therefore beneficial for the management of the coastal zone.

Albania - In Albania SSFs represent a way of life for coastal communities. Artisanal fishermen carry out a subsistence activity or sell on local markets and/or along the coasts, individually, since no dedicated landing sites exist for this fisheries category. The distribution of artisanal fisheries boats, using traditional fishing techniques and small boats, is diffused along the Albanian coasts. This activity is vital to livelihoods and food security. Over the years, this fishery has been rather mechanized but tends to use traditional fishing gears such as small nets, traps, lines and spears. The biodiversity of the catch tends to be high. Harvests include a greater variety of high value species than in large-scale fisheries. The selectivity of fishing gears is also higher than large scale fisheries.

According to the National Legislation on fisheries (Law Nr. 64, of 31.05.2012), the fishing activities are divided into: commercial fishing (which is divided into professional and artisanal fishing), recreational/sport fishing and fishing for scientific and study purposes. Up to date, in Albania the small-scale fishery is out of any monitoring process. Currently, commercial fisheries data are not collected in separated way, and they include both professional and artisanal fishing.

The Albanian SSFs are defined by law as a non professional commercial fishing. Artisanal/traditional fisheries are small-scale fisheries, involving fishing households, using a relatively small amount of capital and energy, small fishing vessels, with/ without engine, by short fishing trips, close to shore (up to 3 miles), using their catches mainly for local and familiar consumption. In the Adriatic coast the most used gears are trammel nets and gillnets, longlines, uncovered fishing ponds (fish trap stationary gears, called “Stavnik") and pots. In artisanal fishing, about 90 percent of fishing boats use engine of 5-40 hp, 10 percent without engine. The material used for building the boats is about 80 percent plastic and fiberglass and about 20 percent is wooden material. Higher percentage of wooden boats is present in Adriatic coast. The length of artisanal fishing boats varies from 3 to 4 m. The artisanal fishing boats generally do not use harbours but they are anchored capillary in entire length of the marine coast.

According to the national official data, as per 2012, the number of artisanal fishing boats accounts for 328 units. As stated above, this fishing category is not monitored, therefore is poorly evaluated. According to data collected in a survey in the field, the number of people involved in artisanal fishing was estimated around 1 500 people. Artisanal fishing in Albania is a seasonal and part-time activity, oriented toward seasonal and high price species.

Conflicts are generally with other users of the resources rather than with other small-scale fishing vessels. The SSF is often part of the economic activity of a family that supplements the family income with agriculture activities, tourism and secondary services. A source of conflict is often derived from the large industrial fishing vessels (mainly trawlers) that operate very close to the coasts, often destroying the small-scale fishing nets. These conflicts urge the establishment at national level of small-scale/artisanal fisheries management plans and actions, vessel registration system and inspection schemes.

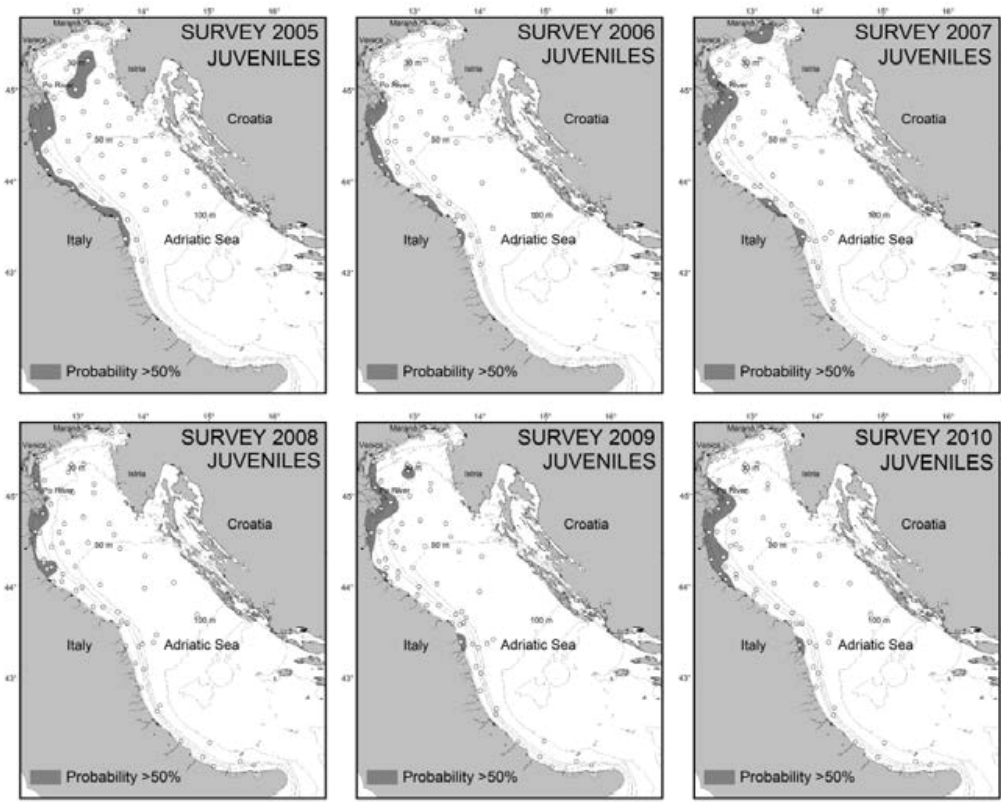
As general comment, the need for secure infrastructure like small harbours and landing areas was pointed out. At the same time, a regular monitoring of this activity should be set up at the national level, in order to evaluate all aspects, including registering/licensing, fish production, social, economic, biological, traditional, environmental and fishermen’s rights.

3. SHARED STOCKS: THE CASE OF *SOLEA SOLEA*

The common sole is one of the most important resources for the SSFs in the Adriatic Sea. The sole stock is mainly targeted by the Italian and Croatian fleets, which exploits the juveniles and adults of both species.

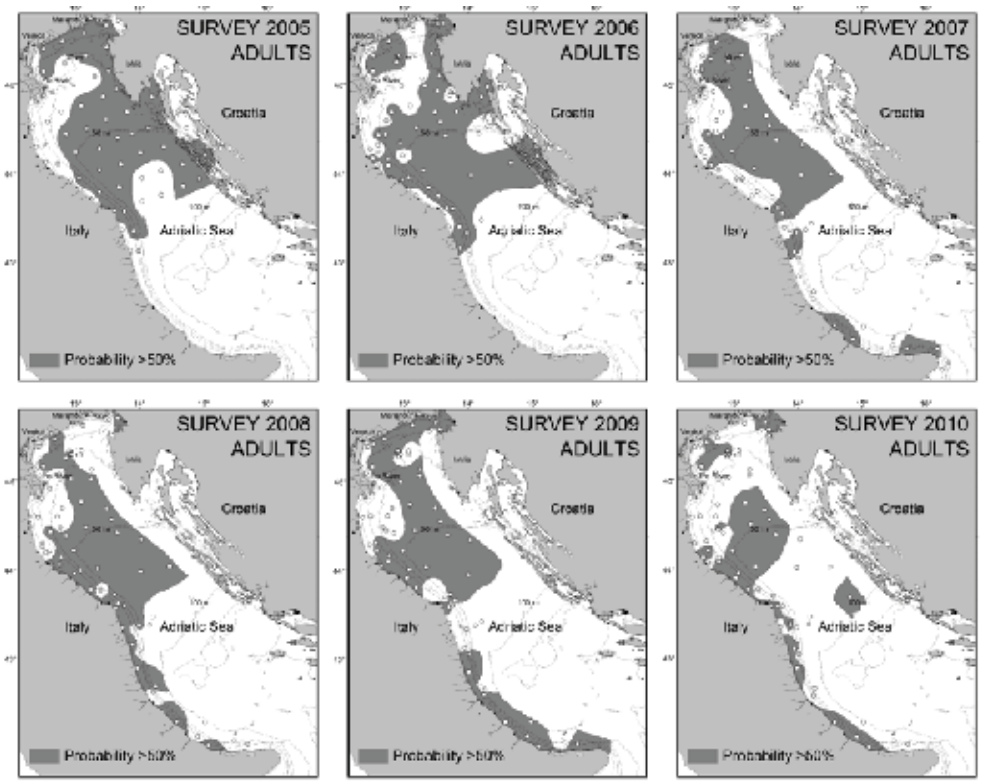
In particular, data obtained during SOLEMON rapido trawl survey evidenced that in the GSA 17 the spatial distribution of juveniles and adults of sole is clearly different, supporting the hypothesis that the geomorphological and hydrological characteristics of the central and northern Adriatic Sea considerably influence the distribution pattern of sole in these two sub-basins (Grati *et al*., 2013). Results highlighted that juveniles are mostly concentrated in shallow water (0-30 m depth) along the Italian coast and their spatial distribution persisted along the sampled years (Figure 3).

FIGURE 3
Maps of sole juveniles hotspots



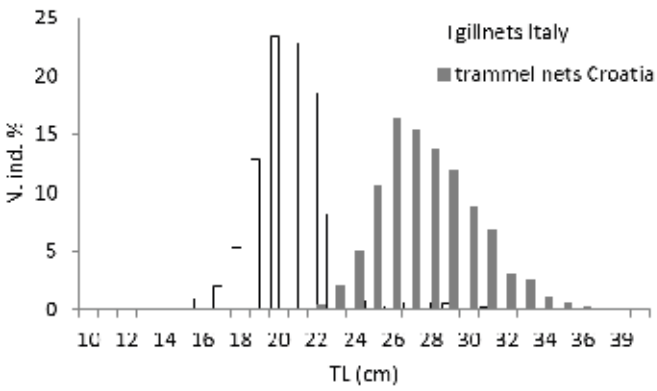
By contrast adults were mainly distributed in the central/eastern part of the basin at depths >30m (Figure 4).

FIGURE 4
Maps of sole adults hotspots



The size-frequency distribution of Italian gill net and Croatian trammel net catches clearly shows that, as a result of the different spatial distribution, juveniles are exploited exclusively by Italian vessels, while adults are caught by the Croatian fishing fleet (Figure 5). These results, represent crucial information for the setting of international collaboration for a rational spatial-based management of the resource.

FIGURE 5
Size-frequency distributions of sole caught with gillnets in Italy and with trammel nets in Croatia



4. SHARED STOCKS: THE CASE OF *CHELIDONICHTHYS LUCERNA*

The tub gurnard is one of the most important by-catch species for the small-scale fisheries of the western Adriatic Sea and an important target species for the Croatian longliners. Data obtained during the SOLEMON survey evidenced a high concentration of juvenile tub gurnards in the western side of the GSA 17 (Figures 6 and 7).

FIGURE 6
Distribution and density of tub gurnards during the SOLEMON survey carried out in October 2005

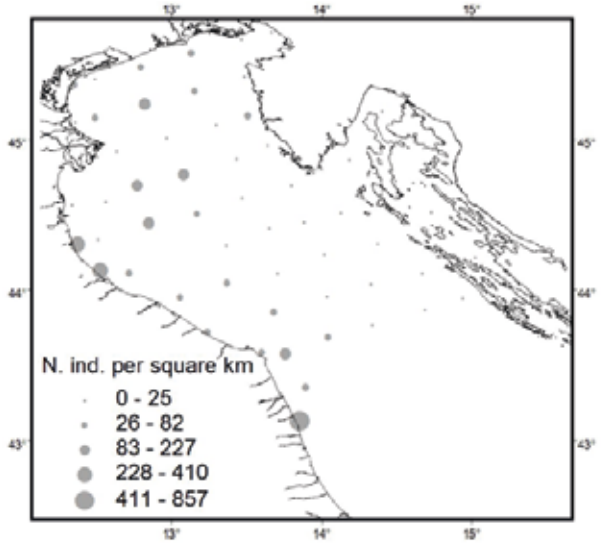
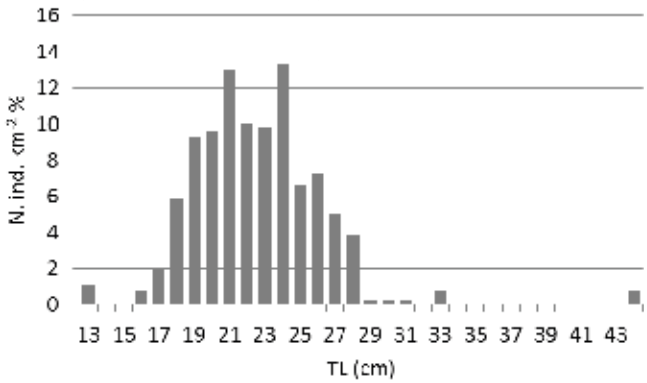
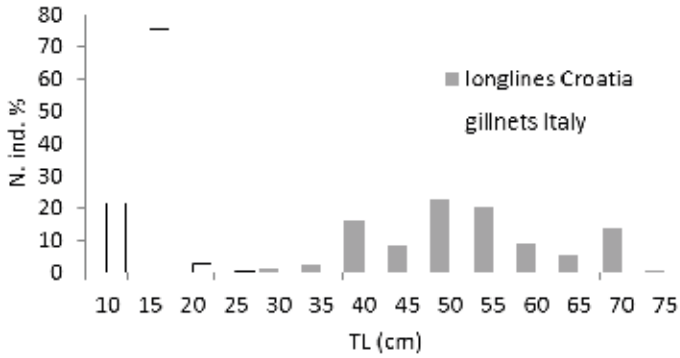


FIGURE 7
Size-frequency distribution of tub gurnards caught during the SOLEMON survey carried out in October 2005



These juveniles are mainly caught by Italian gillnetters but discarded because of their low commercial value (Figure 8). In contrast, adults mostly concentrate inside the Croatian national waters, where they represent an important resource for longliners (Figure 8).

FIGURE 8
Size-frequency distributions of tub gurnard caught by Italian gillnetters and Croatian longliners



CONCLUSIONS

The study describes the main features of SSFs in the Adriatic region. It provides an outline of similitudes and divergences among countries, and major gaps that prevent the proper development and management of SSFs. Overall, SSF in the Adriatic has been very adaptive through time. It was developed as a function of the geo-morphologic characteristics of the national coastal areas and the bio-ecologic features of the fisheries resources.

In terms of SSFs target species in the Adriatic Sea, stocks are often shared by national fisheries. This is more evident in the central and northern part of the Adriatic. National fisheries in some cases exploit different phases of the ontogenetic cycle of the same species, thus affecting indirectly the potential capture production of neighbouring countries (e.g. juveniles *Chelidonichthys lucerna* are caught by Italian fishers using gill nets and adults by Croatian fishers' longlines).

From the technology point of view a number of fishing gears are currently used at national level, most of them being of passive nature. Overall, more than 70 fishing gears are currently used in the entire basin and, in many cases, the same vessel is authorized to use more than one gear. Regarding the socio-economic implications, the study shows that in the Adriatic Sea the small-scale fisheries play an important role for coastal communities, ensuring income and food for more than 12 000 fishers.

In spite of its importance at national and regional level, a proper monitoring system is not in place for Adriatic SSF. The lack of appropriate and complete statistics is one of the main constraints identified for most of the Adriatic coastal countries in view of developing proper management strategies for SSF. Moreover, when dealing with data requirements, the social and economic components of SSFs have been poorly addressed, e.g. basic data on level of employment, catch quantity and value, fleet composition, fishing season, area and, ideally, on by-catch is missing.

More in details, the following features should be strengthened to further progress toward a sustainable and profitable development of Adriatic SSFs:

1. the SSF population (statistical universe) must be univocally defined (number of active vessels, type of fishing gears, target species, etc.);
2. in general, the monitoring system (landings, socio-economic, biological, etc.) must be optimized or, in some cases, established;
3. the impact of the fishing gears used by small-scale fisheries on the marine ecosystem should be assessed;
4. multi-annual management regional plans for the management of shared stocks should be created;
5. the management of SSFs must be integrated with other human activities carried out inside the coastal area.

All the above mentioned issues urged the development of common and/or standardised tools for the monitoring and management of SSFs. The cooperative framework established by the FAO-AdriaMed Project could be instrumental to define strategies and pilot actions to cope with emerging issues and lay the foundations for the development of a common view on the management of SSF in the Adriatic Sea.

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Standardization of monthly catch per unit effort (CPUE) of small-scale fisheries in Cyprus waters from 1980 to 2006

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ABSTRACT
Monthly CPUE standardization by using generalized linear models (GLM) was applied between transformed (Ln) CPUE as a dependent variable and the independent variables of the year, month, area and their interactions for the period 1980–2006. The area was identified as the most important variable influencing the CPUE of small-scale fisheries, explaining 26.7 percent variability in LnCPUE. The CPUE shows an increase from east to west of the island. The analysis showed that temporal variables (month and year) also had an important impact on the CPUE. The statistical significance of CPUE trends was not obvious due to the autocorrelation of the residuals from the GLMs. Therefore, generalized additive mixed models (GAMM) were developed with the independent variables of the year, fishing month (fm) and area, initially without introducing autoregression (GAMM-1), and secondly by using a first order autoregression (p=1) (GAMM-2). The results showed an interannual decrease of CPUE in the western region of Cyprus. This could be due to the overfishing status of the stocks combined with the reduction of river runoff in the sea.

Keywords: *CPUE, standardization, GLM, GAMM, small-scale fisheries*

INTRODUCTION
Small-scale or artisanal fisheries are considered to be the main fishing category in Cyprus, playing a major role as in many other locations of the Mediterranean (Juntunen *et al.*, 2008). The main gear used are trammel nets, set gillnets and set longlines. These characteristics of fishery combined with inaccurate and often biased data, may introduce some problems and challenges in analyzing catch and effort data and thus affecting the management decisions (Papaconstantinou & Conides, 2007, Tsikliras *et al.* 2007).

Nominal CPUE is affected also by other several factors such as seasonality, spatial dispersion and habitat of the resources, fishing strategy, as well as environmental variables (Siquan *et al.,* 2009). This could result in errors in using nominal CPUE to index fish stock abundance. Therefore, the process of reducing the influence of these factors is essential before CPUE can be used to as an index of stock abundance, and is commonly referred to as standardizing the CPUE (Hinton & Maunder, 2003).

Generalized linear models (GLM) are widely preferred for this process (O'Brien & Kell, 1996) as they are considered a strong tool for examining any difference between areas as well as temporal trends (Hilborn & Walters, 1992), even though generalized additive models (GAM) can afford greater flexibility in accommodating different forms of relationships between explanatory variables and CPUE (Venables & Dichmont, 2004).

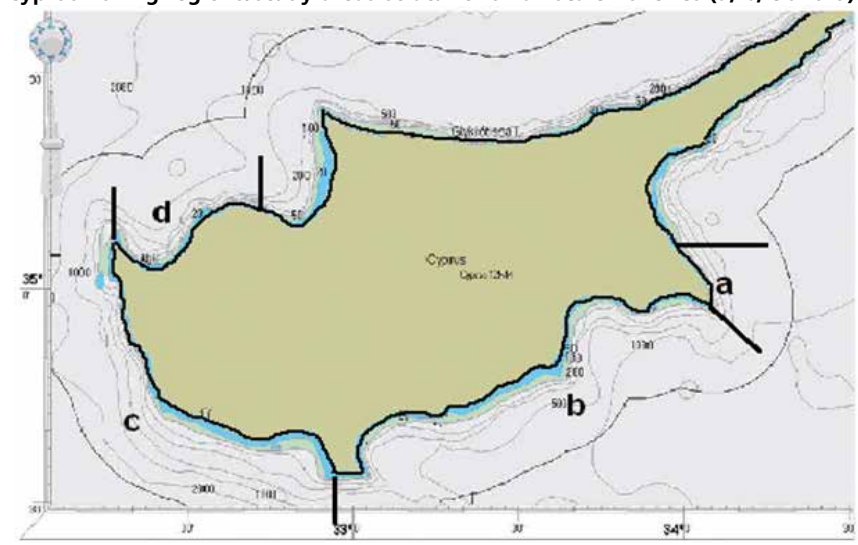
Generalized additive mixed models (GAMM) are useful to reduce the error from the existence of autocorrelation in the residuals, which leads to an overestimation of the level of significance and misinterpretation of the model (Zuur *et al*., 2007). These models follow an application of autoregression of the errors through an autoregression and moving average (ARMA) process in a Generalized Additive Model (GAM) (Wood, 2006a).

The aim of this study is to develop a standardized CPUE of small-scale fisheries in Cyprus waters which is characterized by great variability, in order to obtain a more representative index of relative abundance. Both GLM and GAMM were used in the CPUE standardization to identify factors influencing the CPUE of this multigear and multispecies fishery.

MATERIAL AND METHODS

Monthly data concerning landings (kg) and fishing effort (days at sea) from the small-scale fisheries for the period 1980–2006 were obtained from statistical reports of the Department of Fisheries and Marine Research of Cyprus, covering four fishing regions which are the study areas-strata (Figure 1). The nominal CPUE of each month was calculated by dividing the total catch (kg) by the number of fishing days. As there were no available data on species composition on a monthly basis for each region, the monthly data of CPUE including all the species were used.

FIGURE 1
Cyprus fishing regions/study areas-strata for small-scale fisheries (a, b, c and d)



The nominal values of CPUE were natural log-transformed (*Ln*) and a simple GLM (GLM-1) was developed in relation with the parameters of year, month and area:

$$Ln(CPUE) = \mu + Year + Month + Area + \varepsilon \qquad \text{(GLM-1)}$$

where μ- intercept and ε- standard error, while a more complicated (GLM-2), including the interactions of the parameters, was also developed:

$$Ln(CPUE) = \mu + Year + Month + Area + interactions + \varepsilon \qquad \text{(GLM-2)}$$

In both models, records with CPUE equals to zero were disregarded. Specifically, there were 7 zero values from a total number of 1 296 monthly values covering the period 1980–2006, which were not included in the models.

The best GLM was chosen by checking the diagnostics of the residuals, the statistical test of analysis of variance (ANOVA) and the Akaike's information criterion (AIC). The technique of stepwise regression was applied thereafter for any further improvement of the chosen models, which is based on the selection of the most important variables of the model (Vonta & Karagregoriou, 2012). The process of the technique starts with a simple model of the form $yi = \beta o + \varepsilon j$, where in each step an independent variable is added only if this variable has a significant contribution for the variation of the dependent variable Y [Ln(CPUE) in this case]. This is happening additionally to the contribution of the other independent variables which are already in the model from the previous step. Once the final models of natural log-transformed CPUE were set, the calculation of the standardized values of CPUE has followed according to the exponential equation (1) (Quinn & Deriso, 1999):

$$CPUE = e^{pred\_LnCPUE + \frac{SE}{2}} \qquad (1)$$

The non-parametric two-sample Kolmogorov-Smirnov test was then used to compare nominal with standardized natural log-transformed CPUE, as well as nominal with standardized CPUE for each area.

The statistical significance of any CPUE trend will not be obvious due to the autocorrelation of the residuals from the GLMs. Therefore, GAMMs were developed with the independent variables of year, fishing month (fm) and area, initially without introducing autoregression (GAMM-1), and secondly by using a first order autoregression (p=1) (GAMM-2) (Table 5). The fishing month is considered to be the month from the beginning of the fishing season, which for small-scale fisheries is January (fm=1, January). The GLM and GAMM procedures mentioned in the present study were implemented by coding in R statistical language programme (r-project.org).

RESULTS

The results of GLM-1 and GLM-2 showed that all parameters that describe the models are statistically significant ($P < 0.05$) (Table 1). The GLM-1 and GLM-2 models describe 60.2 percent and 100 percent of the total variability respectively. The comparison of the two models for each fishery by using statistical test ANOVA, showed GLM-2 to be most significant ($P < 0.05$) while the AIC criterion had lower value (Table 2). The diagnostic plots of the models indicated that variance of residuals in GLM-2 is reduced, while there is also further smoothing of the values as the number of outliers is also reduced (Figures 2–3). Stepwise regression technique improved the GLM-2 model by removing the interaction between year and month which is less statistical significant, achieving a further reduction of the AIC (Table 3).

FIGURE 2

Diagnostic plots of residuals from GLM-1

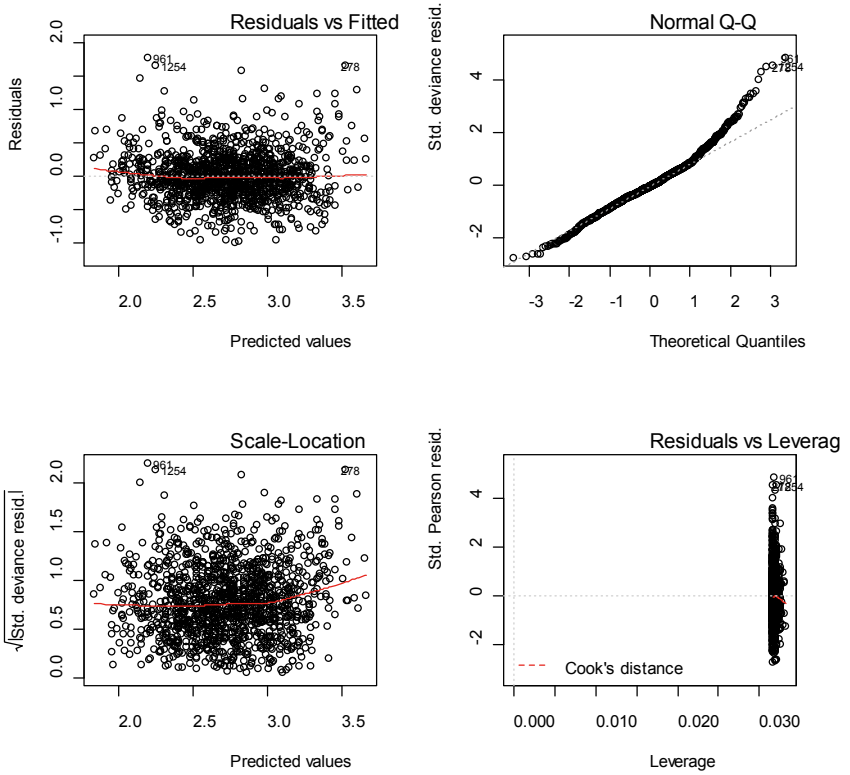


FIGURE 3

Diagnostic plots of residuals from GLM-2

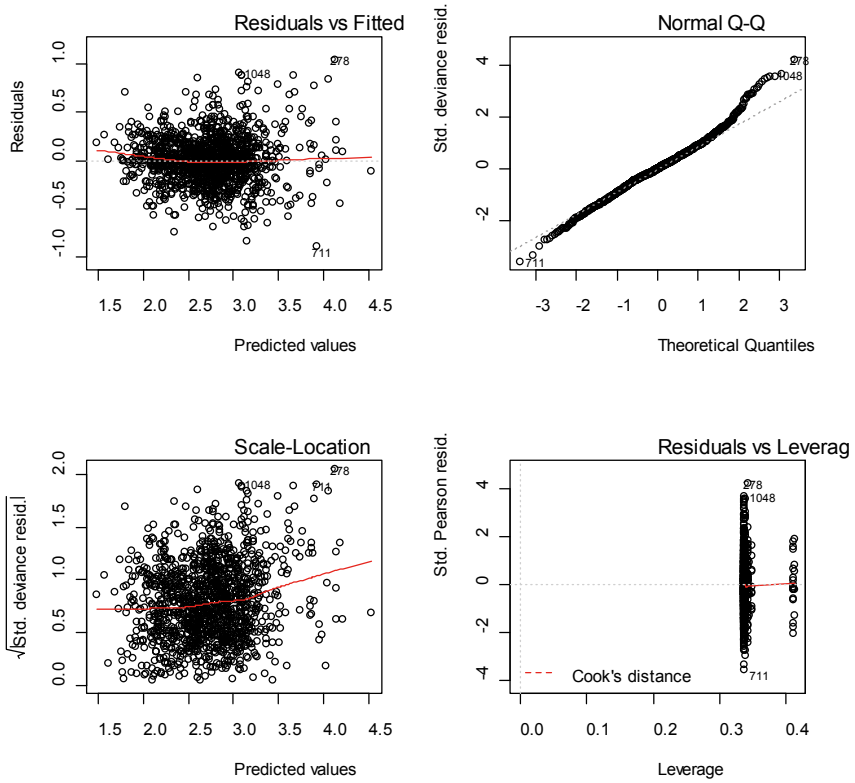


TABLE 1
Parameter contribution to the GLM models GLM-1 and GLM-2

GLM-1: *Ln(CPUE) = μ + Year + Month + Area + ℰ*

	D. freedom	Variation (%)	D. freedom.res	Res. Deviance	P (0.05)
Year	26	22.813	1262	261.720	1.302e-66
Month	11	10.693	1251	236.356	2.621e-33
Area	3	26.671	1248	173.095	1.549e-98

GLM-2: Ln(CPUE) = *μ + Year + Month + Area + interactions+ ℰ*

Year*Month	286	13.277	962	141.602	1.438e-02
Year*Area	78	18.799	884	97.013	1.296e-59
Month*Area	33	7.746	851	78.640	1.392e-25

TABLE 2
Results for GLM-1 and GLM-2

GLM-1: *Ln(CPUE) = μ + Year + Month + Area + ℰ*

Num. Residuals	1 248
Dev. Residuals	173.1
AIC	1 154

GLM-2: *Ln(CPUE) = μ + Year + Month + Area + interactions+ ℰ*

Num. Residuals	851
Dev. Residuals	78.64
AIC	931

TABLE 3
Stepwise regression results for GLM-2, indicating the interaction between year and month as non-significant in the model

Steps	Parameters	Degrees of freedom	AIC
1	-	-	931
2	*E*M*	286	793.8

Therefore, GLM-3 is the final model for standardizing the values of natural log-transformed CPUE:

$$Ln(CPUE) = \mu + Year + Month + Area + Year*Area + Month*Area + \varepsilon \qquad \text{(GLM-3)}$$

The time series of nominal and standardized CPUE for each area are presented in Figures 4–11, where the reduction of strong variability and outliers is obvious, as it is shown from the boxplots (Figures 12–13). Two sample Kolmogorov-Smirnov tests showed statistical significant difference ($P<0.05$) between the distributions of nominal and standardized CPUE (Table 4).

Area was identified as the most important variable in influencing CPUE, explaining 26.7 percent of the variability in LnCPUE (Table 1). The CPUE increased from east (area [a]) to west (area[d]) (Figures 12–13). Area [a] indicates the lowest values of CPUE in the time series (Figures 4–5), while area [d] shows the highest values (Figures 10–11), but all areas indicate a general decreasing trend of CPUE. However, only in areas [c] and [d] is recorded an annual decrease of CPUE (Table 6, Figure 14), according to the results of GAMM-2 where it was chosen as the best according to AIC (Table 5), where the coefficients of decrease are negative with values of -0.24 and -0.11 respectively.

In the GLM analysis, results showed that the temporal variable of Year is also important in influencing the CPUE. The inter-annual variation of CPUE is considered to be high as the variable of Year is the second most significant in affecting the LnCPUE according to GLM-2, explaining 22.8 percent of the variability (Table 1).

FIGURE 4

Nominal transformed *(Ln)* and standardized natural log-tranformed *(pred_LnCPUE)* monthly CPUE based on GLM-3 for area [a] and period 1980–2006

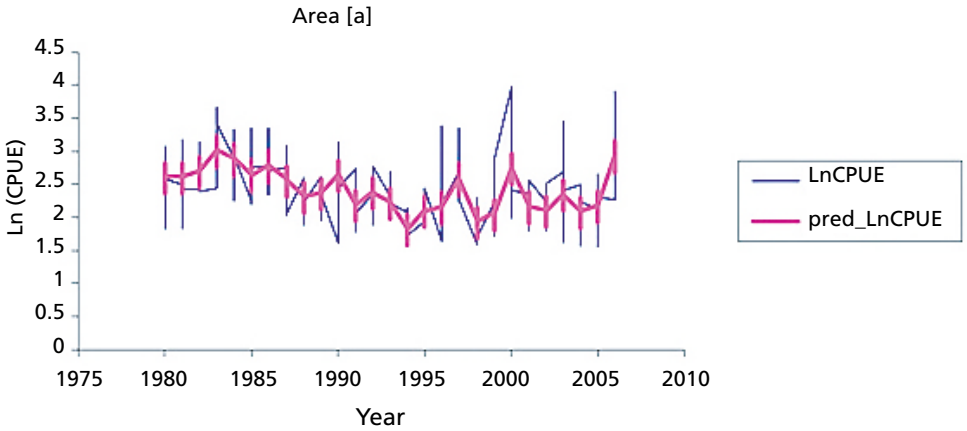


FIGURE 5

Nominal and standardized *(pred_LnCPUE)* monthly CPUE based on GLM-3 for area [a] and period 1980–2006

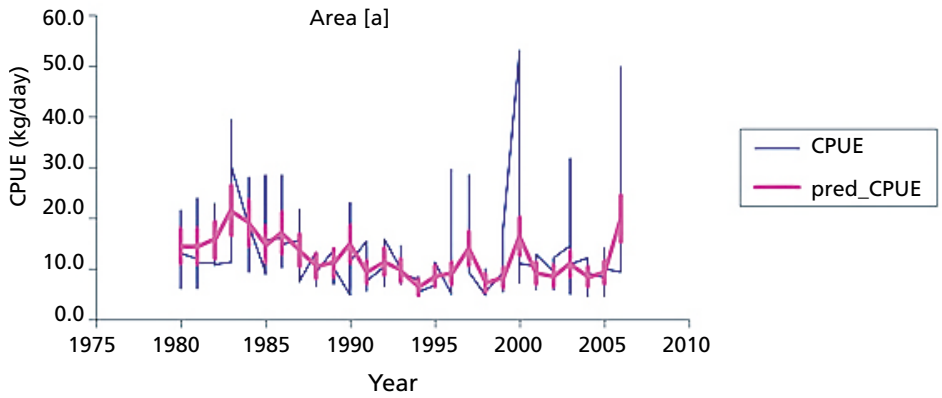


FIGURE 6

Nominal transformed *(Ln)* and standardized natural log-tranformed *(pred_LnCPUE)* monthly CPUE based on GLM-3 for area [b] and period 1980–2006

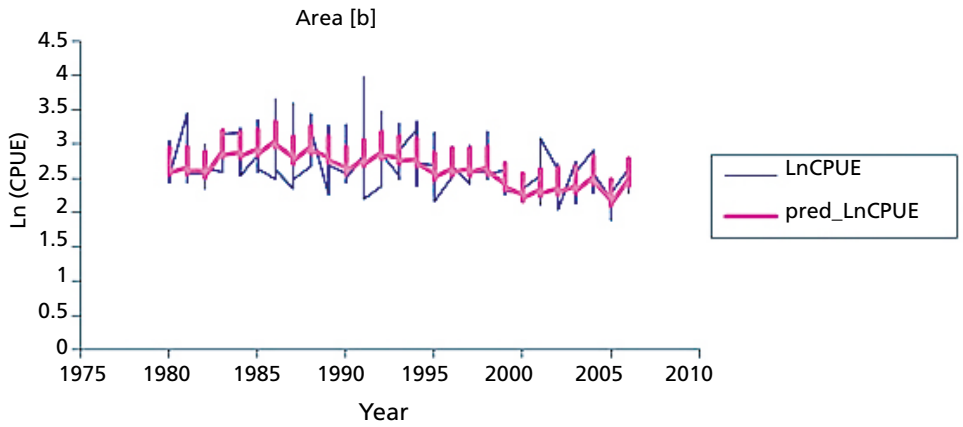


FIGURE 7
Nominal and standardized *(pred_LnCPUE)* monthly CPUE based on GLM-3 for area [b] and period 1980–2006

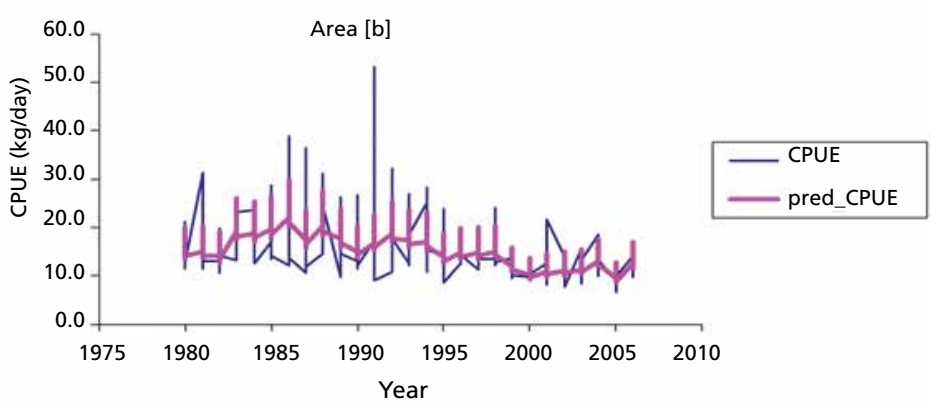


FIGURE 8
Nominal transformed *(Ln)* and standardized natural log-tranformed *(pred_LnCPUE)* monthly CPUE based on GLM-3 for area [c] and period 1980–2006

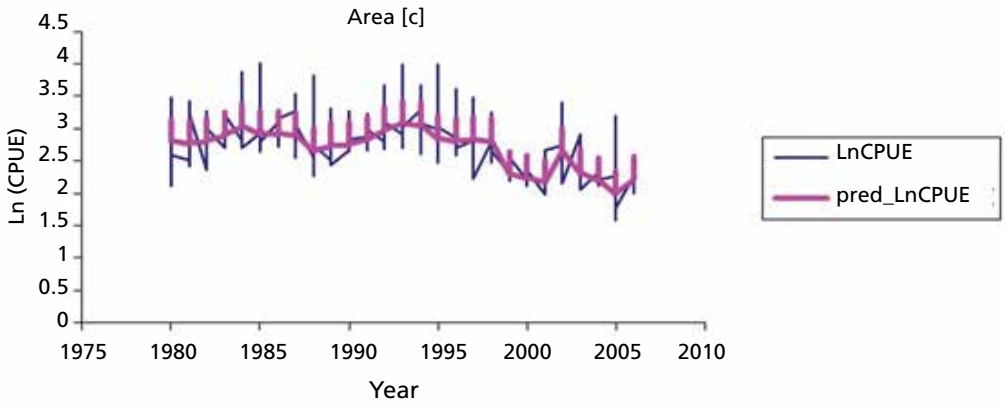


FIGURE 9
Nominal and standardized *(pred_LnCPUE)* monthly CPUE based on GLM-3 for area [c] and period 1980–2006

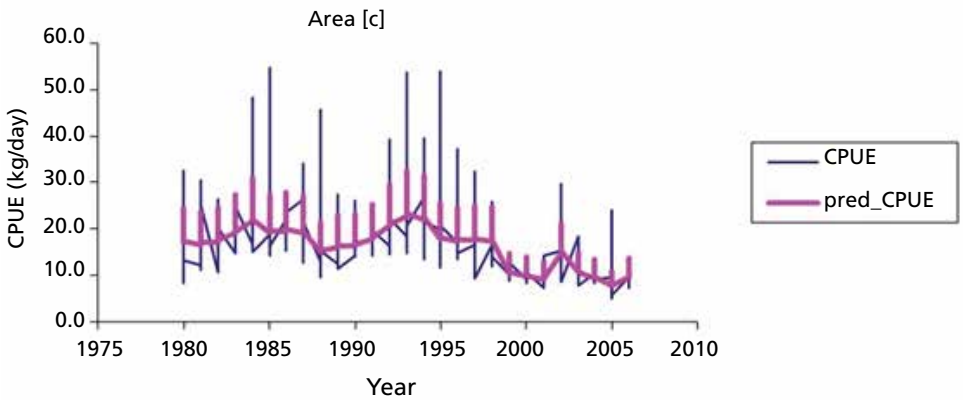


FIGURE 10

Nominal transformed *(Ln)* and standardized natural log-tranformed *(pred_LnCPUE)* monthly CPUE based on GLM-3 for area [d] and period 1980–2006

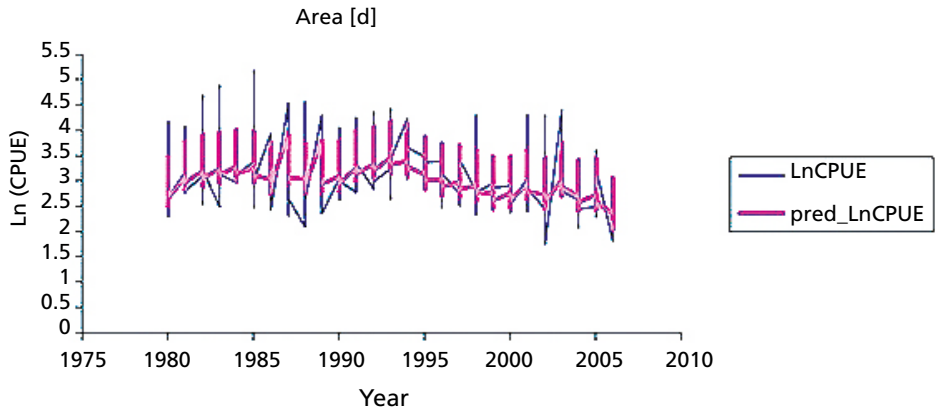


FIGURE 11

Nominal and standardized *(pred_LnCPUE)* monthly CPUE based on GLM-3 for area [d] and period 1980–2006

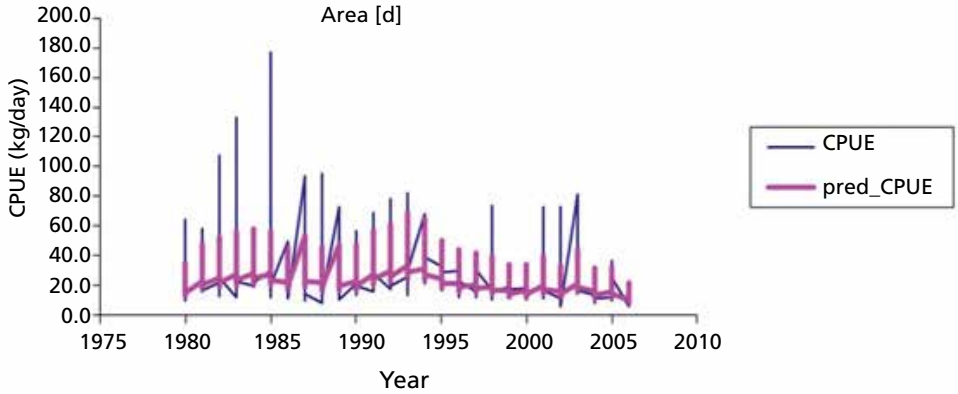


FIGURE 12

Boxplots of natural log-transformed A) nominal and B) standardized CPUE for each area (a, b, c, d)

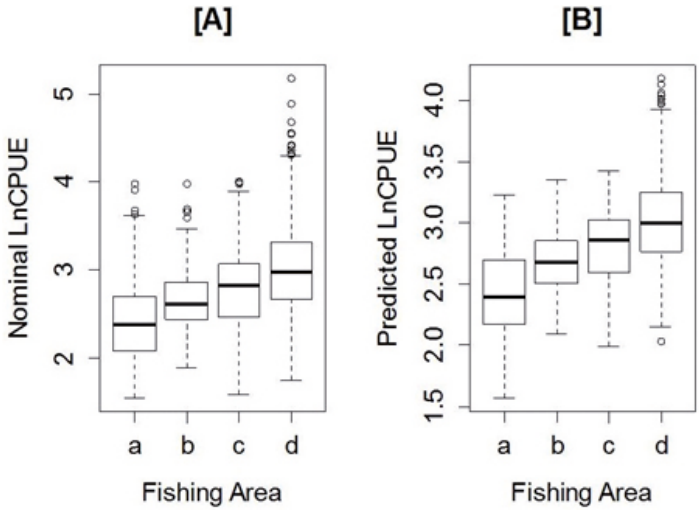


FIGURE 13

Boxplots of A) nominal and B) standardized CPUE by fishing area (a, b, c, d)

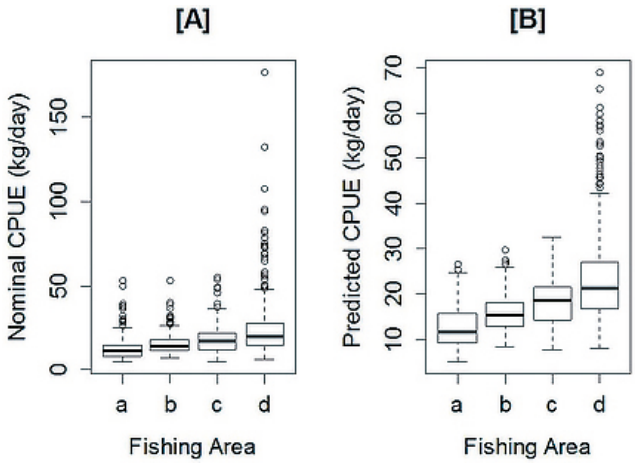


FIGURE 14

GAMM prediction of LnCPUE (Z) in relation to year and fishing month (fm) within A) area[c] and B) area [d]. An ARMA (p=1) process is included

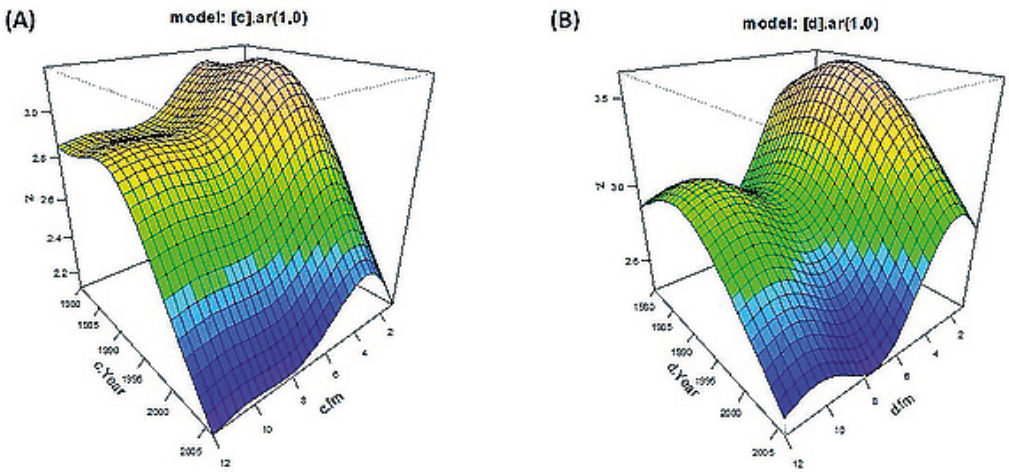


TABLE 4

Two sample Kolmogorov-Smirnov test results between the nominal and standardized distributions of CPUE

Two sample K-S	All data	Area [a]	Area [b]	Area [c]	Area [d]
D-criterion	0.1334	0.162	0.1975	0.1759	0.1406
P-value	2.155e-10	0.0004	6.467e-06	8.831e-05	0.0036

TABLE 5

GAMMs were developed with the independent variables of year, fishing month (fm) and area, initially without introducing autoregression (GAMM-1), and secondly by using a first order autoregression (p=1) (GAMM-2)

GAMM	Model	error pdf	AIC	BIC	p
GAMM-1	LnCPUE ~ s(Year) +f(fm) + f(Area)	Gauss	1197.4	1290.3	
GAMM-2	LnCPUE ~ s(Year) +f(fm) + f(Area), corr= corARMA(p = 1)	Gauss	983.5	1081.6	<.0001

TABLE 6
Results of GAMM-2 using a first order autoregression (p=1) by fishing area

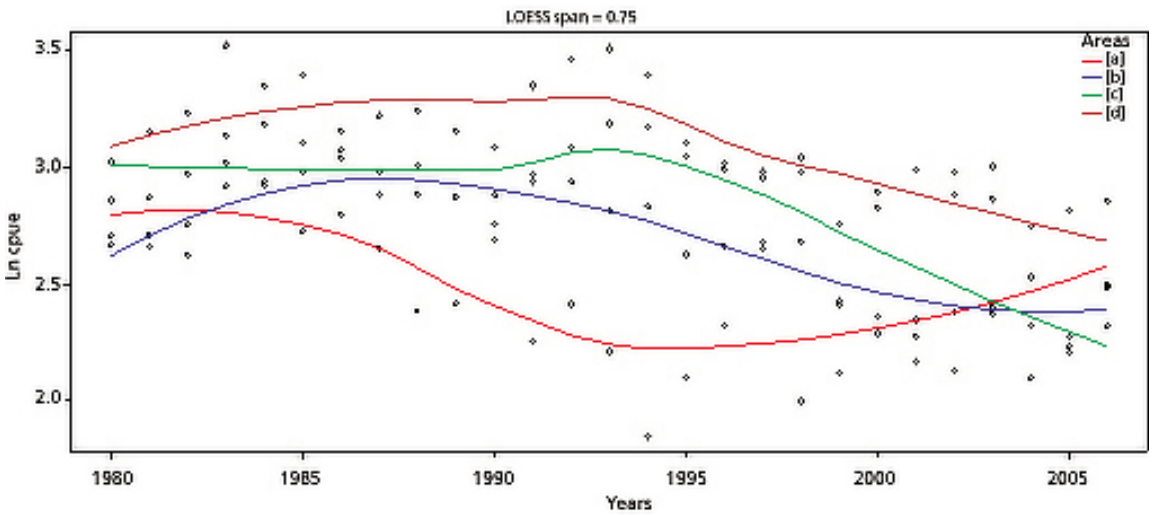
GAMM by fishing area				
	Regression coefficient (with SE)	**P-value**		
Area [a]			AIC = 256.6	BIC = 283.0
Month	0.15 (0.15)	0.323		
Year	0.06 (0.14)	0.664		
φ	0.50			
Area [b]			AIC = -3.134	BIC = 23.3
Month	0.17 (0.06)	0.006		
Year	0.13 (0.09)	0.128		
φ	0.38			
Area [c]			AIC = 116.1	BIC = 142.6
Month	0.24 (0.07)	0.002		
Year	-0.24 (0.11)	0.028		
φ	0.46			
Area [d]			AIC = 406.7	BIC = 433.1
Month	0.12 (0.11)	0.284		
Year	-0.11 (0.09)	0.274		
φ	0.04			

DISCUSSION

According to the results, CPUE standardization is essential in the case of small-scale fisheries in Cyprus waters. Fishing vessels usually tend to operate in various depths (5–100 m), using different gear depending on the season and weather conditions. This could easily lead to wrong estimations of a relative abundance index (Hilborn & Walters, 1992).

Area [a] shows the lowest values of CPUE in time series (Figures 4–5), while area [d] shows the highest (Figures 10–11). There is a remarkable difference between the two areas in the period 1980-1994 where annual CPUE in area [a] shows a decreasing trend, while in area [d] is increasing (Figure 15). The trend of CPUE in the two areas continues to be different in the period 1994–2006 where in area [a] is increasing, while in area [d] is decreasing.

FIGURE 15
Trends of annual LnCPUE by fishing area (a, b, c, d)



The distance between the areas seems to be a factor that affects the productivity in fisheries, and this assumption is enforced by the GLM results (Figures 12–13). A possible variation of environmental conditions, could affect to some degree the levels of production in small-scale fisheries. For example, knowing that area [a] has the lowest river-runoff in the sea (Dimitriou, 2000) could explain the low fisheries abundance with the stocks being more vulnerable to fishing pressure. Moreover, the annual decrease of CPUE in areas [c] and [d] (Table 6, Figure 14) could be due to a possible overfishing status of the stocks, but most potentially from the changes of environmental conditions that usually take place in the south western regions, such as the reduced river runoff in the sea.

Generally, stocks that are being exploited by artisanal fisheries have to be managed on a regional basis. Spatial variability of the standardized CPUE (Table 1), showed an increase from east to west (Figures 12–13) and gives initial information for the need of controlling fishing effort depending on the characteristics of each area as well as the environmental conditions. Also, other management plans on the basis of marine protected areas (MPA) and artificial reefs, should also be taken into account for the recovery of stocks in areas with low abundance.

Future work requires the approach of single species study for the main exploited stocks in artisanal fisheries, in order to avoid the errors that come out from a multispecies and multigear approach. The correlation between abundance and environmental factors could show if there are leading factors of CPUE that should not be ignored in the management of Cyprus fisheries.

Also, it would be useful to examine the possibility of the existence of reproductively isolated stocks between the areas, implementing morphometric and genetic analysis between samples of the most important stocks which are bogue (*Boops boops*), striped mullet (*Mullus barbatus*), red mullet (*Mullus surmuletus*), common pandora (*Pagellus erythrinus*) and picarel (*Spicara smaris*).

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Fisheries in the Tunisian dams: diagnosis of the current situation and development opportunities

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ABSTRACT
The Tunisian experience of fishing in reservoirs was initiated in the 1960s by the National Fisheries Office through the stocking of some dams with fry of various fish species. Currently, the number of boats is estimated at about 232 and the number of fishermen at about 450 operating in 33 dams. Extensive fish farming, offers to fishermen the opportunity to produce profitably fish at low prices that can be easily sold or consumed.

This study showed that catches, which were significant, were sold in the wholesale market of Tunis. Production in the dam reservoirs increased from 843.5 tonnes in 2000 to over 1 170 tonnes in 2010. However, it decreased to 919 tonnes in 2011. The most commonly caught species are: carp, pike perch, mullet, eel, catfish and tilapia. Otherwise, they are sold in villages close to reservoirs, or self-consumed. The observed growth rate of the introduced species shows that these reservoirs have a significant production potential. Development of freshwater fish farming is recommended. However, fisheries management of dams in Tunisia deals with or witnesses several technical and administrative problems. The lack of reliable collection of freshwater fisheries statistics is being considered as a major obstacle for the development of this sector. The reported statistics are criticized by scientists. This has a great impact on limiting any reliable study based on these data. Additionally, the diagnosis of fishing gear shows that the nets used are not fitted as standard. Secondly, despite the efforts made by the state, the produced quantities remain beyond expectations. As solution, we recommended the exploitation of all dam reservoirs seeking the maximum capture of mullet for the Tunisian market and perch for export. This will be achieved following the transfer of pike and forage fish in dams where they are not present and the annual capture of mullet fry from the natural sites and their transfer to dams for stocking. In addition to that, the use of specific fishing gear permits good productivity.

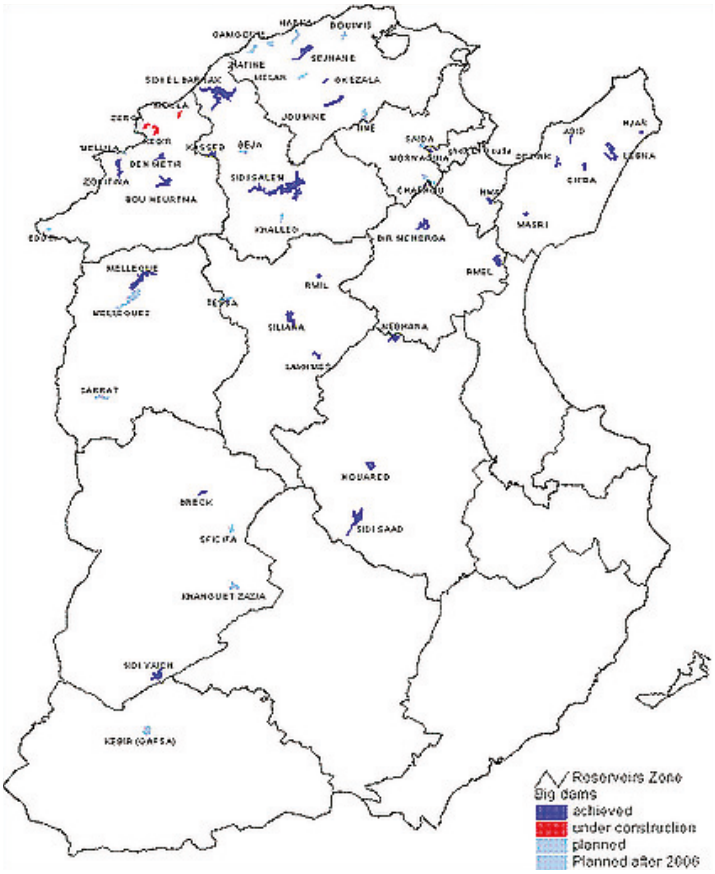
INTRODUCTION
With its two coastlines along 1 350 km; a national maritime domain of 80 000 km^2 and 105 200 hectares of lagoons, Tunisia has always been a country of sailors, and fishing has always been an activity of great importance. This strategic sector accounts for 8 percent of the agricultural production value and 1.1 percent of the gross national product (GNP). It generates also about 53 000 direct jobs (CTA, 2012). The national development strategy of fisheries is based on: preservation of benthic resources, exploitation of small pelagic resources, improving the added value of commercial fishing products and especially aquaculture development. Aquaculture in Tunisia

is a very old activity dating back to Roman times as evidenced by some mosaics of the Bardo Museum in Tunis. The recent Tunisian aquaculture experience began in the 1960s. Initiated by the private sector, this activity began with the growing of the Mediterranean mussel *Mytilus galloprovincialis* and the Pacific cupped oyster *Crassostrea gigas* on intertidal trestles in Bizerte (CTA, 2012). The supply of mussel spat is provided locally by capture in the Bizerte Lagoon while the oysters spat was imported from abroad (France, Italy, etc.). Subsequently, the shellfish facilities were transferred to the national fisheries office (ONP) which continued these activities and began construction of ponds in Monastir and Tunis lagoons. It jointly began with the National Scientific and Technological Institute of Oceanography and Fisheries (INSTOP), currently the Institut national des sciences et technologies de la mer (INSTM), stocking some dams with various fish fry species (common carp, flathead grey mullet, thinlip grey mullet, etc.). In the early 1980s, one of the first Mediterranean hatcheries of seabass *Dicentrarchus labrax* and seabream *Sparus aurata* was built in the south of the country by private operators supported by regional banks. The 1990s were marked by completion of the aquaculture master plan and the development of freshwater fish farming in extensive mode. Since 2003, a new aquaculture activity has emerged which carries an exceptional surge in adoption of new farming techniques. This technique is known as the bluefin tuna *Thunnus thynnus* farming that ensures not only a weight gain greater than 20 percent in a few months, but also allows the flow of this product in the international seafood markets. Tuna, from fishing and for fattening, is transferred while living in floating cages in the sea. There it is fattened in captivity for several months before being sold fresh at relatively more remunerative prices. The recent years witness the expansion of fish farming (seabass and seabream) in floating and submerged cages. Fry and food supplies are mainly imported from abroad (France, Italy, etc.).

From a strategic standpoint, the Tunisian government has carried out two strategies for aquaculture development: the Master Plan for Aquaculture (PDA) (1996–2006) and the National Strategy for Aquaculture Development (2007–2016). The PDA has estimated the potential and the target production for each sector and specified the development strategies to achieve this potential. The national strategy for aquaculture development (2007–2016) relies mainly on encouraging private promoters through strengthening financial incentives (exemption from customs duties and VAT for imported equipment etc.) and creating the Technical Center of Aquaculture (CTA) which is responsible for assuming aquaculture technologies transfer and promoters support.

The Tunisian experience of fishing in reservoirs began in the 1960s. This activity was first initiated by the ONP through the stocking of some dams with fry of various fish species. Currently, nine governorates are concerned by this type of fishing activity (Beja Ben Arous, Bizerte, Jendouba, Kef, Nabeul, Zaghouan, Kairouan and Siliana) (Figure 1). The main objective of this study is to diagnose or investigate the current situation and development opportunities of the fisheries in the Tunisian dams by conducting a scientific investigation.

FIGURE 1
Map of the main dams in Tunisia (DGTH, 2004)



MATERIAL AND METHODS

During the investigation made in the Tunisian dams, the most important information was collected specifically the types of exploitation, fishing effort, types of gear used, technical characteristics of nets, and species caught. This survey was made in 2011 covering the most important Tunisian dams and using an appropriate survey sheet. Additionally, data on statistics are analyzed and a database which regroups all information collected on the dams was made using Flash player 11. Fishing surveys were made in dams using multi-mesh nets to verify the results of the stock assessments that were made to use acoustic surveys. An analysis of collection of mullet fry in the various stations was made to determine the optimal zone and period for the collection of each species. Data history of fishing in the dams was collected from the archives of the Tunisian General Directorate of Fisheries and the National Institute of Marine Science and Technology. This study was carried out by the staff of the Technical Center of Aquaculture in collaboration with the Higher Institute of Fisheries and Aquaculture, Bizerte.

RESULTS

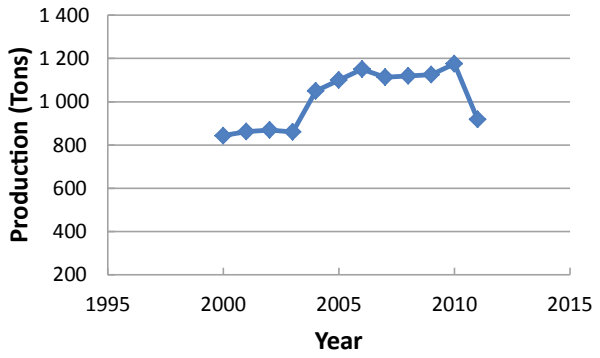
The investigation has shown several general remarks and results. During this investigation, it was noted that there is a great variability among Tunisian dams. This variability can be due to the different watersheds alimenting dams and consequently to various physicochemical parameters of the water (Figure 2).

FIGURE 2
Relationship between watersheds and Tunisian dams

Watershed	S/ watershed	Dam							
Nefza - Ichkeul	Nefza	Barbra-Zouitina	Sidi Barrak	Zerga	Kébir	Ziatine	Gamgoum		
	Ichkeul	Joumine	Ghezala	Sejnane					
Medjerda	Mellègue	Nebeur/MellekLe							
	Tessa								
	Bou Heurtma	Beni Métir	Bou Heurtma						
	Kasseb	Kasseb							
	Khalled								
	Siliana	Lakhmess	Siliana	Rmil					
	Moyenne Medjerda	Sidi Salem							
	Bases Medjerda								
North-east and north Sahel	Côtier								
	Meliane	Sidi Boubaker	Bir M'cherga	El Hma					
	Cap-Bon	Chiba	Masri	Bezirk	Laabid	Abdelmomen	Lahjar	Mlaabi	Lebna
	Sahel nord	Rmel							
Centre	Centre	Nebhana	Sidi Sâad	El Houareb					

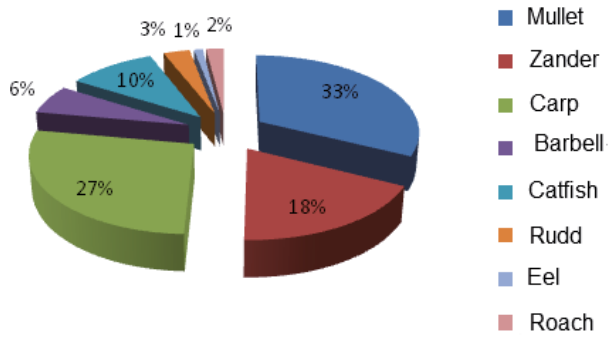
The total number of boats operating is estimated at about 232 and the number of fishermen at about 450. These fishermen are farmers of the inland areas who have a relatively low level of income. Extensive fish farming offers them the opportunity to produce profitably fish at low prices that can be easily sold or consumed. The largest catches are made in winter. Catches, which are significant, are sold in the wholesale market of Tunis. Otherwise, they are sold in villages close to reservoirs, or selfconsumed.

FIGURE 3
Annual production of fish in Tunisian dams (DGPA, 2012)



Production in the dam reservoirs increased from 843.5 tonnes in 2000 to over 1 170 tonnes in 2010, but it decreased to 919 tonnes in 2011. This diminution can be due to the Tunisian revolution and the lack of statistical data in this year. However, we note a small increase in the national production of the fresh water fish in 2012 (969 tonnes). The ninth development plan (1997–2001) has set a production target of 1 100 tonnes of freshwater fish by 2001. The recorded production rate was only 82 percent. The tenth development plan (2002–2006) has set a production target of about 1 700 tonnes of freshwater fish. Reported production in 2006 was only 1 086 tonnes. The objectives of the eleventh productive development plan (2007–2011) predicted a production of 2 200 tonnes. The reported production in 2010 is barely 1 176 tonnes.

FIGURE 4
Specific production of fish in Tunisian dams (DGPA, 2012)



The commonly caught species are: carp with four species (*Cyprinus carpio, Hypophthalmichthys molitrix, Hypophthalmichthys nobilis and Ctenopharyngodon idella)*, pike perch (*Stizostedion lucioperca*), mullet with two species (*Mugil cephalus* and *Liza ramada*), and eel (*Anguilla anguilla*). Additionally, many other species are caught in Tunisian dams like catfish (*Silurus glanis*), barbell with two species (*Barbus setivimensis* and *Barbus setivimensis*) and tilapia (*Oreochromis niloticus*). The fish representing the most important commercial interest in Tunisian dam reservoirs are summarized in the following table.

TABLE 1
Species present in the Tunisian dam reservoirs

Reproduction	Origin	Genus and species
Natural in freshwater	Autochthonous	*Barbus callensis*
		Barbus setivimensis
		Pseudophoxinus callensis
		Pseudophoxinus chaignoni
		Pseudophoxinus punicus
		Aphanius fasciatus
		Alosa fallax algeriensis
	Allochthonous	*Gambusia affinis holbrookii*
		Micropteris salmoides
		Stizostedion lucioperca
		Rutilus rubilio
		Scardinius erythrophtalmus
		Silurus glanis
		Oreochromis niloticus
		Cyprinus carpio
Artificial in freshwater	Allochthonous	*Hypophthalmichthys molitrix*
		Hypophthalmichthys nobilis
		Ctenopharyngodon idella
Natural reproduction in the sea with tests in artificial reproduction (pilot scale).	Allochthonous	*Mugil cephalus*
		Liza ramada
		Anguilla anguilla

A diagnosis was made during this study to determinate the characteristics of fishing gear used in Tunisian dams. In the course of this investigation, it was noted that there is a great variability between fishing gear used in dams. These fishing gear have a very

heterogeneous technical specification. This variability is mainly due to the incorrect mounting of the fishnets by local fishermen. All data collected during the investigation especially data on the dams, technical characteristics of the fishing gear used and the problems are gathered in an interactive database (Figure 5). For each dam, a datasheet was made bringing together all information.

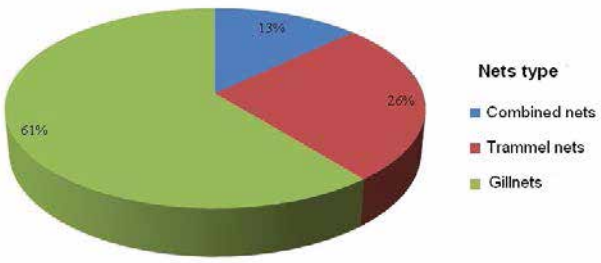
FIGURE 5
Interactive database of fisheries in the Tunisian dams

A small outline of the fishing gear used (especially the technical nets) in Tunisian dams will be detailed in the next section

Net types

Three types of nets are used in all the Tunisian dams which are invisible gillnet, trammel nets and combined nets (Figure 6). Each type of net has different characteristics in every dam. The type of net used by most professionals is gillnets, with a percentage of 61 percent. Trammel nets rank in second place with approximately 26 percent. Combined nets are the cheapest used in the Tunisian dams; the percentage does not exceed 13 percent. The limited use of this type of net is mainly due to the complexity of mounting this type of net. However, it has a very high efficiency of capture compared to other types of nets.

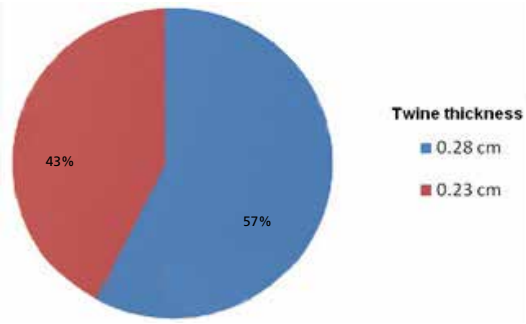
FIGURE 6
Types of nets used in Tunisian dams



Twine thickness

Nets used in Tunisian dams are made with twine and have a variable diameter (Figure 7). Most of them are carried out with invisible monofilament wires that have a diameter of 0.28 cm (57 percent). The largest percentage corresponds to those with a diameter of 0.28 cm (57 percent). The nets manufactured using twine with a diameter of 0.23 cm represents (43 percent) of the total.

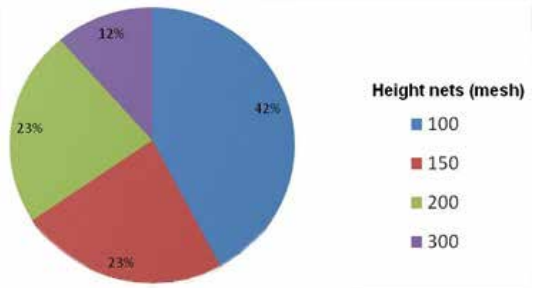
FIGURE 7
Different types of twine diameter used in nets



Height nets (number of mesh)

The figure below shows that 42 percent of nets used have 100 meshes in depth (Figure 8). However, nets with 150 and 200 meshes are used in Tunisian dams with the same percentage (23 percent). The nets having 300 meshes in depth are the less frequently used (12 percent).

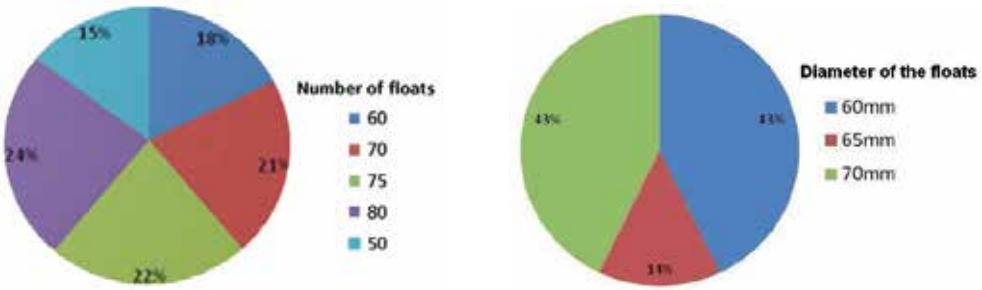
FIGURE 8
Depth of nets by mesh number



Number and diameter of floats

The number of floats is highly variable (50 to 80 floats) depending on the nature of nets (Figure 9). The percentage of the floats used is similar for all the types of nets except those with 50 floats. This gear has a deficiency in buoyancy (15 percent). For the confection of fishing nets in Tunisian dams, many floats with variable diameters are used. Only the floats with 65 mm of diameter are used with a low percentage (14 percent). The other types of floats (60 mm and 70 mm) have the same percentage (43 percent) used.

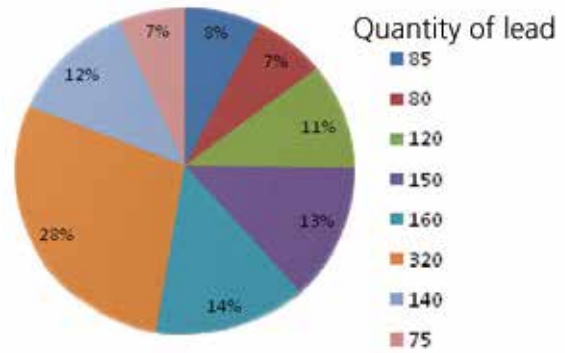
FIGURE 9
Number and diameters of floats used



Quantity of lead

Lead in the nets has a large variability. The number of ballast varies from 75 to 320 pieces of lead (Figure 10). Generally the mounting is done with washers or pallets of lead. In contrast, olives leads are rarely used.

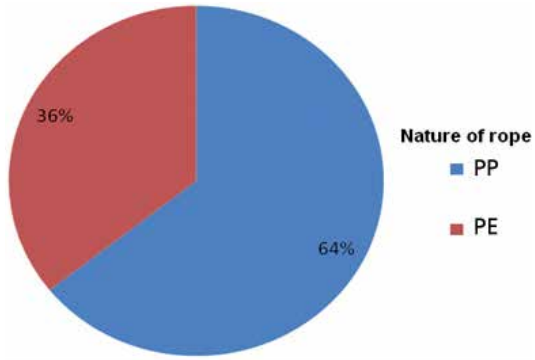
FIGURE 10
Quantity of lead per net (piece of 100 g)



Nature and diameter of ropes

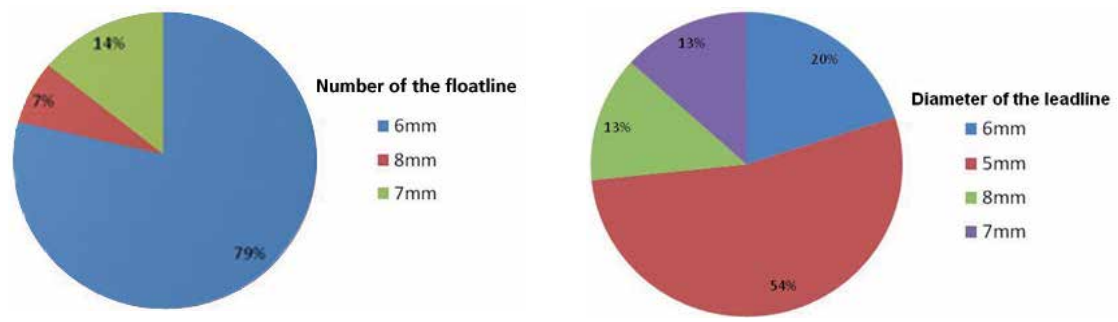
The figure below (Figure 11) shows that most nets used in dams are made with polypropylene ropes PP (64 percent). Usually, the top rope (float line) is made of polyethylene while the headline is made of polypropylene.

FIGURE 11
Types of ropes used



The figures below show that most of the nets used in Tunisian dams are made with ropes having a diameter of 6 mm (79 percent for the float line and 20 percent of the headline). For the headline, 54 percent of the ropes have a diameter of 5 mm (Figure 12). Generally the float line has a diameter larger than the footrope. For most nets examined, the float line has a larger diameter than the footrope, which indicates a failure in the mounting of nets used in Tunisian dams. Normally, large diameter ropes are used for the headline.

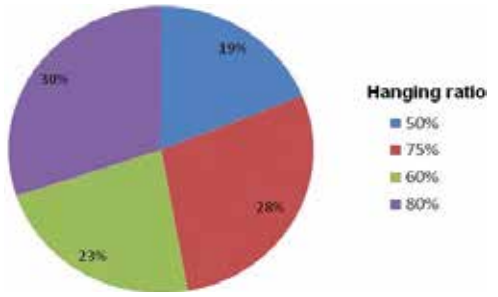
FIGURE 12
Diameters of ropes used



Hanging ratio

Regarding the hanging ratio, 19 percent of the nets used are mounted with a hanging ratio of 50 percent (Figure 13). The largest percentage of nets is realized with a hanging ratio of 80 percent, which induces a closed mesh. This failure causes a decrease in the efficiency of fishing nets. This variation proves that the mode of assembly differs among dams; however 81 percent of dams are exploited using nets with a hanging ratio of more than 50 percent.

FIGURE 13
Different hanging ratios used



DAMS STOCKING

The most important source of stocking the freshwater fish in the reservoirs is the capture of mullet fry from the natural sites and their transfer to dams, associated to the transfer of pike and forage fish and the introduction of carps produced in hatcheries. This work is carried out by the CTA.

Knowledge of the periods for which species are most abundant is important for successful capture of mullet fry and to avoid confusion between the species fished. The problem is the strong similarity between the Mugilidae fry and depigmentation of some juveniles. A study was conducted to determinate the periods of abundance of the fry mullet.

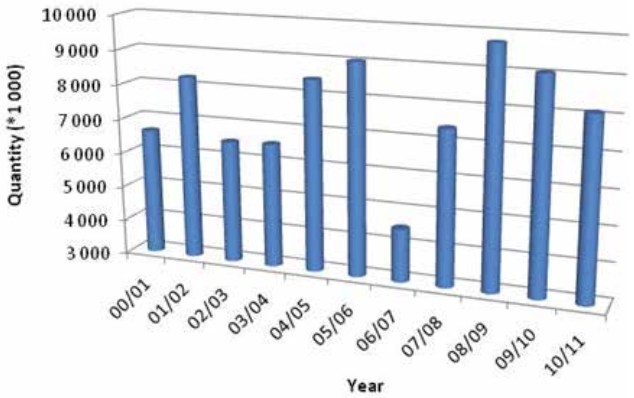
The first experience of mullet nursery (100 000 fry of *Mugil cephalus*) was made in 1964 in the dam of Mellègue. The fry are collected in water with a salinity between 7 and 37 g/l. Therefore, they are transported and discharged into the dam after acclimatization, by replacing gradually fresh water during transport. Fishing gear used in the capture of fry are numerous, the most used ones are the small Italian seines. The periods of presence of mullet fry along the Tunisian coasts are illustrated above. The period of maximum abundance of species is represented by sign (+) while the occasional presence is represented by signs (+-). Fish stocking density depends on living space, food, environmental conditions and size of fish. It is also necessary to increase the potential losses by predation and mortality. The number of stocked fry varies seasonally, depending on the density in the zones of capture (Mili *et al.*, 2013). The analysis of the collection of mullet fry in the various stations shows that fry abundance does not occur throughout the fishing season but in smaller periods. These results can be compared to those found by Vidy and Franc (1987), Farrugio (1975), Chauvet (1986).

TABLE 2
Periods of presence of mullet fry along Tunisian coasts

	A	S	O	N	D	J	F	M	A	M	J	J
M. cephalus	+-	+-+-	+-+-	+-+-	+-+-	+-+-	+-+-	+-+-	+-+			
L. aurata			+-	+-+-	+-+-	+-+-	+++	+++	+-+-+	+-+-		
L. ramada					+-+-	+-+-	+++	+++	+++-	+-+-	-+-	
C. labrosus			+-+-					-+-	+-+-+	+++	+-+-	+-+-
L. saliens	+++	+++-	+-+-							+++-	+++-	+++

Stocking dams with Mugilidae is the principal means adopted to ensure continuity and development of fish farming in Tunisia. The quantity of mullet fry collected is variable according to the years, but the objective is to attain 10 000 000 fry of mullet. The figure below summarizes the quantities of mullet fry stocked during the last decade. Since Mugilidae juveniles for aquaculture are still obtained from wild stocks, these data provided a valuable baseline for further investigations on these fish.

FIGURE 14
Quantities of mullet fry stocked in Tunisian dams



Larvae of carps (bighead carp, grass carp and silver carp) are produced by the CTA (continental fish farm Boumhel) during May and June and are seeded between June and July. The table below summarizes the quantities of carp larvae seeded in the Tunisian dams by the CTA (2009–2012).

TABLE 3
Quantities of carp larvae seeded in the Tunisian dams

Governorate	Dam	Grass Carp	Silver Carp	Bighead Carp
Jendouba	Bni Mtir	10 000	0	0
	Bouhertma	10 000	0	5 000
	Zouitina Barbra	10 000	0	0
Kef	Mellegue	10 000	0	10 000
Beja	Sidi Salem	35 000	5 000	20 000
	Sidi Barrak	35 000	5 000	20 000
Bizerte	Joumine	20 000	20 000	15 000
	Sejnane	20 000	10 000	15 000
	Ghezala	20 000	10 000	15 000
Siliana	Siliana	20 000	5 000	10 000
	Rmil	0	5 000	0
Zaghouan	Bir Mchergua	15 000	5 000	15 000
	Rmel	10 000	40 000	5 000
Nabeul	Lebna	15 000	9 500	15 000
	Masri	10 000	8 000	5 000
	El Abid	20 000	10 000	15 000
Kairouan	Sidi Saad	20 000	10 000	15 000
	Nebhana	10 000	5 000	5 000
Ben Arous	El Hma	35 000	10 000	20 000
Dams / Hillside Lakes		80 000	55 000	45 000
Total		**405 000**	**212 500**	**250 000**

Fry of perch and black bass are produced by the INSTM in the branch of Khair-Eddine during the months of February and March and are seeded between March and April. Tilapia fingerlings are produced by the INSTM in the station of Béchima. Actually, the transfer of Tilapia brood stock was made by the CTA. The table below summarizes the Tunisian dams seeded with zander, black bass and tilapia.

TABLE 4
Tunisian dams seeded with zander, black bass and tilapia

Governorate	Dam	Zander	Black Bass	Tilapia
Beja	Sidi Barrak			**
Bizerte	Joumine	*		**
	Sejnane	*		
	Ghezala	*		**
Siliana	Siliana	*		
	Lakhmes	*		*
Zaghouan	Bir Mchergua	*	*	*
	Rmel	*	*	*
Nabeul	Lebna	*	*	
	Bzireg	*		
	El Abid	*	*	*
Ben Arous	El Hma	*	*	**
Nabeul	Lahjar	*		*
	Mlaabi	*		

PROBLEMS DETECTED

Fisheries management of dams in Tunisia deals with several technical and administrative problems. The lack of a reliable collection of freshwater fisheries statistics is being considered as a major handicap for the development of this sector. The reported statistics are criticized both by professionals and scientists. Thus, it limits any reliable study based on these data. Besides, and despite the efforts made by the state, the produced quantities remain below expectations. The failures are due to the mismanagement of continental fisheries by fishermen. Inefficient control services generate serious problems especially the increase of the phenomenon of IUU fishing. Difficulty of communication with fishermen leads to serious problems on all the aspects of the freshwater fisheries (marketing, stocking, acquisition of equipment, etc.). Important depth in some dams induces difficulty in using gillnets, which does not allow the fishing of species distributed over the water column. The poor knowledge of fishermen in confection of fishing gear and the remoteness of outlets for fishing equipment induce an increase in operating expenses and low efficiency of fishing gear. The presence of tree trunks in the dam limits the fishery by causing tears in the nets or sometimes total loss of fishing gear. The use of a non-regulatory mesh and non-respect of the fishing season in most dams causes an incorrect exploitation of the freshwater fishery. Finally, the difficulty of marketing and prices volatility cause the major problems for fishermen.

PROPOSED SOLUTIONS AND RECOMMENDATIONS

The good growth rate of the introduced species shows that these reservoirs have a significant production potential. Development of freshwater fishery should be therefore encouraged. We proposed recommendations that aim to develop the freshwater fish farming sector in Tunisia. Firstly, we are interested in the development of the fishing activity and secondly in the aquaculture component.

- The most important recommendation is to increase the control on fishing gear used especially the mesh size and the number of net pieces.

- Strengthen oversight to minimize IUU fishing (excluding fishing season, fishing without authorization) by the competent authorities.
- Stocking fry can be a point of pressure in the event of fishermen unwillingness to cooperate or in fraud cases and failure to comply with fisheries regulations.
- Standardizing the fishing gear used and proposing a planning to use for the different types of nets.
- Conduct training on confection of nets the fishermen with specific characteristics for each dam.
- The concession of dams can be better if the operation is carried out by groups of fishermen.
- Moreover, the use of specific fishing gear allows for good productivity.

The PDA has recommended the exploitation of all dam reservoirs seeking the maximum capture of mullet for the Tunisian market and perch for export. This will be achieved following the transfer of pike and forage fish in dams where they are not present, the introduction of Chinese carps produced in hatcheries and the annual capture of mullet fry from the natural sites and their transfer to dams for stocking. The most important axis of development for freshwater fish farming is: granting of dams to private developers, breeding cages of Nile tilapia in the reservoirs of dams, improving the productivity of dams, developing Tilapia aquaculture in geothermal water, installing a mullet hatchery, increasing production of pikeperch and black bass, and finally introducing new species.

ACKNOWLEDGMENTS

Authors would like to acknowledge the support of Messeher Akkari for her helpful comments and correction of the manuscript.

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State of small-scale fisheries practised in the Romanian and Bulgarian sectors of the Black Sea during the past decade

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ABSTRACT

Changes during recent decades in the Black Sea ecosystem have contributed to the deterioration of structural and functional components of the marine ecosystem, which had direct impact on reducing the biological diversity and productivity, affecting the ecological balance and quality of life. Consequently, the Black Sea biota, including the ichthyofauna has undergone major changes, both in the qualitative and quantitative structure and the behavior of different species. These changes are the result of anthropogenic activities, direct – through fishing pressure – and indirect – by environmental deterioration, especially in the western part of the sea. The characteristic of the Black Sea basin is that most of the fish occupy extensive areas, located in the exclusive zone of several riparian countries. In this respect, the Romanian coast is extremely important, knowing its role in the feeding and breeding of the main fish species, although the catches in this area do not exceed 2–3 percent of the total catch taken in the Black Sea.

Romania and Bulgaria, Black Sea riparian countries, have together a coastline 622 km long (Romanian coastline – 245 km, Bulgarian coastline – 378 km) and the shallow continental shelf in their area of responsibility is an important segment of the regional fishery potential in terms of commercial interest, the domestic and international market demand, given the competition created by opening the import of fishery products, especially frozen fish, the lack of operating experience in the new conditions, the ageing fleets and especially increased fuel and maintenance costs, which led to a drastic involution of commercial fisheries in the Black Sea.

Small-scale fisheries are practised in the Romanian and Bulgarian shallow marine waters with fixed gear and are characterized mainly by concentrating activities in the first six months of the season (April to September), when usually the main fish species of commercial interest approach the coast for breeding and feeding. Fishing is practiced along the coast, in about 30 fishing points, located between Sulina and Ahtopol, with *pound nets, gillnets, longliners, handlines* and beach seines, at depths between 3.0 and 11.0 m, and *turbot gillnets* and *longliners* – up to depths of 40–100 m.

The catches and fishing productivity vary from year to year, depending on fishing effort, the evolution of hydroclimatic conditions, the state of the main fishable species stocks and anthropogenic factors. Catches in the shallow area in the last decade have fluctuated between 100–616 tonnes, on the Romanian coast, and 650–3 500 tonnes, on the Bulgarian coast.

Keywords: *Black Sea ichthyofauna, fishing pressure, catches dynamics, small-scale coastal fisheries*

INTRODUCTION

The Black Sea ecosystem is highly productive and provides many goods and services for recreation, food, pharmaceutics, mining and navigation. This impact of maritime uses on the marine ecosystem, and especially the impact of fisheries, is the key task for the sustainable development of the marine environment. On the larger scale, the ecosystem is affected by global climate change, which has influenced many aspects of the distribution, dynamics and abundance of marine living resources. At the same time, the recent history of the Black Sea showed more than elsewhere a tight interdependence between fish stock status, eutrophication, pollution, climate change, habitat changes and opportunistic settlers. Actually, all experts agree that the main historical feature can be described as: "collapse of pelagic fisheries at the end of the 1980s, due to the combined effect of successive overexploitation of fish stocks, increasing pollution and eutrophication, population outbursts of alien planktonic species, strong decadal-scale climate fluctuations". Fish consumption at present has reached a moderate level, with an increase in the past 15 years by more than 50 to 100 percent in different Black Sea coastal States. The reduced share of marine species in the total fish product consumption (except for Turkey) is notable.

Another peculiarity of the Black Sea is that until 1990, except for Turkey, small-scale fisheries in Georgia, Bulgaria, Romania, Russia and Ukraine were developed at reduced or moderate levels, because the main investment efforts were focused on commercial fishing fleets. After 1990, the number of vessels below 12 m in length increased rapidly. Due to very poor or limited data and information on small-scale fisheries existing at regional level, we focus our presentation only on Romania and Bulgaria.

The Black Sea ichthyofauna underwent major changes in the last 50 years, both in the qualitative and quantitative structure and the behavior of different species. These changes are consequences of anthropogenic activities, direct and indirect fishing pressure by deteriorating environmental conditions, particularly in the western part of the sea. Although Romania and Bulgaria are coastal countries at landlocked sea, with a coastline of 622 km, in the last decade, the new conditions of fishing practice, with the ceasing of state subsidy to the principles of alignment and competitive economy, have led to radical changes in national marine fisheries. However, the competition created by the opening of imports on fishery products, especially imports of frozen fish, the lack of experience of exploitation under the new conditions, the ageing fishing fleet and especially the rising cost of fuel and maintenance have led to a drastic involution of active fishing, especially in the Romanian Black Sea waters.

According to the present state of the fisheries sector, the improvement and financial support of the reorganisation of the fishing activities, also ensuring a sustainable fishing, are required, taking into account environment protection, social develpoment and economical welfare aspects. Romania and Bugaria are interested in the protection of the resources and in the preservation of the customs of the fishermen communities and in their social and economical development for the stabilisation of the coastal zone. Also, both countries are interested in developing the fishery communities and their involvement in the sustainable exploitation of the marine living resources.

MATERIAL AND METHOD

The methodology and techniques that were used for the collection, check, processing and analysis of data and for the assessment of fish stocks are those generally accepted for the Black Sea basin and in accordance with international methodology. The qualitative and quantitative composition of fish catches was obtained from the fishing statistics achieved through the centralization, on time periods, of the data obtained from the commercial companies in the field operating at the Romanian and Bulgarian littoral.

RESULTS AND COMMENTS

Current status of marine small-scale fisheries

The Romanian and Bulgarian marine fishery is taking place in the Black Sea (GFCM Fishing Subarea 37.4, Division 37.4.2, and Geographical Subarea GSA 29).

In the Romanian marine shallow coastline, the small-scale fisheries are characterized by the activity being carried-out mainly during the first four/seven months of the fishing season (March–October), when the main commercial fish species reach the coastal area for spawning and feeding. During the past years, marine fisheries in the Romanian Black Sea area were restricted to practicing stationary fishing, in the shallow coastal area, using fixed gear such as: uncovered pound nets, gillnets, longlines, beach seines, cages/traps and handlines. Fishing is practiced along the Romanian coast using four fishing ports (Sulina, Cape Midia, Constanta and Mangalia) and other 18 small fishing stations, located between Sulina – Vama Veche. The fishing depths range between 2–20 m and sometimes up to 60 m, when practicing specialized turbot, shad or dogfish fisheries (Figure 1) (Plate 1).

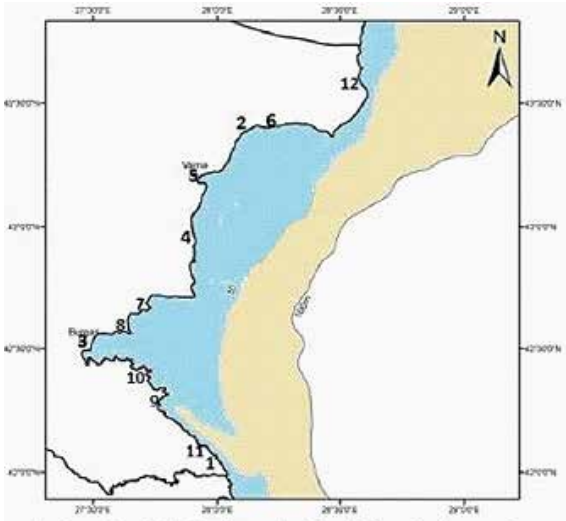
FIGURE 1
Map of Gökova Bay and protected area (Southern Aegean Sea), Turkey

PLATE 1

Fishery activity in the Romanian sector

The Bulgarian marine fishery opportunities are limited by the specific characteristics of the Black Sea and the exploitation of the fish recourses is concentrated in the shelf area (depths under 100–110 m are anoxic). The main fishing grounds are coastal (to 30–40 m depth) and offshore (to 100 m depths). Most of the fishing activities are carried-out in territorial waters (12 miles), but significant part of the fishing occurs up to 100 m depth. Open (coastal) sea fishing practices are either demersal (by bottom-set gillnets) or pelagic (by pelagic trawls), whereas in shallow waters close to the coastline small-scale fisheries are based on stationary uncovered pound nets, gillnets and hook-and-line methods. Recreational fishing is also well developed. The information about the fleet operating in the Bulgarian Black Sea area is recorded in the Fishing Vessel Register (FVR), maintained by the National Agency for Fisheries and Aquaculture (NAFA). The FVR contains data on registered fishing vessels including their length, gross tonnage, maximum main engine power, registration number, age of the vessel and owner, which is updated in real-time. Most of the fishing activities are carried-out in territorial waters. The main ports used by fishermen for landing catches are in Burgas, Varna, Baltchik, Sozopol, Nessebar and 7 fishing points (Figure 2) (Plate 2).

FIGURE 2
Fishing stations and fishery activity in the Bulgarian sector



1 - Ahtopol, 2 – Balchik, 3 - Burgas, 4 – Biala, 5 – Varna, 6 – Kavarna, 7 – Nessebar, 8 – Pomorie, 9 – Primorsko, 10 – Sozopol, 11 – Tzarevo, 12 - Shabla

PLATE 2
Fishery activity in the Bulgarian sector

In the Romanian small-scale coastal fisheries, during 2002–2012, a total number of 279–255 licensed vessels/year were used, of which 16–20 percent were boats smaller than 6 m and 84–90 percent boats 6–12 m long (Figures 3 and 4). Most of these boats are fitted with engines (93.45 percent).

FIGURE 3
Number of fishing boats used during 2002–2012

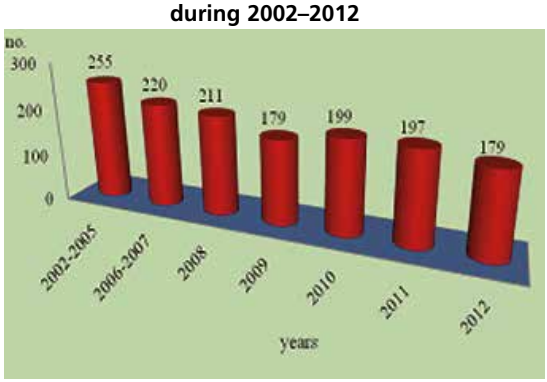
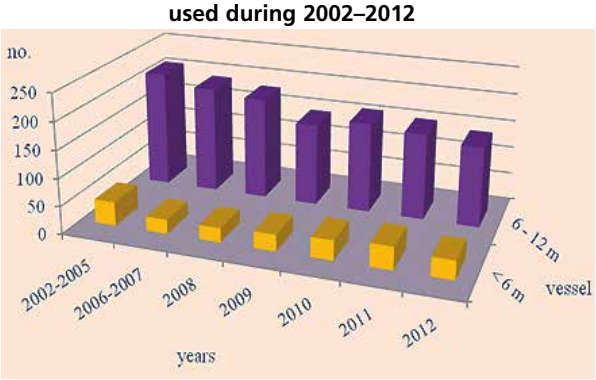
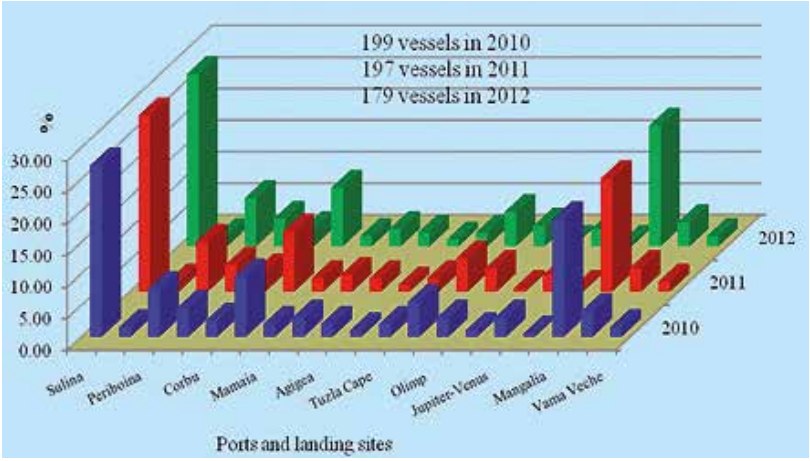


FIGURE 4
Type and number of fishing vessels used during 2002–2012



Concerning the distribution of fishing boats during the past three years, it can be noticed that the main activity ports are Sulina/27.14–27.89 percent, of the total number of fishing boats, Mangalia /17.89–19.13 percent, Cape Midia/9.29–9.55 percent, Periboina/7.54–7.89 percent, Costinești/5.26–5.53 percent, Vadu/4.21–4.52 percent, 2 Mai/3.68–4.02 percent (Figure 5).

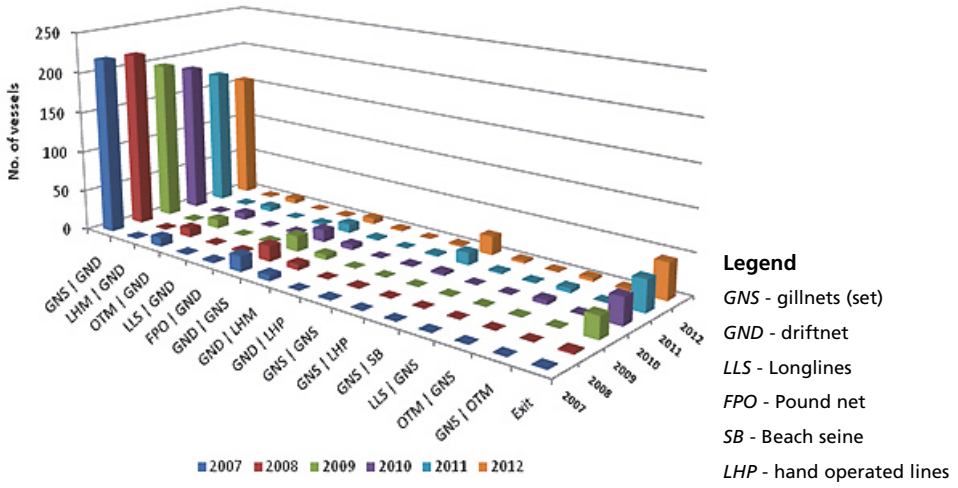
FIGURE 5
Dynamics of the fishing vessels in Romania. Distribution of fishing boats, during 2010–2012



In Bulgaria, most of the fishing activities are carried out in territorial waters. The main ports used by fishermen for landing catches are in Baltchik, Burgas, Varna, Sozopol and Nessebar.

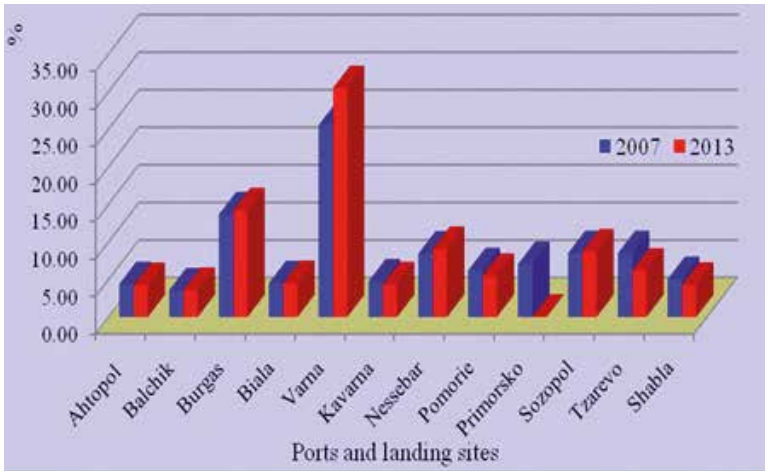
The Bulgarian fishing fleet consists of 1 994 vessels (EC fleet register, 2013) with a total of 6 476 GT and 5 544 kW. The fleet decreased compared to previous years: 2 547 in 2008 and 2 546 in 2007. The Bulgarian fleet operates exclusively in the Black Sea and 95.28 percent of the Bulgarian vessels are <12 m length and most of the vessels use set gillnets (anchored) as their preferred gear type.

FIGURE 6
Gear combination evolution of Bulgarian driftnet vessels – all size of vessels



Concerning the distribution of vessels on ports, it can be noticed that the main activity port is Varna, with more than 35 percent of the total number of vessels, followed by Burgas/17.5 percent, Nessebar/12.32 percent and Sozopol/11.98 percent (Figure 7).

FIGURE 7
Dynamics of fishing vessels in Bulgaria



Romanian small-scale coastal fisheries use the following types of fishing gear: pound nets, gillnets, longlines, beach seines, cages/traps and handlines. During 2010–2012, along the littoral, the number of gear used varied from one year to the other. Thus, the number of pound nets was identical throughout the three years, i.e. 25/year, while the number of gillnets used by fishermen ranged between 5 533/2010 and 3 530/2012, the number of longlines ranged between 436/2010 and 252/2012, the number of handlines ranged between 499 and 256, and the number of cages ranged between 320 and 391 (Figure 8).

In the small-scale coastal fisheries, the main fishing gear is gillnet, used both for pelagic and demersal species. The highest number is held by turbot gillnets/66.71–76.66 percent of all the gillnets used, followed by shad gillnets/16.61–26.78 percent, and other types of gillnets (gobies, dogsfish, bluefish, horse mackerel etc.)/6.68–13.31 percent (Figure 9).

FIGURE 8
Type and number of fishing gear used during 2010–2012

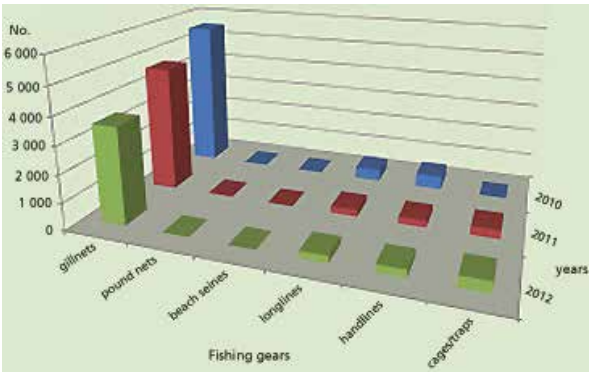
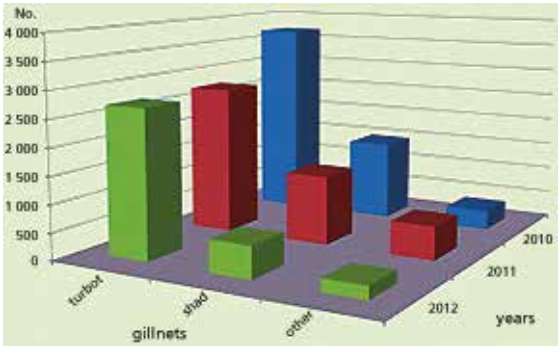
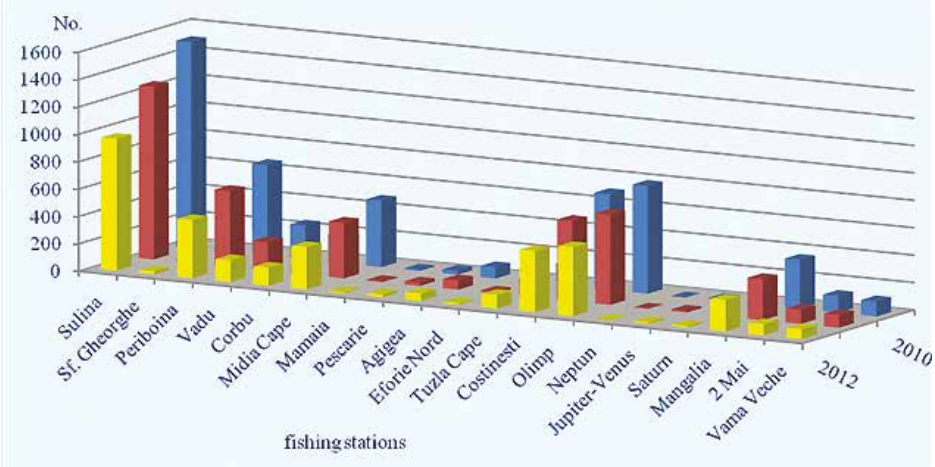


FIGURE 9
Type and number of gillnets used during 2010–2012



With reference to the distribution, during the past three years, of fishing gear on fishing stations, the highest number were used in the Sulina port (27.22 percent), followed by Olimp (14.22 percent), Costinești (12.63 percent), Periboina (11.98 percent), Cape Midia (8.75 percent) and Mangalia (6.46 percent) (Figure 10).

FIGURE 10
Number of gillnets used during 2010–2012, divided by fishing points

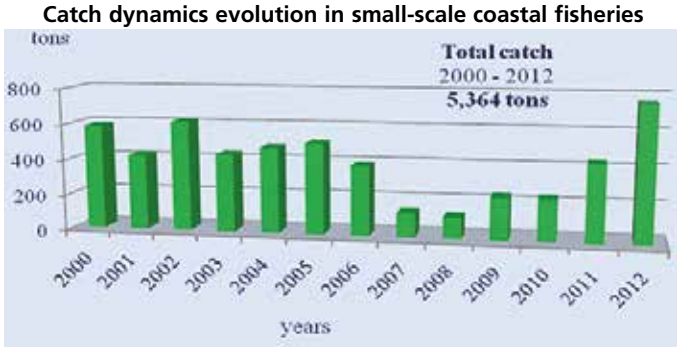


Catch dynamics in the coastal area during 2000–2012

On the Romanian coast, small-scale fisheries are characterized by the activity being carried out during the first four–seven months of the fishing season (March–October), when the main commercial fish species reach the coastal area for spawning and feeding. The level of the catches and fishing productivity were different from year to year, depending on the fishing effort (number of gear and effective fishing days), the evolution of the hydrometeorological conditions, the state of the main fish stocks and anthropogenic factors. The Romanian catches made during 2000 and 2012 varied between 137 tonnes in 2007 and 759 tonnes in 2012.

While during 2000–2005 the annual catches ranged between 423–616 tonnes, with an annual mean of 508.85 tonnes, the following years the catches dropped by 42.5 percent compared to the annual mean, namely from 392 tonnes in 2006 to 120 tonnes in 2008. After 2008, the economic operators along the Romanian coastline changed their option, prioritizing the fitting of vessels with equipment and gear specialized for turbot fishing and rapa whelk harvesting. The catches have slightly increased, from year to year, from 236 tonnes in 2009 and over 750 kg in 2012 (Figure 11).

FIGURE 11
Catch dynamics evolution in small-scale coastal fisheries



In Romania, the coastal small-scale fishing takes place in three main sectors:
a. Northern sector – between Sulina and Gura Portiţei;
b. Central sector – between Gura Portiţei and Cape Midia;
c. Southern sector – between Cape Midia and Vama Veche.

The largest catches in the small-scale coastal fisheries are achieved in the central sector (49.66 percent of the total), followed by the southern sector (42.89 percent) (Figure 12).

FIGURE 12
Catch dynamics during 2000–2012 by sector

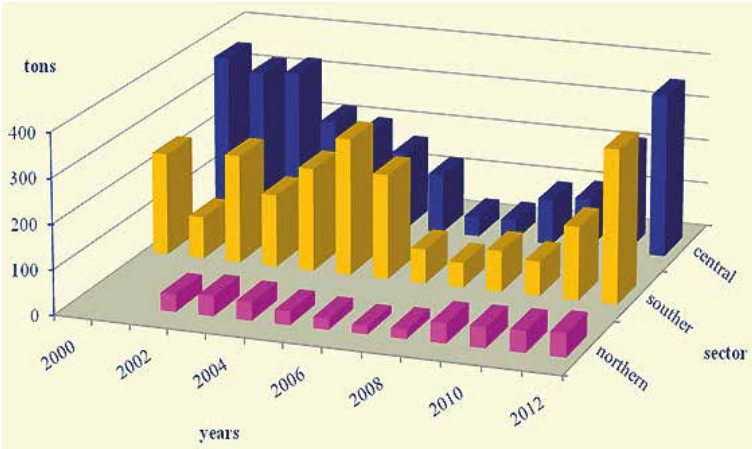


TABLE 1
Catches of main species by small-scale fisheries using GND and other gear (kg)

Species	Bonito		Gobies		Pontic Shad (Alosa immaculata)		Black Sea Shad (Caspialosa pontica)	
Year	GND	ALL	GND	ALL	GND	ALL	GND	ALL
2007		16 069		73.89		25 814		
2008		170 279	0.653	24.97		14.71		
2009		4 808	0.172	36.77		38 655		
2010		16 313	0.150	44.2		63 182		
2011		8 257		85 184		57 668		
2012	48	96 099.6		89.98	0.036	22.10	0.843	

Species composition of the catches

The main fish catches characteristic in the Romanian marine sector is the presence of a very high number of species (over 20), of which the main ones are the small size ones (sprat, anchovy, whiting, goby). We noticed that the presence of the valuable species

(turbot, picked dogfish, sturgeons, horse mackerel, garfish, Danube shad, flathead grey mullet, bluefish) is still low, but their stocks show a recovery trend, even if their state is still critical.

During 2006–2012, in the whole Romanian marine sector and during the whole fishing period, the dominance in catches belongs to the species: *Sprattus sprattus*/sprat (10.89–82.16 percent), *Alosa immaculata*/pontic shad (2.39–21.34 percent), *Psetta maxima maeotica*/turbot (3.02–18.69 percent), *Engraulis encrasicolus*/European anchovy (1.65–19.05 percent), followed by the traditional species: *Merlangius merlangus euxinus*/whiting (1.77–12.45 percent), *Gobiidae*/goby (2.05–5.13 percent), *Trachurus mediterraneus ponticus*/horse mackerel (1.37–5.07 percent), *Squalus acanthias*/picked dogfish (0.9–1.36 percent), *Mugilidae*/bluefish (0.16–3.25 percent), *Alosa tanaica*/Caspian shad (0.18–0.47 percent) and other (0.7–3.4 percent) (Table 2) (Maximov 2006, 2007, 2008).

TABLE 2
Total catches of the main species in the Romanian marine sector (mt)

Species	2006	2007	2008	2009	2010	2011	2012
Whiting	82 000	72 000	55 000	41 177	23 469	27 267	14 740
Turbot	42 000	42 000	47 000	48 767	48 248	43 248	43 213
Sprat	1 142 000	521 000	234 000	91 707	41 740	133 838	90 878
Anchovy	23 000	87 000	15 000	21 371	49 192	40 801	19 235
Goby spp.	49 000	37 000	13 000	16 960	13 476	21 088	17 145
Picked dogfish	9 000	17 000	10 000	4 330	3 069	4 425	2 144
Flathead mullet	3 000	4 000			3 513	99	149
Golden mullet	2 000	6 000	7 000		4 872	4 105	1 171
Caspian shad					1 203	1 233	1 513
Pontic shad	9 000	20 000	48 000	70 595	45 830	46 353	24 035
Horse mackerel	19 000	14 000	11 000	16 783	6 745	23 129	20 443
Red mullet	5 000	2 000		1 536	1 537	1 901	1 372
Common sole						590	881
Mussel					429	1 042	1 902
Rapa whelk					65	218 256	588 484
Other	5 000	14 000	4 000	17 603	14 788	822	7 578
Total	**1 390 000**	**836 000**	**444 000**	**330 829**	**258 176**	**568 197**	**834 883**

During 2007–2012, in the whole Bulgarian marine sector, 4 species were caught in the near-shore zone using GND (driftnets): bonito, gobies, shad and Black Sea shad. However, the reported catches of shad and gobies with driftnets might be a misreporting of catches using GNS and therefore these data should be treated with caution (Table 3). The scientific institutions consulted are not aware of any driftnet fisheries targeting gobies and shad in the Black Sea. Given the uncertainty and lack of information, it is difficult to draw firm conclusions on whether there is a marine driftnet fishery for shads and gobies in Bulgaria.

TABLE 3
Catches of the main species in the Bulgarian Black Sea for the period 2007–2012 (values in kg)

Main target species	FAO code	Catch in 2007	Catch in 2011	Catch in 2012
European sprat	SPR	2 984 585.0	3 957 895.0	2 836 201.9
Mediterranean horse mackerel	HMM	115 885.7	394 836.0	380 662.2
Atlantic bonito	BON	895.0	8 257.0	96 099.6
Bluefish	BLU	8 218.9	29 387.0	550 782.7
Flathead grey mullet	MUF	5 844.9	14 687.0	24 702.2
Red mullet	MUT	12 595.0	176 199.0	131 488.3
Picked dogfish	DGS	23 978.0	81 014.0	28 692.7
Turbot	TUR	66 885.0	38 060.0	36 361.6
Rapa whelk	RPN	4 309 989.0	3 118 868.0	3 793 386.0
Gobies nei	GPA	73 894.7	85 184.0	89 481.0
Thornback ray	RJC	3 562.0	93 434.0	68 587.7
Silversides nei	SIL	9 437.0	16 515.0	28 108.5
Total		**3 164 692.7**	**8 014 336.0**	**8 064 554.4**

Issues small-scale fisheries in Romania and Bulgaria are facing

In our opinion, the small-scale fisheries in the Romanian coastal area face many problems, among which (Maximov *et al.,* 2010):

- adverse weather conditions which affect fishing opportunities;
- ageing fishing fleet and increased fuel costs;
- lack of minimum conditions for safe navigation, hygiene and storage of fish on board;
- ineffective marketing and poor promotion of fishery products;
- poor organization of producers and fishermen;
- non-standard gear;
- low productivity;
- low training levels;
- low sanitary – veterinary control;
- inadequate vessels for coastal fisheries;
- lack of almost all mechanization of fishing operations on board and on land;
- high risks of accidents at sea;
- reduced diversity of fishery products;
- limited access to financial resources;
- lack of landing facilities;
- inadequate working conditions;
- insufficient control of IUU fisheries.

The small-scale fisheries in the Bulgarian coastal area also face many problems, such as:

- the insufficiency of measures aimed at restricting IUU fishing;
- fishing capacity: the poor condition of the ageing fleet;
- elaboration of a new Black Sea Fisheries Convention/Protocol, and for fishing capacity
- modernization of the fishing fleet;
- there were no strengths in international fisheries management, and reports from Bulgaria

Measures and recommendations concerning the promotion of small-scale fisheries in Romania

Romania is interested in the protection of the resources and in the preservation of the customs of the fishermen communities and in their social and economical development for the economic and social stabilization of the communities along the coastal zone.

In order to create the premises for the development of small-scale fisheries, along the Romanian coast, the following are necessary:

1. Technological innovations regarding the selection of fishing techniques and equipment

- vessel renewal and modernization to improve the safety of navigation and to ensure the preservation of fishery products;
- providing small boats for fishermen, under 12 m length, built and adapted to the conditions of the marine environment;
- bonuses for young fishermen (under 40 years) who start for the first time this kind of activity;
- redesigning and improving of fishing gear;
- clothes and gear manufactures;
- creating storage conditions for fishing products on board;
- using gear aimed at reducing the impact of fishing on the marine ecosystems and bottom;
- developing selective fishing tools;
- developing sheltered landing points for coastal fisheries in order to improve working conditions, landings and their conditioning before market capitalization;
- developing the infrastructure in order to ensure a long-term profitable and competitive fishing industry;
- improving the quality and safety of fish products, according to Community quality and safety standards.

2. Modernization and development of fishing ports

- infrastructure development in order to ensure a long term profitable and competitive fishing industry through the modernization of ports and landing points;
- improving landing conditions, taking over and depositing fish products in ports or first sale points;
- when designing and building ports and landing points, the following conditions must be taken into consideration:
  - ensuring safe shelters and adequate installations for fishing vessels, sellers and buyers
  - ensuring enough fresh water resources
  - ensuring waste treatment systems (discharge of petrol products, water containing oil, fishing tools)
  - minimum level of pollution by sea activities and external sources
  - fighting erosion and mudding effects
- infrastructure for supplying services to vessels and fishing boats;
  - fuel supply, materials, food and ice supply
  - installations for the maintenance and mending of fishing boats and vessels
- fitting with boat-houses for improving safety in loading and discharging products.

3. Improving professional training and formation

Training aims at creating opportunities for the management implementation involving producers starting from the decision adoption stage. Also, fishermen training concerns

fish quality and safety improvement according to the Community standards for food quality and safety:

- training fishermen in order to acquire the minimal knowledge about marine living resources and their place in the ecosystem;
- creating the premises for the implementation of a resource management involving producers starting from the decision-making stage;
- implementing adequate training programmes for the enhancement of work efficiency and productivity;
- developing programmes for fishermen training in other business than fishing;
- developing activities diversification to promote multiple jobs for fishermen.

4. Promoting the establishment of production–processing–selling chain of fishing products

- increasing efficiency of fish processing and marketing activities, according to the requirements of consumers and to the food quality and safety standards;
- developing fish markets and advertising campaigns for fishery products;
- assuring financial support for the development of fish markets infrastructure;
- increasing fish products consumption from 2.44 kg/inhabitant to 3.32 kg/inhabitant.

Priorities:

- promoting the commercialization of flat fishes with high alimentary value;
- applying quality promoting policy;
- promoting environmental friendly obtained products.

5. Improving the activities regarding the administration and control of the access conditions in certain fishing areas

- for the protection, conservation and rehabilitation of the marine ecosystem a series of measures should be taken in order to prevent pollution of the coastal areas and some special measures to protect breeding and growing areas are required;
- to prepare management plans (particularly multiannual), the central public administration (NAFA), together with all interested groups, will investigate and analyze all information on the implications of biological, social and economic strategies and different management options;
- fisheries management must take into account interannual variations of fish stock productivity, and needs to include them in its plans; fish availability must be treated very carefully not to be interpreted as changes in stock size (adaptive scheme).

Measures and recommendations concerning the promotion of small-scale fisheries in Bulgaria

1. Increasing the relative share of the fisheries sector in the GDP; the sector should achieve a sustainable share in the formation of the GDP – each year adding approximately 1.0 percent to it;
2. Increasing the share of fish and other aquatic products in the Bulgarian foodstuff market; the annual consumption of fish per capita should reach 7.5–8.0 kg on average;
3. Increasing the annual production of aquaculture products to reach at least 12 000 tonnes of fresh and processed fish and fish products; the primary products for the produced food should be from own sources;

4. Increasing the share of the valuable and delicacy species of fish to at least 60 percent for total aquaculture production; the increase should be at the expense of the share of the carp species;
5. Restructuring of the Black Sea fishing fleet and increasing part of it with modernized fishing vessels with adequate and modern fishing equipment and facilities;
6. Organizing an effective fisheries statistics system with capacity to cover at least more than 90 percent of the total volume of fish and other aquatic organisms production/catches and aquaculture;
7. Projects by the private sector and by the non-governmental organizations should support fish stocks of value and market demanded fish species in the water basins;
8. Increased income of the people employed in the sector;
9. Increasing the share of specialists and workers in the sector with appropriate qualifications for their positions to 80 percent.

Options for the sustainable development of small-scale fisheries in Romania and Bulgaria

1. Tighter harmonization of fisheries development strategies with the opportunities offered by the state of marine living resources and the constraints imposed by the principle of the ecosystem approach and the FAO CCRF;
2. Promotion of instruments for stimulating small-scale fisheries and traditional fishing methods in support of local communities;
3. Developing mechanisms to resolve conflicts between different users of the marine ecosystem goods and services and marine fisheries under ICZM practices;
4. Promotion of gear more selective and less destructive to habitats and with low impact on endangered species, especially dolphins;
5. Stimulating the development of marine aquaculture with the aim of diversifying the species supply and reducing fishing pressure on natural stocks;
6. Ensuring adequate water and sediment quality control in areas for shellfish rearing (Shellfish Waters Directive);
7. Implementation of mechanisms for the control of intentional or accidental introduction of exotic species;
8. Identification of critical habitats and their rehabilitation;
9. Harmonization of the management measures of marine fisheries with the requirements of the Natura 2000 network implementation;
10. Supporting scientific research and the monitoring system of living resources in order to improve support scientific background for fishery policy decisions.

CONCLUSIONS

This paper draws the outline of the species management at the Romanian and Bulgarian Black Sea coasts in order to find ways to protect these valuable resources and to ensure the sustainability of their exploitation. Modern fisheries management is often referred to as a governmental system of appropriate management rules based on defined objectives and a mix of management means to implement the rules, which are put in practice by a system of monitoring, control and surveillance methods.

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La pêche artisanale en Tunisie: diagnostic des techniques et des engins de pêche utilisés

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RÉSUMÉ

La pêche côtière est pratiquée en Tunisie par le moyen de petites embarcations motorisées ou non motorisées. De plus, cette activité peut être réalisée à pied, comme la pêche de la palourde, des éponges ou en utilisant l'épervier. Ces techniques artisanales sont intégrées dans les coutumes locales et nécessitent des populations stables, des sites accessibles permettant la pêche à pied ou au moyen de petites embarcations. Du point de vue économique, la pêche côtière se caractérise par un faible investissement par rapport aux autres modes de pêche et par une structure économique et sociale simple et relativement homogène. La pêche artisanale tunisienne gagne progressivement de l'importance en passant du Nord vers le Sud avec une concentration aux alentours de l'archipel de Kerkennah et l'île de Djerba. De plus, la pêche artisanale tunisienne se localise au niveau des lagunes et des sites abris. Cette activité s'étend sur une frange littorale relativement étroite et exploite une multitude d'espèces de haute valeur commerciale au moyen d'engins de pêche divers. Au total, on recense 20 techniques de pêche réparties en cinq catégories utilisées en Tunisie. Ces techniques sont orientées vers des espèces cibles au cours des saisons et dans des zones bien déterminées. Les principales techniques utilisées sont les lignes et les palangres, la pêche à pied, les pièges, les filets droits et les sennes de plage. L'utilisation des techniques de pêche artisanale devient de plus en plus rare aujourd'hui. Cette activité est menacée de disparaître sous l'effet conjugué de pressions multiples dont l'impact de la pêche industrielle sur les stocks et l'exode de la population maritime. En effet, cette activité souffre du rendement faible par rapport aux autres techniques modernes ce qui entraine une faiblesse de la rentabilité économique. La pêche artisanale en Tunisie subit d'autres types de pressions telles que la concurrence des matériaux synthétiques provoquant le changement des conceptions initiales des *charfias*, des nasses et des pierres creuses.

INTRODUCTION

Actuellement, il n'existe pas de définition commune et universelle de la pêche artisanale, elle est définie différemment selon les régions et les pays. La législation tunisienne actuelle de la pêche n'a pas donné de définition juridique précise et claire à la pêche artisanale. Dans la pratique, on l'associe souvent à «la pêche côtière» qui est pratiquée à bord de petites barques à rames ou motorisées, dont la longueur totale est généralement inférieure à 15 m (Anonyme, 2011). En Tunisie, la pêche artisanale est multispécifique et cible principalement les espèces démersales vivant tout près de la côte. Ces espèces cibles sont variées et présentent généralement une valeur économique élevée. Depuis

longtemps, la pêche artisanale constitue une activité très importante dans les pêcheries en Méditerranée (Griffiths *et al.*, 2007) et notamment tunisiennes, particulièrement celle du golfe de Gabès (M'Rabet *et al.*, 2011). Actuellement, la pêche artisanale assure 33 500 emplois directs, ce qui représente 75 pour cent de la population maritime à l'échelle nationale (DGPA, 2011). Selon cette même source, la production totale de cette activité s'élève à 27 000 tonnes (27 pour cent de la production nationale totale), ce qui représente 40 pour cent de la valeur nationale totale des produits de la mer. Cette activité est qualifiée de pêche «artisanale» ou «petits métiers» et elle est pratiquée par de petites embarcations motorisées (généralement < 5 TJB) ou non motorisées ou même sans embarcations, comme pour la pêche à pied des clovisses, des éponges ou par l'utilisation de l'épervier (Romdhane, 1998). Les techniques artisanales sont intégrées dans les coutumes. Elles nécessitent que la population soit stable et que les sites soient accessibles avec une morphologie de la côte permettant la pêche à pied ou au moyen de petites embarcations. Du point de vue économique, la pêche côtière se caractérise par un faible investissement (taux de capitalisation bas) par rapport aux autres modes de pêche (chalutiers et senneurs) et par une structure économique et sociale simple et relativement homogène (Ben Hamouda, 2006).

Ce travail a été effectué suite à une enquête réalisée par les membres du laboratoire des ressources marines vivantes de l'Institut national des sciences et technologies de la mer (INSTM) en 2011. Cette enquête a été effectuée dans presque tous les ports de pêche le long des côtes tunisiennes.

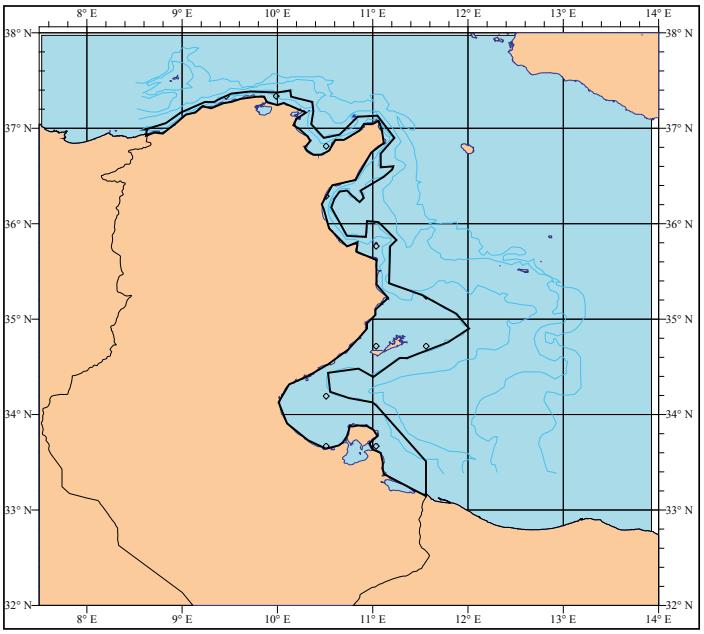
ZONES DE PÊCHE

L'activité de pêche côtière ou artisanale s'étend sur une frange littorale relativement étroite et couvre les petits fonds. Elle exploite une multitude d'espèces à haute valeur commerciale au moyen de divers engins de pêche. Ainsi, la pêche artisanale se localise essentiellement au niveau des lagunes, sites abris et îles (Figure 1) (Romdhane, 1993). Le diagnostic des fonds marins dans les eaux tunisiennes a permis de subdiviser nos côtes en trois secteurs:

- La région nord, qui est caractérisée par un plateau continental restreint et une pente aigue. Son relief est accidenté et ses conditions climatiques sont généralement défavorables à la pêche.
- La région est, dont les fonds assurent la transition entre les zones nord et sud de la Tunisie. Cette zone est caractérisée par une pente douce jusqu'à 25 m de profondeur et des accidents de reliefs dans des profondeurs de 100 m.
- Le plateau continental de la région sud-est, large avec une pente faible. Au niveau de cette zone, les conditions climatiques sont favorables à la pêche. De plus, elle est caractérisée par l'abondance des espèces à haute valeur commerciale ciblées par les engins de pêche côtiers.

En général, la pêche artisanale gagne progressivement de l'importance du nord au sud, avec une concentration dans l'archipel de Kerkennah et l'île de Djerba (Figure 1) (Romdhane, 1998).

FIGURE 1
Zones de pêche côtière dans les eaux tunisiennes



Source: Farrugio and LeCorre, 1983.

LES TECHNIQUES DE PÊCHE RECENSÉES

Au total, on a recensé 20 techniques de pêche artisanale qui peuvent être réparties en cinq catégories, à savoir: pêche à pied, lignes et palangres, pièges, filets droits et sennes. Ces techniques concernent des espèces cibles abondantes selon les saisons et dans des zones bien délimitées.

Pêche à pied

Poissons et palourdes

Développé dans la zone sud où le marnage est important, ce type de pêche est pratiqué en général à l'aide des harpons pour les poulpes, les seiches et les soles ainsi que pour les mugilidés en hiver. La pêche au mulet attiré par une femelle pêchée au préalable dans une nasse est une autre technique qui a été rencontrée localement au nord de la Tunisie. Actuellement, la principale pêche à pied pratiquée en Tunisie est la récolte des palourdes, au moyen de petits faucillons (FAO ArtFiMed, 2009).

Éponges

La pêche à pied des éponges est pratiquée dans l'archipel de Kerkennah sur des fonds de 1 à 1,5 m durant les périodes octobre-décembre et mai-juillet. Le pêcheur dans l'eau tente de sentir l'éponge avec son pied et il est aidé par la couleur des algues autour de l'éponge. En effet, la végétation autour de l'algue est atrophiée par un liquide alcalin secrété par l'éponge formant ainsi une «rosette» blanchâtre autour de cette dernière, ce qui permet de la localiser (Romdhane, 1998). Généralement, cette technique peut être utilisée à des profondeurs entre 2 et 12 m. L'opération de pêche débute par la localisation des éponges à l'aide d'un viseur, ensuite les éponges seront arrachées soit par les harpons soit par une masse de fer emmanchée de cinq tiges à harpon (Romdhane, 1998).

Épervier

L'épervier est présent dans toutes les régions et utilisé durant toute l'année. Il est composé d'un filet de forme conique, d'un périmètre de base lesté et d'un fil de jet servant à former et à hâler l'engin. Le filet est jeté à la main au-dessus des bancs de poissons. Cet engin de pêche artisanale est surtout utilisé aux embouchures des oueds, dans les lagunes et en mer (jusqu'à 1 m de profondeur). Les mugilidés et les sparidés sont les espèces ciblées. Dans la région nord, cette technique est associée à l'attraction des mulets par une femelle attachée à un fil polyamide et entraînée au large provoquant un rassemblement de congénères qui seront attrapés à l'épervier.

Les lignes et les palangres

Les lignes et les palangres sont des techniques qui sont pratiquées durant toute l'année et dans toutes les régions pour la pêche du pagre, mérou, denté, chiens de mer, spars, daurade, loup, thonine, serre, espadon (Chouba *et al.,* 1996).

Les lignes à main sont les engins de pêche efficaces pour les poissons benthiques des fonds accidentés et pour les petits poissons côtiers. Ces lignes sont constituées d'un fil synthétique généralement en monofilament dont l'extrémité est munie d'un hameçon.

En ce qui concerne la palangre, elle est constituée d'une ligne mère portant des lignes secondaires ou avançons terminés par des hameçons. Ces deux engins sont couramment utilisés à partir des petites embarcations, ils peuvent être calés au fond (dormants) ou laissés à la dérive entre deux eaux (pélagiques).

Les pièges

Pièges à poulpes

Sur l'île de Kerkennah, le piège à poulpes est une technique traditionnelle. Au cours du temps, il y a eu une évolution remarquable de cette technique. Les pots en pierre sont les premiers à être utilisés suivi par les pots en ciment. Les pots en argile sont les derniers à faire leur apparition. Les pots en pierre sont encore utilisés dans la région de Kerkennah à des profondeurs allant de 1 à 3 m. Après l'activité de pêche, ces pierres ne sont pas remontées ce qui fait que la zone où elles sont déposées devient la propriété du pêcheur. Les pots en argile sont utilisés dans toutes les régions, surtout au sud, à des profondeurs allant de 5 à 20 m et durant une campagne qui s'étend du 15 octobre au 15 mai.

Nasses

Les nasses ont une structure généralement variable. Elles ont une forme cylindroconique à ouverture tronconique. Ce sont des pièges côtiers dont la capture est prélevée à partir d'une trappe de visite qui permet aussi de placer un appât. Les nasses artisanales sont confectionnées avec des régimes de palmes et des nervures de palmes dans la région de Kerkennah pour la pêche des poissons côtiers tel que : les spars, les labridés, les serrans, les corbes et les rougets. Les nasses confectionnées à l'aide de roseaux sont utilisées au nord du pays au niveau des hauts fonds pour la pêche des langoustes, de la cigale, du pagre, des dentés et des rougets. De nos jours, on utilise une structure métallique revêtue de grillage ou de filet.

Charfia et Zroub

La *charfia* est une pêcherie fixe utilisée dans les hauts fonds et où l'amplitude des marées est importante. C'est un engin à grande utilisation dans le sud du pays, particulièrement aux îles Kerkennah et dans une moindre mesure à Chebba et Djerba. L'engin est formé de bras ou «murs» et de chambres de capture. Les bras sont édifiés à l'aide de palmes qui sont enfoncées dans la vase qui servent de guide aux poissons en les orientant vers

les chambres de captures. Ces dernières sont constituées de claies de palmes soutenues par des poutres en bois de palmier et sont munies de nasses confectionnées à partir de régimes de palmier. Cependant, même si l'allure de l'engin est relativement respectée, il n'en est pas de même pour les matériaux de confection. La *charfia* est un engin qui est installé durant toute l'année et qui permet la capture de plusieurs espèces notamment les mugilidés, les spars, les sargues, les rougets, les daurades, les labridés, les sarrans, etc.

Le *zroub* est un engin du même type que la *charfia*, mais de taille moins importante. Les murs en palmiers sont substitués par des haies constituées par des claies (nattes) en jonc (vannerie) ce qui permet le déplacement facile de l'engin. Le *zroub* est généralement utilisé lors de la pêche estivale et à la fin de la marée basse, animée par quatre ou cinq pêcheurs qui frappent l'eau à l'aide de bâtons, en direction des chambres de captures.

Bordigue

C'est un barrage construit en panneaux métalliques grillagés, dans la zone de communication entre la lagune et la mer. Ces panneaux sont amovibles verticalement, ils sont installés en forme de «V», avec des chambres de capture aux extrémités. L'unité de pêche de cet engin se compose d'une chambre principale et de deux chambres de retour. Les poissons qui remontent le courant pénètrent dans les chambres de capture où ils seront piégés et retirés à l'aide d'épuisettes. On rencontre des bordigues dans les lagunes de Tunis, d'Ichkeul (Tinja) et de Biban. Ils servent à la capture des mulets, des dorades, des sparidés, des anguilles, etc. D'autres bordigues ont disparu: dans le lac de Bizerte (1948), de Ghar El Melh (1973) et de Khnis (1990).

Capétchades

Les capétchades sont un engin destiné à la pêche des anguilles. Ce sont des pêcheries fixes spécifiques en forme et en maillage. L'engin représente des barrages à verveux tours et paradières pour barrer le chemin de la migration des anguilles vers la mer. L'élément pêchant (verveux) est composé d'une série de trois nasses imbriquées l'une dans l'autre. Le tour rassemble trois verveux en triangle. L'engin est fixé au fond par des piquets bien enfoncés dans la vase. Il existe encore au lac Ichkeul et à la lagune de Ghar El Melh.

Les filets

Filets droits

Les pêcheurs utilisent un large éventail de filets de pêche aux caractéristiques techniques variables, selon les espèces ciblées (M'rabet, 1997). Ces engins sont constitués par des assemblages de nappes de filets rectangulaires simples (filets maillants) ou de nappes rectangulaires superposées les unes aux autres (filets trémails) ou de nappes combinées de filets maillants et de trémails. Les problèmes que posent actuellement ces types d'engins pour les techniques traditionnelles et pour les ressources sont leur utilisation non raisonnée (longueur importante et maillage non respecté) dans les faibles profondeurs.

Sautade

Cet engin nécessite un travail d'équipe (10 pêcheurs, 2 à 4 barques) et il est utilisé au moment du repos de la *charfia* pour pêcher les muges. C'est une technique pratiquée pour la pêche des poissons sauteurs. Elle est constituée de deux éléments: un filet maillant vertical de 200 m environ, avec lequel on encercle les poissons et l'autre horizontal soutenu à la surface de l'eau par des flotteurs et des roseaux. Lorsque les poissons sont encerclés, ils sont effrayés par les pêcheurs (bâtons et bruitage sur les coques des bateaux). Les poissons finissent par s'emmêler à travers les nappes.

Senne de plage

Le *hlig* est une senne de plage sans poche, confectionnée de filets maillants. Cet engin est mis à l'eau suivant l'observation visuelle des bancs de poissons, sardines, thonines, mulets, saurels, maquereaux et athérines. Il est mis en forme d'arc à partir d'une embarcation, puis il est tiré à force de bras par deux équipes d'hommes au rivage. Cet engin est mis à l'eau. L'usage de cet engin prohibé est limité à la région de Gabès (Romdhane, 1998).

Senne à mugilidés

C'est une technique pratiquée pour la pêche des mulets et qui est en voie de disparition. C'est une senne de plus grande taille (300 m de longueur, sur 3 m de chute). L'opération de pêche débute par la mise à l'eau de la senne sous forme d'un arc; par la suite, une équipe de pêcheurs commence à effrayer les poissons en frappant sur la surface de l'eau à l'aide de bâtons. Les mulets en bancs s'orientent vers les filets où ils se maillent. L'utilisation de cet engin est typiquement limitée à la région de Mahdia.

Senne à coryphène

C'est une technique très pratiquée dans la région et qui dépend des bonnes conditions climatiques. Cette senne encerclante est utilisée pour la pêche de la coryphène. Le poisson est au préalable concentré grâce à un système d'ombrage (DCP en bois et palmes, avec flotteurs et lest). Chaque pêcheur peut aligner de 25 à 120 éléments indépendants, disposés en lignes espacées de 500 à 1 000 m. La présence de poissons peut être évaluée à l'aide d'une ligne à main. La senne (en moyenne 200 m de longueur sur 20 m de chute) est ensuite déployée en cylindres de plus en plus étroits, jusqu'à concentration des poissons au niveau de la poche.

Évolution des techniques de pêche artisanale

L'utilisation des techniques de pêche artisanale devient de plus en plus rare aujourd'hui. Elles sont menacées de disparaître sous l'effet conjugué de plusieurs facteurs, notamment les pressions multiples dont l'impact de la pêche industrielle sur les stocks (chalutage dans le golfe de Gabès, senneurs pour la pêche au thon et utilisation démesurée des filets droits (M'rabet, 1997)). De plus, cette filière de pêche souffre du rendement faible par rapport aux techniques modernes avec une nette chute de rentabilité économique. Les changements des conceptions initiales des *charfias*, des nasses et des pierres creuses sont dus essentiellement à la concurrence des matériaux synthétiques. De plus, l'exode de la population maritime a montré une grande intensification au cours de ces dernières années d'où l'effet négatif sur la filière de pêche côtière (Anonyme, 2011). La législation a contribué indirectement à la disparition de certains engins, notamment la délimitation du domaine public maritime, les implantations d'engins fixes et la prohibition des exploitations familiales sauf dans les îles (Romdhane, 1998).

CONCLUSION

Il est intéressant de remarquer que les préoccupations et les besoins de la communauté de pêche artisanale sont diversifiés. On a constaté ces dernières années l'utilisation clandestine d'engins de pêche prohibés: le mini-chalut monté à bord des unités de pêche côtière et traîné également dans les zones de faibles profondeurs, généralement entre 5 et 15 m (M'rabet, 1995). Cet engin assez destructeur, qui râcle le fond dans des habitats critiques (zones de frayères et de nurseries), est utilisé sur de longues distances dans les zones normalement réservées à la pêche artisanale. De plus, certains facteurs contribuent à la dégradation des écosystèmes marins, notamment la pollution marine qui se traduit surtout par le rejet en mer de plusieurs types de polluants en provenance principalement des industries, de l'agriculture et des agglomérations. De plus, les changements climatiques peuvent affecter de façons différentes la productivité et/ou

la répartition des ressources halieutiques tant dans les eaux marines que dans les eaux continentales aboutissant à la régression de la pêche côtière et artisanale (Cochrane *et al.* 2009 et FAO, 2011). La pêche côtière en Tunisie regroupe plusieurs activités de pêche de grande importance socioéconomique. Elle est classée au premier rang de tout le secteur, compte tenu des emplois qu'elle procure, de la valeur de la production et de la part qu'elle produit destinée à l'exportation. Comparée aux autres types de pêche (surtout le chalutage), cette filière prouve encore son caractère économique et son comportement vis-à-vis de l'environnement. En effet, elle consomme moins de 14 pour cent du carburant utilisé dans le secteur et a un comportement de préservation vis-à-vis de la ressource puique les engins sont en majorité passifs et sélectifs (Anonyme, 2011). Ainsi, il est crucial d'accorder une attention accrue à la sauvegarde et au développement des différentes branches de l'activité de la pêche côtière et artisanale en Tunisie.

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ABSTRACTS

Oral contributions

ÉTUDE SOCIO-ÉCONOMIQUE DE LA PÊCHE CÔTIÈRE ARTISANALE DANS LE GOLFE DE GABÈS

Scander Ben Salem, Adel Gaamour, Mohamed Salah Romdhane and Rafik Ben Charrada

Ce travail s'intègre dans le cadre de l'étude de l'impact de la pêche sur la biodiversité dans le golfe de Gabès qui constitue une composante du projet «protection des ressources marines et côtières du Golfe de Gabès» financé par la banque mondiale (GEF) dont l'objectif est de permettre un développement économique et social basé sur l'exploitation rationnelle et durable des ressources marines et côtières. On s'intéressera à l'analyse sociale et économique de l'activité de la pêche côtière artisanale. Les indicateurs sociaux choisis pour cette étude sont la structure socio-professionnelle, le système de partage des gains, le salaire moyen, la formation professionnelle et la taille des ménages des pêcheurs artisans actifs dans la pêche de capture (unités de pêche), dans les pêcheries fixes ou dans la collecte à pied des palourdes. Pour l'étude économique, nous réaliserons une analyse comparative entre types de pêche à travers les indicateurs économiques suivants: la productivité moyenne par unité (en poids et en valeur), le capital moyen investi, le prix moyen des captures, le résultat brut d'exploitation (RBE) et la valeur ajoutée. En outre, une description des voies de commercialisation par espèce et par type de pêche sera réalisée. Les données de base sont collectées à partir de 445 enquêtes terrains réalisées dans les trois gouvernorats de Sfax, Gabès et Médenine. La méthode d'échantillonnage adoptée est celle stratifiée en prenant comme niveaux de stratification la zone et le type de l'unité de pêche. Le taux d'échantillonnage réalisé est de 5 pour cent pour les barques côtières, 6 pour cent pour les pêcheries fixes, 2,5 pour cent pour la pêche à pied à la palourde et 14 pour cent pour la pêche aux éponges à la plongée. Pour les unités de pêche côtière-artisanale, parmi les 942 personnes questionnées 311 sont des patrons de pêche, 46 mécaniciens et 585 marins. Tous les pêcheurs artisans sont rémunérés à la part. Cette dernière varie selon le poste de travail, elle est d'une part pour les marins, 1,8 parts pour les mécaniciens et 2,8 parts pour les patrons de pêche. Le taux de couverture sociale observé est de 50 pour cent. Nous avons noté un très faible taux de formation professionnelle avec uniquement 5 pour cent des personnes enquêtées. La taille moyenne des ménages est de 6 personnes (légèrement supérieure à la moyenne nationale: 5 individus par ménage) avec un maximum de 14 individus/ménage à Kerkennah. Pour la pêche à pied, parmi les 112 individus échantillonnés, 90 sont de sexe féminin (80 pour cent). Le taux de couverture sociale (5 pour cent) est le plus faible parmi tous les pêcheurs du golfe de Gabès. En outre nous avons enregistré le plus faible taux d'instruction (50 pour cent). Ceci dénote d'une quasi-absence d'encadrement et de soutien pour la population de femmes collectrices de palourdes dans le golfe de Gabès. Concernant la productivité en poids et en valeur (revenu brut) nous notons une variabilité entre types de pêche et zones de pêche. Mais globalement, les unités côtières artisanales motorisées sont les plus performantes en termes de productivité par rapport aux autres types d'unités de pêche, et ce, dans toutes les zones du golfe de Gabès. Les prix moyens les plus élevés sont obtenus par les unités motorisées de Djerba et de Zarzis, en raison de leur proximité à la zone touristique la plus importante en Tunisie (Zone Djerba-Zarzis).

Concernant le salaire moyen, le fait marquant est que les unités non motorisées des zones de Zarzis et de Kerkennah ont devancé tous les autres types de pêche. Ces zones sont les lieux d'abondance de poulpe et de seiche et, puisque les unités non motorisées utilisent en moyenne moins de main d'œuvre et consomment moins de charges, le salaire moyen est par conséquent plus élevé. En termes de résultat économique exprimé par le RBE, ce dernier a été positif pour toutes les catégories de pêche, sauf pour les unités (motorisées et non motorisées) de la zone de Skhira/Mahares. Il est important de noter également les performances exceptionnelles des unités non motorisées des zones de Zarzis et de Kerkennah qui sont parvenues à réaliser des résultats supérieurs à ceux des unités motorisées actives dans tous les ports de la zone d'étude. Ainsi, ces segments ont démontré une meilleure efficacité d'utilisation du capital et de la main d'œuvre que tous les autres types de pêche.

ECONOMIC PERFORMANCE OF SMALL-SCALE FISHERIES VERSUS ACTIVE GEAR: THE ALBANIAN CASE STUDY

Patriot Cobaj, Mimoza Cobani, Dario Pinello, Enrico Arneri and Nicoletta Milone

Small-scale fisheries in Albania have developed remarkably since the 1990s as an alternative way to unemployment and low income in coastal areas. More than 50 percent of the artisanal fishing vessels in the country account for polyvalent passive gear and the remaining for polyvalent gear. Artisanal vessels play an essential social role as a labour generator and as a source of primary income in Albanian fishing communities, while trawlers are a fundamental economic segment generally ensuring relatively high output in terms of production and gross income. In this study, the performance of small-scale fisheries *versus* active gear is analyzed. A broad set of economic indicators is estimated for the fishing fleet operating in Albania in 2012, based on data obtained from a sample survey based on direct interviews with fishers. Artisanal and trawlers were the most representative segments of the study fleet. Considering the artisanal and the trawlers segments together, the two groups of vessels were generally performing adequately, although not all the performance indicators showed a profitability. The outcomes of the survey underlined the importance of these fisheries in the country and could be considered a reference background point for decision-makers for any management strategies to be taken for the development of small-scale fisheries in Albania.

SMALL-SCALE FISHERIES IN THE ADRIATIC SEA: INFORMATION GAPS AT THE BIOLOGICAL, SOCIO-ECONOMIC AND ENVIRONMENTAL LEVEL

Mimoza Cobani, Branko Dragičević, Jakov Dulčić, Monica Gambino,Otello Giovanardi, Fabio Grati, Robert Grgičević, Zdravko Ikica, Aleksandar Joksimovic, Jerina Kolitari, Miro Kraljević, Bojan Marčeta, Sanja Matić-Skoko, Armin Pallaoro, Nika Stagličić, Jernej Švab, Pero Tutman, Nedo Vrgoć, Enrico Arneri, Luca Ceriola and Nicoletta Milone

Small-scale fisheries (SSFs) are a prismatic and dynamic sector the characteristics of which vary from one location to another. It tends to be strongly anchored in local communities reflecting their traditions and values. In the Adriatic Sea, a wide range of small-scale fisheries are engaged in various sets of gear fisheries over the year. SSFs in the region target a pool of species using a high number of fishing methods mainly depending on season (e.g. only in Croatia a total of 55 different fishing gear are officially listed and currently used). Many small-scale fisheries are effectively unregulated, unreported and poorly monitored. Within the framework of the Working Group on Small-scale fisheries in the Adriatic Sea of the FAO AdriaMed project, the major knowledge gaps and priorities for the small-scale fisheries sector in the Adriatic

have been identified. The lack of appropriate and complete statistics is one of the main constraints identified for most of the Adriatic coastal countries (few countries have in place routinely monitoring programmes while others are dealing mostly with estimates). Moreover, when dealing with data requirements, the social and economic component of small-scale fisheries should be addressed; in particular basic data on level of employment, catch quantity and value, fleet composition, fishing season, area and, ideally, on by-catch should be collected. In the Adriatic context, when dealing with shared stocks and subregional management processes, attention should also be paid at national management plans to tackle issues like territorial access rights. Adriatic SSF management processes strongly require the harmonization of the information available, data collection and data requirements. The management of SSFs in the subregion has often been targeted to fishing gear, whereas individual species are caught with a variety of gear types; thus any future management indication needs to be based on all gear types used. The full participation of fishing communities in decisions on the sustainable use of natural resources should be facilitated and monitoring and surveillance through innovative approaches to marine conservation (co-management) should be considered. The outcomes of the discussion held among Adriatic experts on SSFs have provided a background for a wider discussion on perspectives and sustainable development of SSFs at the Mediterranean level taking into account the FAO principles defined by in the International Guidelines on Securing Sustainable Small-Scale Fisheries.

CHARACTERISTICS OF MALTESE SMALL-SCALE FISHERIES

Martin Nicholas Flores, Roberta Mifsud, Mark Gatt, Reno Micallef, Eric Muscat and Marie Louise Pace

The Maltese fishery is a relatively small industry of a typically Mediterranean artisanal type, and it is frequently described as multi-species and multi-gear fisheries, with the majority of the fishermen switching from one gear to another several times throughout the year. The Maltese fleet as at 31 December 2012 consisted of 1 041 professional vessels of which 39 percent were professional full-time and 61 percent were professional part-time vessels. A good 92 percent (960 vessels) of the professional vessels are less than 12 metres in length overall and more than half of them are of a traditional design, mainly Luzzu and Kajjik and these operate mainly in coastal waters. By far, the most popular gear used by the Maltese fishing fleet, in terms of number of boats having specific registered gear, are various forms of hooks-and-lines (60 percent). Different types of gillnets and entangling nets are also popular (20 percent), whilst traps form over 10 percent of the registered main gear. The most prevalent method of fishing is set bottom longlining, followed by trammel netting, which is practiced by 27 percent of the fishers, principally those operating smaller craft. Several species are targeted by the Maltese fishing fleet including the three main target species in Malta *(Thunnus thynnus, Xiphias gladius and Coryphaena hippurus)*, demersal species and to a lesser extent pelagic species. Fishing activity and catches of these species very much depend on the season, mainly due to weather conditions as well as fishing seasons governed by local and international regulations.

AMÉLIORATION DU SYSTÈME STATISTIQUE DE LA PÊCHE ARTISANALE

Inès Ben Hafsia

La pêche artisanale (dite «côtière») en Tunisie se place au premier rang dans l'employabilité du secteur de la pêche avec une population maritime d'environ 33 500 marins exploitant près de 10 500 unités de pêche à majorité sans moteurs. Elle participe avec plus de 25 pour cent des captures et 38 pour cent en valeur des produits de pêche. Néanmoins, ses caractéristiques et ses données de base font défaut en raison de la non-adéquation du système actuel de collecte des données statistiques. Ainsi, un projet pilote SSPAT a été réalisé au niveau du gouvernorat de Monastir durant la période octobre 2011-mai 2012 avec l'appui technique et financier du Bureau sous-régional de la FAO à Tunis. Compte tenu des résultats concluants de la phase pilote du projet SSPAT et de l'approche par échantillonnage pour le suivi statistique de la pêche côtière avec intégration de l'aspect socio-économique de cette activité, un projet d'extension de la dite phase sur tout le littoral tunisien a été préconisé. L'objectif global de ce projet est: - l'amélioration de la performance de la base de données sur la pêche artisanale/côtière pour diverses applications statistiques; - le développement et la mise en place d'un système informatique pour l'échange, l'analyse et le traitement des données statistiques de la pêche; - la consolidation et l'amélioration des revenus des pêcheurs artisans; - l'aide à l'élaboration de plans d'action pour une gestion durable des pêcheries artisanales.

THE SOCIO-ECONOMIC SITUATION OF THE SMALL-SCALE FISHERY IN LEBANON

Samir Majdalani, Dahej El Mokdad, Dario Pinello, Mark Dimech and Constantina Riga

The Lebanese fishing fleet is the only fleet in the Mediterranean which is completely made up of small-scale fisheries. However, since the fishery is extremely small it has been neglected as opposed to other agricultural sectors. Apart from that, the sector has suffered enormously from the effects of war in 2006, both directly as a result of Israeli hostile actions and indirectly from the loss of income caused by the conflict and its after effects. In this study, we investigated the socio-economic circumstances of the Lebanese fishing and tried to point out the main difficulties experienced by the small-scale fishery in Lebanon, followed by suggestions on how it can be improved. In fact, this was the first countrywide socio-economic study ever undertaken. A questionnaire survey was conducted in order to investigate the main socio-economic characteristics of the fishing vessels, by interviewing the vessel owners or skippers. In total, 389 owners/skippers were interviewed which represented 27 percent of the total fleet. The results showed that the small-scale fleet was making a profit of 24 percent which is comparable to other Mediterranean countries. The average price per kg of the production in Lebanon was 5.6 USD, which is relatively high compared to the European prices (6.1 USD /kg). However, the revenue of the fleet provided an annual salary of about 3 000 USD per fisher to about 3 229 fishers. Considering that about 45 percent of the fishers are also owners, their revenue also included the net profit and which, on average, was 4 400 USD per vessel per year. This resulted in an overall gross income of 7 400 USD per fisher who is also an owner (fisher-owner). The GDP per capita is 9 904 USD and the income per fisher-owner is about 20 percent lower than the national GDP per capita. However, a fisher who is not an owner earns about 70 percent less than the GDP per capita. The minimum annual wage in Lebanon is about 5 400 USD, so a fisher who is not an owner earns about 45 percent less than the minimum wage. Social security, social costs and pension contributions, are practically non-existent. One has also to consider that the salary is also biased since it does not

include any social contributions that are a form of deferred compensation. This is important in order to have a retirement plan, which is an arrangement to provide fishers with an income during retirement when they are no longer earning a steady income from the fishing activity. The results show that the fishing communities in Lebanon are considerably poor, and that they don not pay any social security for pensions. Appropriate action should be taken in order to improve the livelihood conditions of this part of society. The study suggests several ways on how the incomes of the Lebanese fishers could be increased, from the social, economic and the efficient harvesting of the resources. The suggestions include the exploration of the possibility to support the fishers through social security contributions, to increase the added value of the product, to increase the quantity of production by adjusting the fishing effort in order to fish at the maximum sustainable yield (MSY) or one of its proxies, to test the possibility to use alternative fishing techniques and to explore the possibility of shifting part of the fleet to new fishing grounds, in deeper and/or offshore waters, in order to put new unexploited species on the market and to reduce the present high pressure on coastal resources.

PÊCHE ARTISANALE EN MÉDITERRANÉE MAROCAINE, UN SECTEUR EN PLEIN ESSOR ET UN INTÉRÊT SCIENTIFIQUE DE PLUS EN PLUS IMPORTANT

Mohammed Malouli Idrissi and Abdelmalek Faraj

La pêche artisanale en Méditerranée marocaine présente un grand potentiel halieutique, avec une production d'environ 7 000 tonnes réalisée par 2 650 barques et composée principalement d'espèces à haute valeur commerciale destinées à plus de 50 percent vers l'exportation. Sur le plan scientifique, cette activité suscite un intérêt particulier tant pour les aspects socioéconomiques que pour les aspects bioécologiques. L'Institut national de recherche halieutique (INRH) suit de près ce secteur, surtout pour accompagner les diverses actions de développement menées par le Département des pêches maritimes. En raison de l'absence d'un système régulier de collecte de données, l'INRH a pour grand défi de collecter les informations nécessaires pour répondre à deux questions cruciales pour le futur de ce secteur, à savoir: (1) Quelle est la place de la pêche artisanale dans le secteur productif de pêche dans sa globalité? et (2) Coment évaluer l'impact de l'activité de la pêche artisanale sur les ressources halieutiques méditerranéennes ? Un autre axe sera analysé en s'inspirant de l'expérience de l'Atlantique marocain. Il s'agit d'une pêche artisanale qui utilise des petits moyens traditionnels pour servir une grande industrie en amont, ce qui peut présenter une pression et un danger sur les ressources.

A STANDARD METHODOLOGY TO COLLECT SOCIO-ECONOMIC DATA IN THE EASTERN MEDITERRANEAN: EXPERIENCE FROM EGYPT, GAZA STRIP, LEBANON AND TURKEY

Dario Pinello and Mark Dimech

Within the context of the Ecosystem Approach to Fisheries (EAF), socio-economic information is extremely important in order to provide fisheries managers with scientific advice on the socio-economic context of the fisheries. In this respect, in recent years socio-economic data have been collected in several parts of the world. Apart from the methodologies of the European Commission Data Collection Framework (DCF), at present there is no standard methodology to collect socio-economic data in the Mediterranean. In this paper, we propose a standard methodology to collect socio-economic data in the Mediterranean based on the experience gathered in four different countries in the Eastern Mediterranean. The methodology is based on a statistical design, where the licensed fishing fleet for the reference year is taken as the population

and the data, refer to the year n-1. Thus, during 2013 the data for 2012 was collected. The sampling unit was the single licensed fishing vessel and it was based on a stratified random sampling without replacement. Sampling is stratified due to the fact that the fishing vessels of the fleet are divided into homogenous groups or segments based on suitable variables. Independent samples are then taken from each of these segments. Following this process, each sampling unit is chosen so that each sampling unit has the same probability of being chosen during the sampling process and avoiding the possibility to be chosen more than once. The sample size was determined in order to have a large sample and to minimize as much as possible the variance. Since in all the countries such a survey was convened for the first time, the appropriate sample size could not be determined a priori, and hence a coverage rate from 15–50 percent was used depending on the number of vessels in each fleet segment. The stratification was according to the GFCM task I fleet segmentation which is based on the technical and dimensional characteristics of the vessels. The statistical design was the most important step in order to maintain a standard methodology in all the areas sampled. Following that a questionnaire was designed to evaluate the socio-economic circumstances (costs and revenue) and activity of fishing vessels. The selected vessels were surveyed by means of direct interviews and the technical data on the fleet, such as vessel length, weight and power, age, and demographic data on vessel owners were obtained from the respective fisheries department. The socio-economic variables were the ones defined in the GFCM task I, however some additional variables were also collected which were specific to the area. The quality of the data was assessed using the coefficient of variation and modified for small populations. The methodology was successfully used in all the areas, where in general the data gathered had a low coefficient of variation which shows that the statistical quality of the data was extremely good.

Posters

LA PÊCHE RESPONSABLE ASSURE LE FUTUR

Mohamed El Andalossi

Le respect des lois de la pêche garantit la préservation des ressources halieutiques, la sécurité alimentaire, des postes de travail et un développement économique durable. Les filets maillant dérivants utilisés par de la flotte marocaine en Méditerranée et dans les eaux atlantiques adjacentes ont provoqué la disparition d'un nombre incalculable d'espèces marines non ciblés (tortues marines, dauphins, cétacés, poisson lune, etc.). Le chalutage illégal en eaux peu profondes est la cause principale du déclin de population de poissons et de la destruction des écosystèmes marins.

LA TRANSFORMATION DES CHARFIAS ET SON IMPACT SUR L'ÉCOSYSTÈME MARIN

Hichem Kacem and Lassaf Neifar

Les *charfias* sont des engins de pêche passifs dont le principe consiste à intercepter les poissons au cours de leur déplacement, au moyen de palissages en branches de palmier, et à les diriger vers des chambres de capture se terminant par des nasses. Ces engins de pêche traditionnels sont utilisés dans le golfe de Gabès et particulièrement dans les îles Kerkennah, à Chebba et à Djerba. Ils sont calés dans une zone de hauts fonds où l'amplitude des marées est importante (Sellemi *et al.,* 1994). L'implantation des *charfias* se faisait à partir de l'automne (septembre–octobre) jusqu'au début de l'été (juin–juillet). Actuellement, cette pêcherie fixe est sujette à une profonde transformation au niveau de sa structure. Les sous-produits du palmier dattier qui formaient la presque totalité de la structure de la *charfia* sont remplacés par d'autres produits tels que le polyamide, l'acier et le PVC. Des observations effectuées à Kerkennah (34°45'N, 11°17'E) et Chebba (34°14'N, 11°06'E) et ont été menées sur deux types de *charfias*, l'une construite à partir des sous-produits de palmiers dattier et l'autre bâtie à partir de produits synthétiques (polyamide, PVC) et de matériaux ferreux. Cette étude révèle que les oeufs de seiche *Sepia officinalis* et de poulpe *Octopus vulgaris* qui sont fixés sur les feuilles de palmiers restent humectés lors de la basse marée. Par contre, ils sont déshydratés lorsqu'ils sont fixés sur les filets polyamide des *charfias* transformées. De plus, les résultats obtenus montrent que les feuilles de palmiers forment un microhabitat pour plusieurs épibiontes faisant partie du régime alimentaire de nombreuses espèces de poissons. Les *charfias* traditionnelles sont démantelées au cours des mois de l'été, période de repos biologique crucial, pour préserver et renouveler les stocks (Rhouma et Labidi, 2006) alors que les nouveaux matériaux utilisés dans les *charfias* transformées permettent de les garder sur place deux à trois ans de suite. Le mollusque exotique *Pinctada radiata*, considéré comme l'une des pires espèces invasives de Méditerranée (Treftaris et Zenetos, 2006), trouve en effet un support idéal pour se fixer sur les filets des *charfias* transformées. En revanche, la prolifération de cette espèce est limitée sur les feuilles de palmiers du fait qu'elles ne représentent pas un support adéquat pour leurs fixations sur les folioles puisque les individus accrochés finissent par tomber sous l'action de leur propre poids sur les fonds de mer pour être capturés par les poulpes.

DEVELOPING AND ADOPTING THE NATIONAL REPORTING SYSTEM FOR ARTISANAL FISHERIES IN LEBANON FLOUCA WEB

Manal R. Nader, Shadi El Indary and Constantine Stamatopoulos

In Lebanon, fisheries are artisanal in nature with the country's coastal sea comprising 1 685 fauna species, 50 of which are fish of commercial importance. The legal framework of the sector suffers from an outdated fishing law (No. 2775) that was enacted in 1929, while a new updated law was drafted and is currently pending at the Lebanese Parliament. In addition, the overlapping mandates of national authorities and the severe stress on the coastal marine environment from sea filling, destruction of habitats, land-based pollutants, global warming and invasive species are leading to a decrease in fish catch. The sector also suffers from irregular data collection adding to the difficulty of establishing management plans for sustainable fishing practices. The Marine resources and coastal zone management programme (MRCZM) at the Institute of the environment (IOE) at the University of Balamand (UOB) initiated a data collection programme of commercial fisheries that has been ongoing since 2005. Information about effort, fishing gear, species, quantity, price and size is collected on a weekly basis for 88 commercial species from the four major ports in North Lebanon covering 45 percent of the Lebanese coastline. Gathered information is entered in the FLOUCA utility (Fish landing operational utility for catch assessment) allowing the generation of monthly and yearly trends of catch, catch per unit effort (CPUE), and average price for the monitored species. Currently, FLOUCA is being expanded into FLOUCA Web through a collaborative activity between the FAO EastMed project, the IOE-UOB and the Ministry of Agriculture (MoA) to cover the whole Lebanese coastline. This entailed the training of the m rangers and staff on FLOUCA Web that included the updated catch/effort and vessel registration forms, and field data collection, entry and reporting. The FLOUCA Web system handles catch/effort data to regularly produce monthly and yearly estimates on catch, fishing effort, prices, values and average fish size on a national scale. FLOUCA Web operates as an internet-driven system with outposts at selected major ports of the Lebanese coastline. Data input and estimations are performed locally but are visible throughout the network. It also offers a wide variety of statistical diagnostics that are in line with the latest requirements demanded by regional and international fisheries bodies (specifically FAO and GFCM Task 1). FLOUCA Web will be delivered to the MoA to act as the fisheries national reporting system. The country of Lebanon will therefore possess for the first time a system to report on its fisheries sector according to FAO and GFCM Task 1 requirements and will have trend, empirical datasets to enact appropriate management plans.

HOW DOES AN OUTNUMBERED SMALL-SCALE FLEET PERFORM? THE CASE IN EGYPT

Dario Pinello, Alaa El Haweet, Atif Salah, Mark Dimech and Constantina Riga

The backbone of the Egyptian fishing fleet in the Mediterranean is made up of trawlers and small-scale fisheries are a minority accounting for 20 percent of the fleet in terms of number of vessels and 4 percent in terms of tonnage. Actually, there is an inverted pyramid in the structure of the Egyptian fleet where the big vessels, mostly trawlers, make up the largest part of the fleet as opposed to the small-scale fishing vessels. Being outnumbered in a sea of larger vessels, the small-scale fisheries experience all types of competition. The larger vessels including trawlers do not have any restriction in fishing grounds, and can fish at all depths and as close to the coast as they can. Since the area off the Nile delta is characterized by shallow water muddy bottoms, without rocky areas, trawl activities are practically conducted everywhere thus limiting the area that the small-scale and passive gear fishery can exploit without the influence of trawlers.

This often results in conflicts with the small-scale fisheries, where for example they can easily loose fishing gear due to considerable trawling activities. The competition and conflicts between the trawl and small-scale fishers and the dominance of the larger vessels by time could have led to the inverted pyramid structure of the Egyptian fleet. One other restricting factor for the small-scale fleet is that the shelf area around the Nile delta is extremely large so deep waters are relatively far away from the port, so that deep water demersal resources and large pelagic species are not easily accessible by the small-scale fisheries. In this study, we compare the economic performance of the small-scale fleet with the average values of the fishery in Egypt. The data for this study was gathered through a questionnaire survey in order to investigate the main socio-economic characteristics of the fishing vessels, by interviewing the owner or skipper. Mean socio-economic indicators by vessel were then calculated for the small-scale fleet and the total fleet. The indicators included the return on investment, salary per crew, revenue per crew member, landings per crew, fuel consumption per crew, profit as percentage of gross revenue, gross cash flow as a percentage of revenue, capacity utilisation. From the results of the questionnaire survey the fishing vessels less than 6 m are not active in the Mediterranean and mostly fish in the lagoons and canals. In this respect only the small-scale fishery vessels between 6–12 m were considered in the analysis, which in effect constitutes the bulk of the Egyptian small-scale fishery in the Mediterranean Sea. On a daily basis, the vessels generated revenue of 211 USD, sustained 141 USD of operating costs and gained a net profit of 59 USD. The salary per crew member was 17 USD per day. Considering the social pattern of the fishery and its very artisanal nature, where normally more members of the same family are directly involved in the onboard activity, the vessels tend to operate more as a single economic unit. The salary per crew and the profit are therefore a figurative value that would likely be additive. In economic terms the small-scale vessels performed quite well when compared to the other fleet segments, having the highest return on investment (ROI) and net profit against gross revenues. The salary per fisher per day was also comparable to the larger vessels.

Source: Artisanal boats in Lipari Island, Italy ©Nicolò Tonachella.

Thematic Session II

Management and co-management options for small-scale fisheries in the Mediterranean and Black Sea

Source: A fisherman with a bucket of fish ©FAO/Abdelhak Senna.

BACKGROUND DOCUMENT

Management and co-management options for small-scale fisheries in the Mediterranean and Black Sea

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INTRODUCTION

1. Management and co-management: actual co-management versus participatory advisory schemes

1.1. Definition of co-management

Traditional and self-management of natural resources, and fisheries in particular, has been around since early times. However, co-management is an approach that has been more recently adopted globally in response to the perceived failure of centralised management of fisheries in avoiding the decline of fish stocks, and to a lack of government resources to manage fishery resources effectively. Although co-management brings together managers, fishers, and other fishery stakeholders, processes and structures differ in terms of the nature of power sharing, functions and compositions.

Although there is no single globally accepted definition of co-management (Armitage *et al.*, 2007; Berkes, 2007), the term usually refers to a suite of arrangements with different degrees of power sharing allowing joint decision-making by the state and user groups about a set of resources or an area. Co-management shares many features with other kinds of partnerships and cooperative environmental governance arrangements involving multiple actors (Berkes, 2002; Plummer and FitzGibbon, 2004). However, a critical characteristic of co-management is the presence of at least one strong vertical link between the community or user group and the government, including formal arrangements for sharing responsibilities and authority (Berkes, 2002; Borrini-Feyerabend *et al.*, 2009). In addition, ad hoc public participation in management decisions or mere consultation is often not regarded as co-management.

The term co-management is relatively recent, where its earliest use has been traced to late 1970s (Pinkerton, 2003). However, as mentioned previously, the practice of power sharing in resources management goes back to earlier times (Ostrom, 1990). Most definitions of co-management entail some institutionalized arrangement for user participation in management and decision-making, a dynamic partnership using the aptitudes and interests of local communities and fishers, supplemented by the capacity of the state to provide enabling policies and legislation as well as enforcement and other assistance.

- Co-management refers to a suite of arrangements with different degrees of power sharing allowing joint decision-making by the state and user groups about a set of resources or an area.
- Co-management entails institutionalized arrangements for user participation in management and decision-making.
- Ad hoc public participation in management decisions or mere consultation is often not regarded as co-management

1.2. Types of co-management

Despite the inclusiveness of the co-management term, it can be defined as the sharing of responsibility and/or authority between the government and local users to manage a particular resource (Jentoft, 1989; Nielsen *et al.*, 2004). In the literature, co-management covers a broad spectrum of management arrangements and the amount of responsibility and/or authority that the government and local resource users have will differ and depend upon country- and site-specific conditions (Pomeroy, 1995). A certain level of involvement and mode of communication between government and fishers is needed to categorize a fishery as co-managed, as well as the presence of well-established co-management organizations and/or institutions with decision power in local fisheries management. Further, considering that most fisheries management systems, particularly in developed countries, involve some form of user involvement through participation of stakeholders on the decision-making bodies (e.g., through consultative committees), those cases where the importance of the legal and political systems dominates the co-management aspects of the fisheries are often excluded from this categorization (Gutiérrez *et al.*, 2011).

As several authors have noted, there are different degrees of co-management (Sen and Nielsen, 1996; Berkes, 2007; Castilla and Defeo, 2001). Within an instructive type of management arrangement, there is limited exchange of information between government and users and it only differs from centralized management by the existence of mechanisms for dialogue with resource users. A consultative type of management arrangement exists when mechanisms for consultation between government and users have been established but where decisions are still taken by government. These two types of management arrangements cannot be considered true co-management. On the other hand, cooperative types are closer to a true definition of co-management, which involves arrangements where governments and users co-operate on an equal basis in management and decision-making. Advisory co-management arrangements are those where the users advise government of decisions to be taken and government endorses them. Informative co-management occurs when government has delegated responsibility to user groups who are responsible for informing government of their decisions. Finally, self-governance, such as community-based management or traditional marine tenure systems, entails a total power devolution from the central government to the local users. Although some authors exclude community-based management or self-governance from the concept of co-management, others argue the contrary since these arrangements are recognised in national legislation or they form part of sectorial development policies (Gutiérrez *et al.,* 2011 and references therein).

It is important to bear in mind that this typology is just a simplification of very complex management and governance structures. There is a variety of responsibilities that can be co-managed under a different type of arrangement at different stages in the process. Thus, co-management covers a broad spectrum of potential collaborative decision-making between government and communities or user groups.

- There are three main typologies of co-management with different levels of involvement in management and decision-making: cooperative, advisory, and informative
- Self-management or community-based management can be considered a form of co-management since these arrangements are often part of sectorial development policies and/or legal frameworks

1.3. Actual co-management (executive role of stakeholders) versus participative advisory schemes

Co-management is becoming increasingly important in contemporary fisheries management. As mentioned in previous section, co-management describes power and responsibility sharing agreements that are made between government and user groups. Co-management that involves true power-sharing and joint responsibilities between user groups and central government is sometimes difficult to achieve in a setting where stakeholders are polarized and or not encouraged to participate in the process actively. In fact, participation can happen at many different levels of inclusion. At a basic level, participation can be passive consultation where information is propagated and those impacted are informed of future plans (Pomeroy and Berkes, 1997). However, effective participation of main stakeholders requires a certain level of empowerment. In fact, Jentoft (2004), defines empowerment as "a process through which people become strong enough to participate within, share in the control of and influence, events and institutions affecting their lives".

True co-management requires a departure from thinking about the role of local, regional and federal governments and considers the political changes that are necessary for power devolution. An important concept behind power devolution and executive role of stakeholders is actually defining who are those relevant stakeholders. The popular term "stakeholder" encompasses all sorts of professions and groups, besides fishers, who may possibly have an economic or cultural interest in fisheries, many of whom do not reside in geographically defined fishing communities. Environmentalists, processors and shippers among others might therefore be considered as stakeholders in the general sense of the term. Local fisheries management, however, requires considering local fishing communities and the fishers themselves as legitimate stakeholders. In general, a lack of representativeness of decentralized bodies and institutions usually precludes accountability goals.

Local engagement in management and fishers' participation in the decision-making is then an essential component of successful co-management. Certainly, there are many possible procedures that could lead to a successful co-management outcome that incorporates both biological and social concerns, and is considered legitimate by user groups. However, an essential component that all of these must contain is direct local community involvement. Thus, it is not only critical to characterize the most relevant stakeholders but also to clearly define local communities in geographic terms (Pinkerton 1999). Local ownership and control, when embedded into a system of institutions that delegate power and are truly interactive, may be a key principle in facilitating successful co-management (Ostrom, 1990, Pinkerton and John, 2008).

For example, most fisheries in the United States (US) under the Fishery Management Council systems have a formal consultation process with stakeholders at several stages of the decision-making process. In fact such consultation is found in fisheries throughout the developed world. The US council system is unique (compared to Europe, Canada, Australia and New Zealand) in that some stakeholders sit on the councils. However, these systems remain effectively top down managed, with the US laws and the courts often being the dominant determinant of fisheries management actions. The US councils also manage many fisheries, and it would often be the case

that only one or two stakeholders from an individual fishery would be represented on the council. Thus, the US council system is not true co-management although some exceptions prevail.

- Effective participation of main stakeholders in co-management requires certain level of empowerment.
- True co-management requires a departure from thinking about the role of local, regional and federal governments and considers the political changes that are necessary for power devolution.
- Local engagement, ownership and control, when embedded into a system of institutions that delegate power and are truly interactive, is a key principle in facilitating successful co-management.
- Co-management arrangements must go beyond consultation by redirecting social and economic benefits from the fishery back into communities. Unless geographically defined communities are allowed to share power and responsibility with government managers, both fish stocks and fishing as a way of life could be at risk.

2. Overview of traditional fisheries management in the region

2.1. Traditional schemes involving self-management

Attempts at managing European fisheries are ancient. Mediaeval Europeans consumed high quantities of fish thus the need to manage fisheries comes from ancient times (Arlinghaus *et al.*, 2002; 2007). By the eighteenth century, legislators and managers already acknowledged the problems associated with overfishing at the same time that anthropogenic impacts on habitats were also affecting fishery resources and yields (Hoffmann, 1996). Between 1200 and 1400, Europeans became aware of shifts in the availability and the exhaustibility of fishery resources, stimulating the evolution of fisheries management. By then, fishermen were often grouped into guilds, which were in charge of exploiting and managing the resources at the local level. However, public authorities such as kings and lords undertook regulation of fisheries for both consumption and conservation purposes. The first fisheries laws in Europe came into effect during the thirteenth century and considered the size of fish caught and both gear and temporal restrictions and closures. This simple fisheries management worked until the industrial revolution in the late 1800s which allowed rapid expansion of exploitation for an ever-growing market.

In other parts of the world, such as Hawaii and Florida, US, a study by McClenachan and Kittinger (2012) has shown that fisheries management four centuries prior to the arrival of Europeans was characterized by adaptive management with characteristics of common property resource governance systems. These management systems involved protected areas of the coral reefs, protection of vulnerable life-history stages of fish as well as species with high susceptibilities to overfishing. The authors also demonstrate that fisheries management and governance included strategies and social institutions to support resources allocations among community members and strict enforcement by a local rule-making authority. This form of self-management has allowed these coastal communities to manage their resources sustainably for centuries.

More recently, there are many examples of self-governance or sharing mechanisms for the management of natural resources, including government-community partnerships for forest management in the Kumaon Himalayas, India, around the 1900s (Agrawal, 2005), and in the council forests of Kirinyaga, Kenya, around the 1930s (Castro and Nielsen, 2001). In the area of fisheries, the earliest documented legal arrangement seems to be the Lofoten Islands cod fishery in Norway in the 1890s

(Jentoft and McCay, 1995), and Japanese inshore fisheries under Japan's 1901 Fisheries Act and its subsequent revisions (Lim *et al*., 1995). The early literature depicted co-management as a class of relatively simple partnership arrangements, for example, in the implementation of indigenous land and resource claims (Berkes *et al*., 2009 and references therein). However, the extensive range of experience accruing since the 1980s indicates that co-management has become more multifaceted and dynamic than concluded from earlier literature (Plummer and Armitage, 2007).

For example, until the 1920s, fishing communities in Kenya used traditional ecological knowledge (TEK) and social norms to define the rules for resource management and governance. Traditionally, an elder was the leader of a landing site and provided advice about seasonality, issuing permission to fishers from other areas, ensuring social cohesion, and restricting specific fishing gear. Local social structures were used to enforce such rules or to impose sanctions when needed. After independence, the state took of the management of fishery resources and these management decisions were subsequently prescribed with little or no input from the fishers and other stakeholders resulting in negative consequences for the sustainability of the resource and the economic viability of the fishery (Berkes *et al*., 2000). Other examples include the Native American communities in the US Pacific Northwest (Hanna, 2003), the Eastern Indonesian "*Sasi*" system (Bailey and Zerner, 1991), and the inshore northern cod fisheries of Newfoundland (Kearney *et al.*, 2007). While some commercial exchange was associated with these systems, they were for the most part artisanal, subsistence fisheries, which were either ignored or legislated away by governments during the emergence of industrial fisheries.

Many traditional, pre-industrial fisheries were also managed under some kind of self- or cooperative management involving different local actors. In less developed nations, fishing communities often controlled access to the fishery resource, mostly through the use of some sort of access rights (e.g., territorial use rights or TURFs). These community-based management systems often involved elaborated social customs and regulations at the local level aimed at controlling effort and/or limit harvests (Ruddle and Johannes, 1985). Under such systems, and given the technological limitations of fishing, control over access to fishery resources was mostly in the hands of those most directly dependent upon them. In these communities, self-regulatory measures were mostly used to manage their resources sustainably. In fact, many pre-industrial fishery-based communities embraced cooperative management of some kind.

- Self-governance and sharing mechanisms for the management of natural resources, including government–community partnerships in forest and fisheries were common since mediaeval times.
- In Kenya for example, fishing communities used traditional ecological knowledge (TEK) and social norms to define the rules for resource management and governance since the 1900.

2.2. Transfer of management responsibility from primary stakeholders to centralized State agencies in modern times

Many of the traditional access systems described in the previous section changed drastically after industrialization in the 1970s, when government policies in most developed countries were directed towards centralization of management functions and scientific advice. In many less-developed nations, governments looking for foreign exchange capital have entered into joint venture agreements with distant water fishing companies who have moved their operations inshore and forced community-based fishers to move from their traditional grounds, or reduced stocks and obliged them to fish harder and farther offshore to meet their domestic needs (Parfit, 1995).

These conditions led to conflicts between stakeholders to the detriment of effective management of fishery resources. In addition, the lack of proper management and enforcement of regulations in these centralized systems led to the depletion of many coastal resources. For example, decades of top-down management with little or no enforcement led to a virtual collapse of many inland fisheries as well as severely depleted artisanal coral reef fisheries in Kenya (McClanahan et al., 2008). Likewise, while traditional or local community-based management systems have a long history of existence in Southeast Asia, the majority of these systems have been weakened or have disappeared, due partly to institutional restructuring under colonial administrations, technological modernization, the rise of the nation-state, and socio-economic stratification and unequal concentration of power and wealth within coastal communities.

- By the 1970s, many of the traditional access systems changed drastically after industrialization, when government policies in most developed countries were directed towards centralization of management functions and scientific advice.

2.3. Contemporary schemes including co-management elements (e.g., Cofradias, Prud'Hommies)

By the late 1980s, a general disillusionment of stakeholders, development agencies and academics in the ability of centralized governments to plan, administer and implement development (Manor, 1999) created the right incentives to move towards decentralization. In fact, community-based cooperative management has often arisen out of crises caused by stock depletion, a growing perception that central governments are incapable of managing stocks centrally, and political pressure stemming from an increasing sense of alienation amongst coastal communities toward their governments. Hence, decentralization, stakeholder participation and community involvement came to be considered as essential components of development and management.

The logic of this new thinking was based on bringing government closer to the users allowing the people whose livelihoods and well-being would be affected by the decisions to have a say in those decisions. Effective user participation and problem solving at the lowest feasible level of organization was considered within the "subsidiarity principle" (Kooiman, 2003) as part of "good governance"; advocated by Agenda 21 of Rio (UNCED, 1992). This subsidiarity principle was incorporated into Article A of the Maastricht Treaty of 1992 establishing the European Community, such that "decisions are to be taken as closely as possible to the citizen" (McCay and Jentoft, 1996). Hence, by the 1990s, the governance focus had shifted to the local level, with almost all developing countries undertaking decentralization reforms (Ribot, 2002). For example in 1991 the government of the Philippines implemented the Local Government Code (LGC) providing policy structures necessary to decentralize the management of coastal resources to local government units, non-government organizations and people's organizations. This has resulted in the establishment of a new approach to fisheries management known in the Philippines as community-based coastal resources management or CBCRM (Pomeroy *et al.*, 2007).

In place of top-down management, principles of "grassroots" or bottom-up planning and management, such as public participation and co-management, became entrenched in various areas of environment and resources in both developing and industrialized countries (Borrini-Feyerabend *et al.*, 2009; Gutiérrez *et al.*, 2011). For example, as a result of ineffective top-down management, the Ministry of Fisheries Development in Kenya began developing legal frameworks to share management responsibility for fisheries in the 1990s. This type of co-management of fisheries

resources was undertaken through a structure that enabled resource users to manage their landing sites within beach management units (BMU; Samoilys *et al.*, 2011). BMUs were first established on Lake Victoria and practiced by the three countries bordering the lake (Kenya, Uganda, and Tanzania) as a way of improving fisheries management. Guidelines have since been developed to supplement the provisions of the fisheries regulation to increase stakeholder understanding in setting up BMUs. On the Kenyan coast, the BMUs are now being promoted by the government to create partnerships between the government and local communities in the management of coastal resources. Through the Fisheries regulations of 2006, a BMU is given exclusive rights to manage resources at a particular landing site.

In Europe, another example of contemporary local management schemes is the *Prud'hommies* (Feral, 1987). These are professional organizations of French Mediterranean fishermen that have been present since medieval times but officially recognised in 1859. Currently, there are 33 *Prud'hommies* representing more than 1 522 fishing vessels along the Mediterranean coast of France. Their competencies are restricted to the 12 miles limits and focused on fishing organizations, regulation and conflict resolution both internally among members and externally. There are 4 *prud'hommes* for each *Prud'hommie,* which are elected by all the fishermen of the territory. A *Prud'hommie* represents all fishermen from one territory defined by a national "*décret*".

These institutions were efficient in keeping their fisheries sustainable and economically viable mostly by regulating gear authorisation and characteristics, share of space between fisheries in coastal salty ponds, and opening and closing dates of fishing. Most of the fishers in French Mediterranean coast are small-scale fishers; they usually target species of high commercial value such as flatfish, sea bream, scorpion fish, wolf fish, hake, eel and various species of shellfish and use small boats from 6 to 12 m and less invasive fishing gear such as longlines, small nets and traps. One of the main arguments for fisheries sustainability by the *Prud'hommies* was the need for local management and governance and the realization that EU policies consider "one-size-fits-all approach" that in most cases result in mismatch of scales between the policy and the local social-ecological characteristics of the fishery.

One of the major challenges faced by these institutions was the industrialization of fishing around the 1970s and the disavowal of national authorities. But even with the weakening fact, they still do exist and continue to ensure that national and European regulations were kept relevant and appropriate for their small-scale multi-species fleets. In 2006, following the EU technical regulations for the Mediterranean, the *Prud'hommies* reviewed and adjusted their local regulations, ensuring their own regulations were more stringent as well as better compliance among their members. Some examples of these stricter regulations include only 5 km allowance for nets, whereas the EU allows 6 km, banning of trawling within some of their fishing grounds and limited seasons (e.g., 4 months instead of year round as allowed by the EU for lobsters). The *Prud'hommies* also have efficient systems for local compliance and enforcement, where in case of infringement, they first give a warning and then a fine and potentially a suspension of the fishing licences. In addition, the *Prud'hommies* have been the drivers behind the creation of marine reserves in France, which have proven to be efficient in increasing abundance of certain fish species, individual sizes and local biodiversity (ISU, 2012). A critical aspect for the effectiveness of these reserves was the fact it was within the *Prud'hommie* territory, allowing them to legally exclude other fishers.

The purpose and functions of these institutions included ensuring impartial allocation of resources and protection from outsiders within the jurisdiction of a *Prud'hommie* as well as protection of the resources through various fishing regulations.

Their role in fisheries management seemed to weaken with the establishment of committees of marine fisheries and the priority given to development of trawling fleet in the 1970–1980s. Nevertheless, for the last few years, it seems that they reclaim local power even without official recognition within the fisheries management framework. Nevertheless, like committees of marine fisheries their influence depends on trust and respect for leaders. In general, presidents of committees of marine fisheries and *prud'hommes* are personally involved in local politics, including position as mayor or members of the town council.

Fishermen guilds in Spain, named "*Cofradias*", also have a long history in fisheries management in Europe (Freire and García-Allut, 1999), where some of the current ones were founded in the twelfth century as economic and religious associations. After the industrial revolution, the general circumstances and institutional conditions changed, from a religious institution to industrial associations, cooperatives and trade unions (Franquesa, 2004). Under these different institutional conditions, the *Cofradias* represented a system to assure the collective economic exploitation of a geographical coastal area. Currently, Spanish fisheries are still organized under the *Cofradias* system and most industrial fisheries have their own system of professional organizations and owners associations. In general, the *Cofradia* is the institutional system accounting for 83 percent of the fishing employment in Spain bringing many benefits to their members. For example, consumers better appreciate their catches and products, which in turn generate higher prices per unit of effort. Nowadays, 229 *Cofradias* cover all the Spanish coastal line and islands (Franquesa, 2004).

Most of these *Cofradias* have different organization and ways of working, but in general they have the following key characteristics (Freire *et al*. 2002; Franquesa 2004; Frangoudes *et al.* 2008): (1) they include all the fishers that are working in their geographical area; (2) they have a democratic structure with two equally represented groups: the owners and the crew; (3) they have certain level of disaggregation by gear, where trawl is usually the most important, followed by purse seines, long lines, or shell gathering; (4) members should only sell their catch through the local first sale port market of their own *Cofradias* and there is a fee to sell in order to cover administrative costs; (5) *Cofradias* are not-for-profit and any surplus is used to improve infrastructures and equipment or sometimes distributed among members; (6) under the general laws and rules established by the European Commission, Spanish ministry and autonomous communities, the *Cofradias* can establish their own rules, such as control of fishing seasons, ban fishing gear in specific areas and accept new members or suspend current ones; (7) they present evolved systems of control, surveillance and enforcement. For example, all members can participate in the surveillance of collective agreements and the transgressor is punished in real time at the market: their products cannot be sold in the market or he/she is forced to sell the last (with lower prices). Other system of penalization is the social isolation or lack of provision of the collective services (shops, ice, bar, etc.).

Another critical aspect of the Spanish *Cofradias* is the system of area-based access rights, particularly for sedentary species. In fact, some particular fisheries have been running as a *de facto* TURF management institution before the economists even established the intellectual concept. In Spain, the administration allows the existence of this mechanism to minimize conflicts to be solved by political intervention. For instance, if the administration tries to reduce the fishing time, probably all fishers would resist this "political" regulation, but if the measure is adopted by fishers themselves because the costs are increasing and the catches decreasing, the role of the administration would be only to assure by additional control over a measure adopted by the fishermen themselves. Additionally, it minimizes the costs associated with control, surveillance and enforcement.

- By the late 1980s, a general disillusionment of stakeholders, development agencies and academics in the ability of centralized governments to plan, administer and implement fisheries management created the right incentives to move towards decentralization.
- In fact, community-based cooperative management has often arisen out of crises caused by stock depletion and a growing perception that central governments are incapable of managing stocks centrally.
- In Europe, two examples of decentralized management include the *Prud'hommies* in France and the *Cofradias* in Spain.
- These institutions attempt to keep their fisheries sustainable and economically viable in some cases by regulating fishing seasons and gear, imposing more stringent regulations than those stated by the EU, and by implementing evolved systems for local compliance and enforcement.

3. Social structures and institutions in co-management

3.1. Fishers, fisheries agencies, scientists and civil society as co-managers: who should qualify to co-manage?

Co-management is envisaged as a partnership between the central government and the local users. Thus, the essential point of departure for co-management is a situation in which several stakeholders having different interest and objectives for the management merge their efforts and agree on a way to manage their own resources collectively. However, the number and nature of partners or actors qualified to co-manage varies depending on the social-ecological context of fishery and the target resources. Typically, the major players with a stake in decision-making on matters that relate to fishery resources include fishers and their institutions, external agents such as NGOs, academic or research institutions, government institutions at different scales (e.g., national, regional, village), fisheries stakeholders (e.g., boat owners, recreational fishers), and other coastal stakeholders (e.g., tourist industry). In recent decades, the number of key players interested in managing fishery resources has increased as a result of widespread socio-political change, including governments' decentralisation processes, the creation of new democratic institutions and the privatisation of previously state-controlled schemes, together with the proliferation of NGOs, associations and business organizations. Many of those new "players" were concerned about both social and environmental problems and opportunities and believed participatory management and decision-making would better contribute to resolve many of them. Besides the question of which key actors are qualified to co-manage a fishery resource, critical aspects of successful implementation of co-management systems include: (1) appropriate inclusiveness of major players or stakeholders; (2) clear roles and responsibilities of major players; and (3) clear and effective linkages among major players.

Inclusiveness of relevant stakeholders is a key aspect of successful implementation of co-management. In fact, co-management is frequently multi-stakeholder but also multi-disciplinary and covering multiple levels and all arrangements, processes, and institutions should be inclusive rather than exclusive. Although these processes and institutions should attempt to include all the bearers of interests and concerns who wish to participate, inclusiveness has to be balanced and is somehow constrained by transaction costs related to these processes. Hence, an important step in the co-management process is to gather information about the organizations, institutions, and individuals with interests and concerns related to fishery management. Ideally,

all relevant actors would take the initiative together to meet, decide what to do and share fairly among themselves the relevant management rights and responsibilities. Unfortunately, this ideal case is not common and a more typical situation sees only one or a few stakeholders having most of the authority and the possibility to set the partnership process and structures.

The roles and responsibilities of the major players are often not clearly defined or understood by the players themselves, compromising an efficient and effective co-management of resources (Pomeroy and Berkes, 1997). Thus, it is essential that key actors have clear roles and responsibilities and sit down regularly to discuss potential changes. For example, main responsibilities for government institutions at all relevant scales should include an enabling environment through the specification of policy and legislation, technical support and human resource development, facilitating a participatory process and linkages, and giving trade and market support at the national level among others. And at the local level, the roles and responsibilities are executing policy, implementing management plans and measures, and issuing local administrative rules, regulations and ordinances. External agents such as NGOs or research institutions roles and responsibilities should include capacity-building, advocacy, linkages, extension and pilots, and standard setting. Fishers and their institutions (e.g. committees, cooperatives, etc.) have roles and responsibilities including local planning and implementation, stewardship over resources, preparation and design of local rules and regulations, participation in objective-setting and planning, enabling participatory processes in management and data collection, and involvement in national and regional practices (Brown *et al.*, 2002).

Lastly, linkages between major players at different scales are critical for successful co-management. These are often determined by the structure of the vertical and horizontal interplay between actors, the characteristics of the resource being managed, aspects of agency such as the emergence of leadership and the translation of knowledge at different levels, and the social construction of crisis to overcome inertia and trigger change (Cash *et al.*, 2005). The nature of the resources being managed clearly affects, to some degree, the institutional design. The size of the resources, the intensity and level of exploitation, the cost of enforcement, and the dynamic nature of resources all play a part in determining the governance structures of collective resources (Dolšak and Ostrom, 2003). These same factors are likely to be important in determining the cross-scale interactions that form part of the institutions of governance, and important design elements for robust social-ecological systems (Berkes, 2007). Local level resource users make common cause with communities in the same situation to learn lessons and spread best practice, as well as to act cooperatively in negotiating with government. These are depicted as horizontal linkages between resource users, scientific and academic institutions and other civil society group, media and NGOs, both local and external to the jurisdiction of the resources. Vertical external linkages include those between communities and agencies, government and regulatory agencies at other levels. As linkages between different parts of systems across scales and levels emerge, it is important to ensure that empowerment of cross-scale institutions is matched with the resources that enable aspirations for sustainable management to be fulfilled (Anderies *et al.* 2004). The persistence and stability of local governance systems depends on social cohesion, trust and unity. The key is to identify those linkages that promote the obvious potential for enhanced management and avoid those that have the potential to undermine trust between stakeholder groups.

- Given that co-management is a partnership between central government and local users, the basic point of departure is a situation in which several actors with different interests and concerns for the management join their efforts and agree on a way to manage their resources together.
- Inclusiveness of relevant stakeholders is a key aspect of successful implementation of co-management, but it has to be balanced with somehow constraining transaction costs related to multi-stakeholder systems.
- Horizontal linkages between stakeholders (e.g., fishers, NGOs, scientists) as well as vertical linkages between local institutions and central governments are key for the successful implementation and sustainability of co-management regimes.

3.2. Attributes for successful co-management: what worked, what didn't (meta-analysis of co-managed artisanal fisheries)

Across the co-management literature, four criteria or pillars are considered essential for successful co-management (FAO, 2005): (i) an enabling policy legislative environment; (ii) empowerment of communities; (iii) effective linkages and institutions; and (iv) adequate resources – a fishery considered worth managing, and the people and finances to implement the system.

An enabling legal framework is critical to ensure that governments have proper systems in place to enable the co-management process. While the state is commended with the management of the resource, it can assign responsibility and acknowledge capability of local communities for the management of fisheries. Thus, resource ownership enhances compliance with locally agreed rules and often with national legislation through robust enforcement mechanisms and sanctions that are easy to implement by the users themselves. A critical step in the implementation of co-management is then the government's disposition to change policy, include communities in the preparation of policy and regulations, define roles and responsibilities of organizations and devolve power to local institutions.

Another pillar is community empowerment allowing local communities to participate effectively and proactively in the management as well as to ensure sustained involvement. There must be genuine sharing of power between governments and resource users in policy development and decision-making. Usually, other stakeholders such as ENGOs and the tourism industry may also need to be involved in some, or all, stages of the process.

Governments and other agencies must recognize the competence of fisher organizations and allow them to make their own rules. Capacity-building in all aspects of fishery management and co-management process should accompany this process.

Effective co-management requires strong linkages between stakeholders. The networks of stakeholders must be recognized and information sharing across sectors and individuals encouraged. It must also be recognized that in a co-management system success criteria and/or objectives may differ between stakeholders and that there may be differing priorities and needs. Ecological status (i.e., healthy fisheries and ecosystems) must be balanced with human well-being (i.e., the need for food or income) and this inevitably requires management trade-offs that must be recognized and addressed. Communication and dialogue between stakeholders such as government management agencies, scientists and fishers must also take place effectively and be part of a participatory process.

Lastly, it must be recognized that effective co-management requires the existence of a resource that is considered worth managing since it requires the input of resources (time, effort, finance) by those involved. The transaction costs for participation in meetings, monitoring, enforcement and management can be considerable and are

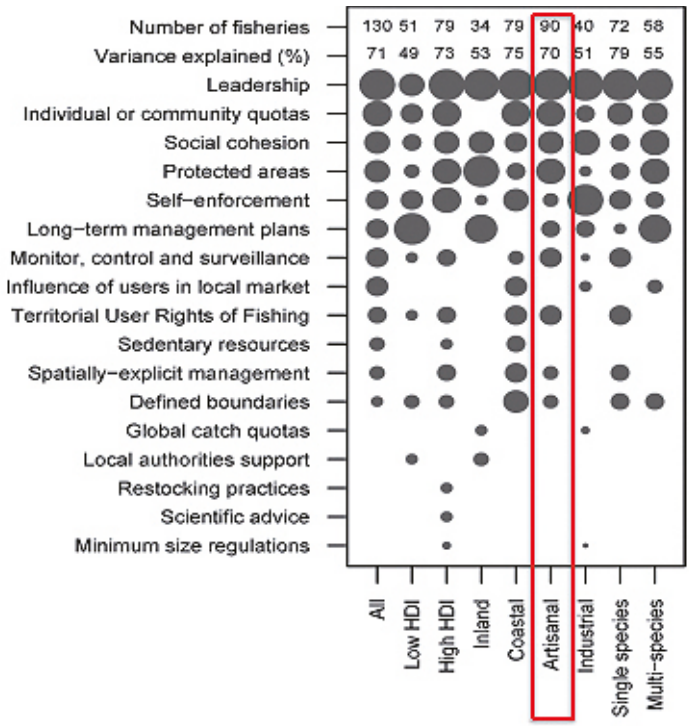
often underestimated at the start of a co-management initiative. Governments and communities must recognize and commit to providing these resources; otherwise these initiatives cannot be sustained. A clear example is when co-management systems are imposed through external funds by donors without creating the basic foundation for stewardship and long-term sustainability of scheme.

Despite these four pillars for successful co-management, the current state of knowledge shows that there are no simple formulae to ensure success in fisheries co-management initiatives. What works in one area may be inappropriate or fail in another for many different reasons.

The meta-analysis performed by Gutiérrez *et al.* (2011) highlighted several attributes as needed for a successful co-management of fisheries. Although presence of strong leaders and social cohesion were the most important attributes across the whole range of 130 fisheries analysed, the relative importance of these differed among categories, and particularly between artisanal and industrial fisheries (Figure 1). Looking at the 90 artisanal fisheries across 38 countries, the aggregated measure of co-management success (success score) varied between a total failure (SS = 0) to a complete success (SS = 8). The estimated mean ± s.d. of 4.3 ± 2.8 implied that co-management on average has been successful in achieving social, ecological and economic objectives. Random forest analyses for the 90 case studies highlighted that community leaders, community-based protected areas and individual or community quotas were the three most important attributes predicting successful Co-management (Figure 1). In addition, the relative importance of each attribute for Co-M success showed marked differences for 3 main attributes: territorial users rights in fisheries (TURFs) and monitoring control and surveillance (MCS). For artisanal fisheries, TURFs and MCS were ranked fifth and sixth in importance.

FIGURE 1

Relative importance of individual attributes (rank proportional to circle size) for 121 co-managed fisheries determined by random forests. The number of fisheries and variance explained are also indicated



Source: Reproduced from Gutiérrez *et al.* (2011).

These results reinforce the critical role that TURFs play as an ancillary tool for co-management highlighted in several other studies (Defeo and Castilla, 2005). For example, it has been demonstrated that spatial access rights and self-imposed internal rules resulted in successful local fisheries when accompanied by co-management as the governance structure in place (Defeo and Castilla, 2005). A combination of strong community leaders, social cohesion of fishing cooperatives, and TURFs within a co-management approach was also critical for fisheries in developing world countries to achieve MSC certification, aimed at sustainable fisheries with low environmental impacts (Gutiérrez *et al.*, 2012; Pérez-Ramírez *et al.*, 2012).

- The four pillars described as essential for successful co-management are: (i) an enabling policy legislative environment; (ii) empowerment of communities; (iii) effective linkages and institutions; and (iv) adequate resources – a fishery considered worth managing, and the people and finances to implement the system.
- However, there are no simple formulae to ensure success in fisheries co-management initiatives. What works in one area may be inappropriate or fail in another for many different reasons.
- A critical step in the implementation of co-management is the government's demonstration of its willingness to change policy, involve communities in the preparation of policy and regulations, define roles and responsibilities of organizations and devolve power to local cohesive institutions.
- Key attributes for successful co-management in artisanal fisheries include strong community leaders, social cohesion, individual/community quotas or TURFs as incentives for access rights, and efficient mechanisms for monitoring, control and surveillance.

3.3. Committees, cooperatives and other institutions

Early conceptualizations of co-management involved only a relationship between the government and the local resource users. However, over the years the concept of co-management has evolved from this two links system to a multiple linkage and relationships system, which includes a wide array of actors and institutions. These polycentric networks connect different levels of governance by delivering communication channels for the different stakeholders in multi-level institutions, enhancing the interrelations between accomplishment, knowledge, and social-ecological contexts.

By engaging communities and other stakeholders in co-management, governments, conservation groups, and scientists alike aspire to make conservation initiatives more reflective of local conditions and consequently, create better incentives for stakeholders' compliance. This need for the development of local institutions to represent and implement community experience, knowledge, and willingness towards the sustainable management of fishery resources has led to a proliferation of community-based organizations involved in managing these resources. The analysis by Gutiérrez *et al.* (2011) shows no particular type of organization (e.g., cooperatives, committees, associations) as more critical than others for co-management success. However, to be effective, such organizations or institutions require several design principles aiming at providing users with a credible commitment. These principles include: (i) cohesion and trust among members; (ii) sense of ownership and resource stewardship; (iii) presence of leaders guided by collective interests; and (iv) simple and intuitive rules and regulations. For the later, Cinner and Huchery (2013) found that perceived compliance was higher when less than 2 rules were in use, suggesting in fact that the complexity of regulations can hinder compliance.

Several studies have shown that fishery cooperatives are able to resolve diverse management problems, improve economic conditions and achieve conservation benefits simultaneously (Deacon *et al.*, 2008; Ovando *et al.*, 2012). In particular, fishery cooperatives often take actions directed toward coordinating harvest activities, adopting and enforcing restrictions on fishing methods and effort, taking direct conservation actions such as establishment of marine reserves, and take business or marketing strategies that assure not only the environmental sustainability of the fishery but its economic viability. However, in light of the diversity in nature, structure, context and management of the world's fisheries, the existence of a particular type of institution cannot be expected to succeed in all cases. In fact, Gutiérrez *et al.* (2011) found that the type and the nature of institutions were not a relevant variable in determining success. Additionally, they found that resource users under locally managed protected areas and customary management arrangements were more likely to perceive beneficial livelihood outcomes than users under national park and devolved governance arrangements.

- No particular type of local institution seems to be more suitable for successful co-management.
- However, to be effective, institutions need to be characterized by strong cohesion and trust among members, sense of ownership and resource stewardship, presence of leaders guided by collective interests, and simple and intuitive rules, regulations and sanction systems.

4. Functioning of co-management committees

4.1 The case of the Co-management Committee of the Catalan sand-eel fishery

The sandeel fishery in Catalonia takes place within 12 miles from the coast and targets two species of sandeel, *Gymnamodytes cicerellus* and *Gymnamodytes semisquamatus*, which are small short-lived forage fish typically found in shallow sandy bottoms in the Mediterranean and adjacent east Atlantic waters (Sabatés *et al.*, 1990). Unlike the industrial sandeel fishery in the North Sea harvesting hundreds of thousands of tonnes for reduction to fishmeal, the Catalan fishery is based on small-scale seines and yields less than one thousand tonnes of catch annually. Boats operate on a daily trip basis and landings are entirely aimed at direct human consumption, as the species is highly appreciated in the region and fetches a good price at the local markets. The currently authorized fleet is limited to 25 vessels operating from 7 different fishing ports along the Catalonian coast: Barcelona, Badalona, Arenys de Mar, Blanes, Palamos, Sant Feliu de Guíxols and L'Estartit. The number of fishermen on board is either 2 or 3 meaning that the total fishermen participating in the fishery could oscillate between 50 and 75. The fishing gear currently used (called sonsera after the fish called sonso in Catalan) has two lateral wings with a maximum length of 125 m followed by a cod-end of 30 m.

After a fishermen's initiative, the first regulatory framework specific for the fishery was adopted in 1987. A key element of this initial regulation was the implementation of a seasonal closure during the reproduction period. This period, proposed empirically by the fishermen based on their traditional knowledge and observations, was set from 15 December to 1st March. However, illegal and unreported catches was widespread resulting in inefficient regulations and the development of black markets.

In 2006, the European Union adopted the first comprehensive regulatory framework concerning management and technical measures for the European countries in the Mediterranean, the so-called "Mediterranean Regulation" (EU Council Regulation 1967/2006). One of the pillars of this regulation is a provision for the compulsory adoption of management plans by Member States for fisheries conducted by trawl nets, boat seines, shore seines, surrounding nets and dredges within their territorial

waters no later than December 2007. With the specific mention of boat seines, this provision directly affects the "*sonsera*". Moreover, the same regulation includes technical measures related to the mesh size, and the minimum distance to the coast and depths allowed for towed nets, which have also an impact on the fishery. From July 2008, the mesh size for towed gear was established either at 40 mm if square or 50 mm if diamond shaped at the cod-end; and the use of the gear was prohibited within 3 nautical miles of the coast or within the 50 m isobaths where the depth is reached at a shorter distance from the coast. Both technical measures, after the same regulation, benefit from a transitional derogation until the end of May 2010. An indispensable additional requirement for vessels to obtain the later derogation (minimum distance to the coast) is to have a track record in the fishery of more than five years without any possibility of a future increase in fishing effort. This later measure had a crucial impact in the size of the fleet targeting sandeel in the Catalan region since it resulted in an effective closed list of 25 vessels allowed to fish for the species.

The management plan needed for the fishery addressing the mentioned derogations was initially sent to the European Commission in 2010, and revised versions of the plan in 2011. In January 2012, the submitted plan was rejected due to the lack of any scientific study that would support the proposed measures and derogations. Therefore, the fishery was deemed illegal and forced to close, leading to a huge crisis in the sector, which approached the NGOs, scientists and the different administrations calling for support. After agreement of the members of the four groups (fishing sector, scientists, administration and NGOs), the Co-management Committee for the sandeel fishery in Catalonia was created in April 2012 (Catalan sand-eel Co-Management Committee, in press).

The Co-management Committee of the sand-eel fishery was created with the aim of promoting the long-term sustainability of the fishery by carrying out all the needed actions for this purpose, including: (i) the design of a scientific study aimed at developing and adopting the required comprehensive management plan for the species; (ii) setting the rules for the fishery under an adaptive management approach during the scientific fishery; and (iii) a close monitoring of the activity including assessing compliance to the rules in place, and agreement on sanctions when applicable.

Members of the Committee agreed on a formal composition of five pillars, each allocated to representatives of the fishing sector, the Catalan authorities, the Spanish central authorities, scientists, and NGOs, respectively; all on equal footing with respect to decision-making regarding the rules and their implementation. Two bodies, the plenary and the permanent commission, compose the Committee. The permanent commission made of ten members, works as a technical working group for the close follow up of the fishery and meets at least once a month. During this monthly meeting, decisions are taken by consensus whenever possible and at least by a majority of seven votes. The plenary of the Committee meets once a year or by petition of the permanent commission. The secretariat of the Committee is assumed by the Catalan administration and meetings usually take place in its headquarters.

The main management measures agreed for the period during which the scientific fishery takes place are: (i) the *sonsera* fishing gear can only operate in sandy bottoms; (ii) the exit and entrance of fishing vessels, landing and commercialization of the catches can only take place in the specified fishing ports and markets; (iii) the activity can take place only from Monday to Friday within a specific timeframe; (iv) a maximum daily catch per vessels and a maximum TAC for the whole 2013 fishing season. Therefore, the initially set daily catches already underwent adaptive changes later agreed during the monthly meetings of the permanent commission.

The control of the fishing activity is ruled by a "control protocol" adopted by the Committee, which includes: (i) strict control of the daily catch (up to 10 percent excess of the daily catch is allowed); (ii) landing control (all vessels should land their total

catch in their base port); (iii) market measures (fish should be sold at the fish market associated to the base port; to guarantee a proper control of the first sale notes by the Co-management Committee, the first sale should take place only within the Catalan territory); (iv) strict fishing schedules (6:00 AM to 2:00 PM); and (v) disciplinary measures applied by the permanent commission of the Committee.

The permanent commission of the Committee is meeting once a month to analyse the fishing activity during the previous month, including the scientific sampling and evolution of the scientific study, the catch levels and associated compliance measures, communications and petitions from the sector and disciplinary measures if applicable. It is noteworthy that during the more than a year of life of the Committee, all decisions of its permanent commission have been adopted by consensus with full agreement of all its members. Those decisions included a continuous improvement of management measures by adapting the original set of rules to the daily reality. This adaptive management has been identified as an effective or even necessary way to cope with new co-management systems (Olsson *et al.* 2004; Folke *et al.*, 2005). The functioning of the Co-management Committee and the permanent adaptation of the management and control measures has proven to be successful. Among the main reasons of this success, the trust between all members of the committee and their huge commitment for working together towards the same objective have been of paramount importance.

Some indicators of success for the co-management of the sandeel in Catalonia include (Catalan sand-eel Co-management Committee, in press): (i) the sense of ownership of the management process among all relevant stakeholders resulted in a very high adherence to the rules; (ii) reduction in the fishing effort by half with threefold increase in profits for fishers due to the elimination of the black market, which overloaded the market by strongly reducing prices, and the strict control of the amount of fish at the auction market through the implementation of an individual daily quota; (iii) the model had also a positive social impact on the local communities since, due to the profitability of the fishery, the owners of vessels who operated with two fishermen on board had decided to increment its crew to three; (iv) the experience has been highly instructive for all stakeholders as regards the relevance of bottom-up participative approaches to dramatically improve management success; (v) the strong by-in from the two administrations involved, who are already promoting the replication of the model to other fisheries.

- Sandeel fishing has been regulated in Catalonia since 1987, but with the entry into force of EU Council Regulation 1967/2006 on Fishing in the Mediterranean, a management plan had to be submitted to the European Commission to allow this fishing practice.
- In April 2012, a Co-management Committee, composed of representatives of the fishing sector, fisheries administrations, scientists, and NGOs was created with the aim of achieving the long-term sustainability of the fishery.
- The management plan for the Catalan sand-eel fishery establishes strict measures including control of the daily catch and landings, fishing seasons/ schedules, market measures, and disciplinary measures applied by the permanent commission of the Committee.
- Indicators of success for the co-management of this fishery include community empowerment and sense of ownership of the management process among all relevant stakeholders which derived in high adherence to rules and regulations, reduction of fishing effort and increase in profits for fishers, and strong by-in from the two administrations involved, who are already promoting the replication of the model to other fisheries.

4.2 Other examples of fisheries co-management in the region

There are other examples in Mediterranean countries where co-management, or at least some elements of it are present (Alegret, 1996; Symes *et al.*, 2003). These include the presence of local cooperatives in Turkey where a certain degree of power devolution allowed fishers to manage their resources effectively and maintain the economic viability of the fishery at the same time. In Italy, the inefficiency of the central government in managing a clam fishery has shifted the responsibilities to local institutions, and the benefits of a marine protected area has driven local fishers to actively comply and even enforce fishery regulations. Finally, in France, the government organized the "Grenelle de la Mer" which includes the objective of developing co-management regimes, where administration, industry, scientists, and civil society decide together the management needed for the sustainable exploitation of fisheries.

4.2.1 Turkey

Fishery management in Turkey is centralised. There are no local government jurisdictions or local village jurisdictions over fishing activities. However, fishers are usually organized in cooperatives, where their number has increased by almost 14 percent since the early 1990s (Unal *et al.* 2009). The 1986 amendment of the Fishery Law 1380 gave fishery cooperatives the rights to hire and operate fishing ports, which resulted in rapid increases in the number of cooperatives. The Turkish fishery cooperative movement started in 1942 and main responsibilities included the organization of credits, production, marketing, construction of cold storage facilities, as well as other industrial facilities such as fish oil factories.

A study of six cooperatives in the Aegean, highlighted the success of at least three of these cooperatives in marketing their fish but also in other functions such as supplies and service (e.g. providing bait, fuel and ice), defending members' rights, providing lobbying services, informing members about new regulations, and establishing rules and collaborating with the management agency and the universities. In these cooperatives, group sizes were small enough to retain the interest of fishers and no evidence of corruption, larceny or other dishonest activities were shown. All had been formed on the basis of local initiatives, in response to the needs of the fishers themselves.

Another example is the small-scale fishery in Alanya, on the Mediterranean coast of Turkey. This fishery is located on the edge of a deep basin, and the inshore zone for setting nets is very limited. The fishers have organised among themselves a system of rotating fishing areas so that each fisher receives equitable access to the more productive fishing spots. There are some 40 named fishing spots in Alanya's trammel net fishery, which takes place between September and May. The overall system of access rights and rules for taking turns is quite complicated but, starting in the 1980s, it has reduced conflicts among fishers. However, given the centralized fisheries management in Turkey, fishers have struggled on how to provide legitimacy for the system they designed. In fact, they decided to draw legitimacy by using the Aquatic Resources Act as enabling legislation. The Act states that local cooperatives have jurisdiction over local arrangements. Thus, rules and regulations were written by the local fisheries cooperatives, agreed and endorsed by all members and handled to the local authorities (Borrini-Feyerabend *et al.*, 2009).

4.2.2 Italy

The Venus clam fishery in Italy is considered as a case of self-management (OECD, 2008). In this country, the fishing of bivalve molluscs performed by means of hydraulic dredges is a relatively recent activity. Introduced in the first years of the 1970s, this type of fishing activity is mainly concentrated along the Adriatic coast. The current clam management system is the outcome of a long process that was initiated in the early 1990s. In the 1980s, fishing capacity increased dramatically and the resource

became overexploited. New measures were immediately established at the central level, including input and output measures and a specific licensing scheme. A national management committee was introduced whose task was to co-ordinate the management measures governing this fleet segment. Towards the end of the 1990s, the failure of the strategy, which had been adopted by the central management, was evident, with overcapacity, high fishing effort and low fishers' income.

This crisis was attributed to a lack of efficiency from the management authority and fishers asked for financial support to develop a new management plan aimed at: (i) shifting of responsibility from the central administration to the users (i.e., ship owners) and (ii) replenishment of clam stocks and establishment of sustainable harvesting practices and quotas. As a result, the national management committee was dismissed and local management co-ordination committees were established, with the power of defining and implementing management regulations (e.g., daily catch quota, number of fishing days in a week, season closure, maximum landings, area rotation, allowed gear, periods, landing sites, and restocking areas). Basically, they were granted all the powers previously held by the Ministry, which were added to those already in their control.

Some positive results of such power devolution included higher CPUE and higher unit prices, and a moratorium on new licenses. The successful management of this fishery was based on a progressive decentralisation of the decision level, ending up with a self-management regime including access rights (TURFs). Some of the local characteristics that can be associated to such success include: (i) the sedentary nature of the resource, which is distributed in specific areas easily identified in every fishing district; (ii) homogeneity of the fishery segment, allowing the introduction of rules largely understood and accepted by all fishermen; and (iii) the implementation of TURFs creating a sense of ownership and stewardship;

The Torre Guaceto Marine Protected Area (TGMPA), located adjacent to an artisanal fishing community, is another case with relevant elements for co-management in Italy. In 2005, scientists and fishermen who collaboratively studied the MPA designed an adaptive co-management plan to allow fishing in a partially protected area of the MPA. This plan was designed to sustain fishermen's income while also limiting fishing impacts. Scientists and fishermen worked together to select fishing gear that would minimize harm to the underwater habitats and protect functionally important fish predators and juvenile fishes, as well as to reduce the number of fishing days within the MPA to one a week.

Immediately after fishing was allowed in the partially protected area of the MPA, fishermen saw an increase in their income. Catch rates of commercially fished species including striped red mullet, octopus, and peacock wrasse were on average 4 times higher than catch rates outside the MPA. After a few years, catch rates within the partially protected area had stabilized to a level that was greater than double the catch rates outside the MPA. Moreover, average catches from 2005 to 2008 within the TGMPA were generally higher than the values reported from other Mediterranean locations. Along the coast of Italy, Spain, Greece, Croatia and France, average catches with fixed nets from more than 20 locations ranged from 3 to 10 kg km^{-1} of net, with a few locations where average catch exceeds 20 kg km^{-1} of net, while catches exceeded 25 kg km^{-1} net in TGMPA (Guidetti *et al.*, 2010).

Collaboration and co-management among fishermen, managers and scientists allowed for the maintenance of sustainable fisheries and the avoidance of overfishing in the partially protected area in Torre Guaceto (Claudet and Guidetti, 2010). Many fishermen support the MPA, including the marine reserve portion, because of the long-term benefits they receive for their fishery. Several characteristics of this system contributed to the successful co-management, including the relatively small size of the

MPA, far away from big cities, and small number of local fishers. In addition, increased trust and collaboration between scientists and fishers was essential to designing effective marine reserves within MPAs that benefited both conservation and fisheries.

4.2.3 France

In 2009, the French government organized the "Grenelle de la Mer" where administration, industry, scientists, and civil society decided together the management needed for the sustainable exploitation of the sea. This Grenelle resulted in the creation of 138 commitments, including the creation of 6 pilot sites of UEGC (unités d'exploitation et de gestion concertées – integrated exploitation and management units) to test ecosystem-based and concerted approaches for fisheries management. The projects are based on 5 pillars: (i) definition of the territorial unit; (ii) setting up a new form of governance based on co-management; (iii) organizing the market and commercialisation to enhance the value of fishing; (iv) designing of a long term management plan; and (v) strict control over the management of the resources.

The Var's project is one of those UEGC pilot projects, created with the objectives of developing a co-management system that includes all stakeholders in a specific territory. These stakeholders share common long terms objectives to rebuild and maintain healthy marine ecosystems and to develop sustainable and diversified artisanal fishing. The platform is composed of fishers' representatives (Comité départemental des pêches maritimes et élevages marins du Var / Project leader), scientists (Université de Nice, Laboratoire Ecomer), public establishment (Agence de l'Eau Rhône Méditerranée et Corse, Parc National de Port Cros), administration (Direction des pêches maritimes et de l'aquaculture, Direction interrégionale de la mer Mediterranée, Direction départementale des territoires et de la mer du Var), NGOs (WWF France, Confédération Environnement Méditerranée), regional authorities (Conseil général du Var, Conseil régional PACA, Toulon Provence Méditerranée) and marines users (diving federation, recreative's organizations). The project focused on 4 major actions:

1. Refocus the role and the rules of the French *Prud'hommies* in territorial maritime management;
2. Develop partnership between fishermen, coastal users and scientists;
3. Establishing local long term management plans and;
4. Bring consumers to choose their seafood through the choice of supporting a type of exploitation.

The experimental phase started in January 2012 and will finish in December 2013, with a possibility for renewal.

- There are several examples in Mediterranean countries where co-management, or at least some elements of it are present.
- In Turkey, the government has devolved power management to local cooperatives resulting in more effective management and economically viable fishery.
- In Italy, the inefficiency of the central government in managing a clam fishery has shifted the responsibilities to local institutions, and the benefits of a marine protected area has driven local fishers to actively comply and even enforce fishery regulations.
- In France, the government organized the "Grenelle de la Mer" which includes the objective of developing co-management regimes, where administration, industry, scientists, and civil society decide together the management needed for sustainable exploitation of fisheries.

5. Relevant options for co-management: area-based management; access limitation; limitation of fishing opportunities; time/area management; monitoring, control and surveillance (MCS)

5.1. Role of information and monitoring; assessing the stocks and value of traditional environmental knowledge (TEK)

Sound and precautionary fisheries management entails high-quality information and analysis of the status and dynamics of fish stocks. In order to facilitate management and regulations, data needs to be collected and stock assessments conducted. Regardless of the social-ecological conditions of the fishery, whether it iscentrally or co-managed, there is a need to collect information to assess the state of the resource, as well as to monitor whether fishing regulations are effective to maintain the long-term sustainability of the resource and the livelihoods of those depending on them. In fact, fisheries monitoring is required to provide operational information for management decisions and to show to stakeholders that the objectives are being met. Normally, purpose of monitoring includes (i) description of current status; (ii) detection of trends; and (iii) prediction of future changes given the management regulations in place. Specifically, data should be available on stock structure, productivity and abundance, fleet composition, and all fishery removals.

Despite the importance of monitoring, fishery managers and stakeholders have often struggled in developing and implementing effective monitoring programmes, particularly in small-scale fisheries with limited access to economic and human resources or where the nature of the fishery does not justify expensive surveys. Although monitoring systems need to be adapted to meet the needs of the fishery and its management framework, there are general guiding principles for each of the planning, development, and implementation stages. These guiding principles include (MRAG, 2011):

1. Stakeholder engagement. From the outset of designing a monitoring programme, stakeholder engagement is key in defining common goals, avoid redundancies, and utilize local and/or traditional knowledge for the fishery. Thus, stakeholders should be involved in the design process and consulted to ensure the monitoring is doable and enforceable.
2. Fishery characteristics: The characteristics and complexities of fishing communities, resources and fishing operations must be monitored at appropriate spatial and temporal scales.
3. Objectives setting: Establishing clear objectives is a key step in developing efficient monitoring programmes, allowing managers, scientists and fishers to identify what the programme aims to achieve. These goals should consider diverse objectives and interests from all sectors, including science, management, and industry and should be assessed regularly to check progress and be adjusted as needed.
4. Monitoring strategies: Identifying the most appropriate monitoring strategy is a key component of a successful and efficient monitoring system. For example, in some situations sampling at sea may be more relevant than at port monitoring. An important aspect is to determine which elements of a monitoring system the management agency or government, industry, or fishers should conduct.
5. Cost considerations: In order to be efficient and doable, monitoring programmes need to consider costs of data collection, processing and analysis. It is critical to determine beforehand who will have the financial responsibility for various aspects of a monitoring programme and in most cases, consider requirements for fishers to fund at least a portion of the management and monitoring costs. In most cases, it is important to scale the monitoring efforts to the value of the fishery.

6. Adaptive approach. Periodic review of a monitoring programme is needed to improve the system and adapt to changing needs in data collection. These programmes should be dynamic, providing stability and consistency while also adapting to changes in fishery and resource circumstances. A feedback system should be used to evaluate the programme to make sure it is achieving its goals and to identify needed changes.

Information on abundance, catches, effort, catch composition and size structure of target stocks are a valuable and needed element for stock assessment and sustainable management. However, this information is not always available for small-scale fisheries due to limited resources to conduct fieldwork and surveys and to implement sampling protocols by management institutions or government agencies. Likewise, data collection for sedentary and low mobility species (e.g., lobsters) with high levels of spatial and temporal variability may require more resources than what is typically available for agencies tasked with such management. Thus, an increasingly adopted solution is when fishers are trained to collect fishery-dependent and fishery independent information at relevant temporal and spatial scales. In this respect, Prince (2003) has proposed extensive use of commercial fishermen as data collectors in order to gather enough information at appropriate scales to support fine-scale management. These community-based data collection programmes (CBCP), which are usually more feasible and effective under strong co-management regimes, improve the quality and quantity of relevant fishery information by enhancing spatial, temporal and categorical resolution and significantly reduce the monetary costs of data collection (Schroeter *et al.* 2009).

A CBCP involves collecting, sharing, and synthesizing essential fishery and scientific data and motivating stewardship within the fishing community. These CBCP may be a way of moving out from a data-limited situation and to support sustainable fishing. In fact, the purpose of collaborative data collection and research may be to establish data-driven management of the fishery in question and to reach the level of information and monitoring adequate for proper stock assessment. To do so, management agencies or co-management bodies need to develop and foster participation in a data collection programme, to recruit and train fishers to collect and share essential data, to improve data storage and management systems, and to develop a stock assessment or review the existent one. Also critical to the success of these programmes is to provide incentives and encourage new fishers to participate in the data collection programme (e.g., show fishers the value of the information for their daily operations).

However, data gathered by fishers or others without a scientific training are often criticized for not being scientifically sound and accurate, and hence not often used to inform management. Thus, checking for data accuracy and data validation are key aspects of the CBCP needed to support integration of collected data into the management process. To address data accuracy and validity, robust procedures and protocols need to be clearly defined and easily carried out by fishers with minimal chance for individual interpretations. Validation of the data may be accomplished, for example, through landing port sampling and should constitute an important component of the CBCP.

In other cases, some biological and fishery information is available although incomplete, unreliable or inaccurate, and other sources of information become critical. An important but often disregarded source of information refers to both traditional ecological knowledge (TEK) and fishers' historical perspective of the systems under exploitation. TEK refers to indigenous, native or other forms of traditional knowledge regarding local environmental resources and usually defined as the cumulative body of knowledge, practice, and beliefs, accumulated through generations by cultural and

experimental transmission. In fisheries management, it has been used as substitute for baseline data to measure changes in for example catch per unit of effort (CPUE) over time in remote regions that have little recorded scientific information. Although fishers have normally accumulated a large body of knowledge about their resources, in most cases there has been little effort to involve these users not only in decision-making, but also in determining research priorities or in the research activity itself. Indeed, in most nations, the vast majority of fishery research takes place within government and universities and although fishers may often express the desire to participate in such research, such cooperative attempts are not widespread. However, advantages of such approaches are multiple, including better understanding of complex systems, improved decisions based on diversity of perspectives, community empowerment and better compliance with rules and regulations (Freire and García-Allut, 1999; Garcia-Allut *et al.* 2003).

- Regardless of the social-ecological conditions of the fishery, or whether it is centrally or co-managed, there is a need to collect information to assess the state of the resource, as well as to monitor whether fishing regulations are effective to maintain the long-term sustainability of the resource and the livelihoods of those depending on them.
- For co-managed fisheries, it is critical to determine beforehand who will have the financial responsibility for various aspects of a monitoring programme and in most cases, consider requirements for fishers to fund at least a portion of the management and monitoring costs.
- Community-based data collection programmes (CBCP), where fishers are trained to collect fishery dependent and independent information, are a cost-effective way to collect the necessary information to assess the status of the resource and monitor the fishery.
- These CBCP are usually more feasible and effective under strong co-management regimes, improving the quality and quantity of relevant fishery information by enhancing spatial, temporal and categorical resolution as well as significantly reduce the monetary costs of data collection.
- In fact, CBCP are probably the only way to move from data-poor to data-rich situations in artisanal, small-scale fisheries.

5.2. Territorial-based management, access limitation, fishing limits (either on catch or effort)

Within co-management arrangements, diverse forms of fishery arrangements have been identified as successful depending on the social-ecological and political settings. Most commonly discussed are area closures, limited entry and other input controls (effort limitations) and output controls (quota allocations), and access rights. User rights options vary widely, including: Territorial use rights in fisheries (TURFs), which have been traditionally applied by indigenous communities in determining the fishing location where a member or group of members of the community can exploit the resource; limited entry, which was the initial approach taken by modern management of fisheries to provide a limited number of individual fishers with right access to the resource (e.g., fishing licences); and quota allocations made to individual fishers, communities, cooperatives or companies to have a share or quota of the total resource (e.g., TAC) or total effort allowed (e.g., number of traps).

It is important to note that while co-management not necessarily implies exclusive access, this may offer complementary effects enhancing the fishers' sense of ownership

and stewardship over the resource, or facilitating the policy process and its outcomes by promoting more cooperative and equitable management approaches (Jentoft, 1989). It is also possible that the nature and success of the co-management arrangement will be influenced by the overall nature of the access rights regime in place. In fact, Gutierrez *et al.* (2011) found that catch shares, a term referring to different sorts of access rights, and in their specific context related to individual or community quotas and TURFs, were an important attribute for co-management success across 130 fisheries. A more detailed analysis showed that these two attributes gain even more relevance when dealing with artisanal co-managed fisheries, or those in developing nations.

TURFs seem to be of critical importance for artisanal fisheries targeting more sedentary resources. Many studies have highlighted the benefits of TURFs in lobster fisheries in Mexico (Defeo and Castilla, 2005), an abalone fishery in Australia (Prince, 2003) and loco and sea urchin fisheries in Chile (Castilla *et al.*, 1998) and for multi-species and multi-gear fisheries in Oceania (Johannes, 2002; Defeo and Castilla, 2005). However, Cinner *et al.* (2012) found that providing local resource users with exclusive rights to their fishing grounds in coral-reefs systems in developing countries actually decreased levels of compliance with rules and regulations due to marriage arrangements between right holders and external users and lack of resources for monitoring, control and surveillance among members. In this context, social cohesion, trust and cooperation in fishing communities may alleviate conflicts and reduce the need for control and surveillance, subsequently increasing the benefit of access rights (Gutiérrez *et al.*, 2011).

Thus, the effectiveness of the TURF system depends on several aspects, including but not restricted to (Castilla and Defeo, 2001): (i) the characteristics of the resources, being particularly effective when dealing with sedentary (lobster, abalone) and inefficient when dealing with highly migratory species (e.g., tuna); (ii) reduced number of users in the system, which in turn favours social cohesion and sense of unity; (iii) defined areas and territories (e.g., enclosed bays or "*caletas*"), facilitating control and surveillance; (iv) low levels of conflicts and unemployment rates, which lead to less social pressure of fishing as a main income and livelihood; (v) strong and efficient social institutions. TURF management systems need the existence of one institution (cooperative, association, guild) that assures the management of the common.

In Chile, TURFs allocated to small-scale fishers communities through management and exploitation areas for benthic resources (MEABRs) constituted a major shift in the management framework of fisheries. In cases where legislation has been properly used, the cascading effects resulting from the allocation of TURFs included: (i) long-term effects in the economic welfare of fishers, (ii) the strengthening of organizations/syndicates which led to the implementation, by fishers themselves, of effective monitoring, control and surveillance procedures, and (iii) use as experimentation tools to refine stock assessment and management procedures.

Despite the successful examples detailed above, most small-scale, artisanal fisheries around the world are still far from implementing TURFs due to a lack of legislation that includes exclusive access rights to a marine area. In fact, this has been identified as a major constraint for the successful implementation of co-management success in coastal fisheries targeting sedentary resources in Latin America (Castilla and Defeo, 2001).

- While co-management not necessarily implies exclusive access, this may offer complementary effects enhancing the fishers' sense of ownership and stewardship over the resource, or facilitating the policy process and its outcomes by promoting more cooperative and fair management approaches
- Often, the nature and success of the co-management arrangement will be influenced by the overall nature of the access rights regime in place.
- A meta-analysis of 130 co-managed fisheries around the world showed that catch shares, a term referring to different sorts of access rights, that can take the form of individual or community quotas and TURFs, is an important attribute for co-management success.
- A more detailed analysis showed that these forms of access rights gain even more relevance when dealing with artisanal co-managed fisheries, or those in developing nations.

5.3. Time/area management (including different kinds of spatial closures) in co-management

Spatial closures, or time-area closures are one of the tools most commonly used by managers for all types of fisheries and management schemes, including co-management. They are also used outside of fisheries for a variety of conservation, research and other purposes. Often, the objective of these spatial and temporal closures is to reduce fishing mortality in one segment of the population (e.g., juveniles, spawning aggregations, etc.). Spatial and temporal closures have also other objectives such as re-distributing fishing effort, minimizing gear conflicts, reducing impacts of fishing in sensitive substrate or vulnerable fish habitats.

Closures are also recognised in a fisheries management context for their potential to provide a buffer against uncertainties in stock assessments, variability in recruitment, and catastrophic events by providing a shelter in space or time/seasons (Wilen, 2004). Through spill-over processes as well as through protection of spawning seasons among many other mechanisms, spatial and temporal closures would be expected to benefit the management of fisheries where other means of control on exploitation rates are limited. However, the effects of closures will depend upon the spatial and temporal population dynamics of the fish species, the spatio-temporal dynamics of the fishing fleet, and the other management controls in place.

Spatial management is considerably applied in fisheries to address biodiversity and sustainable use, as well as to optimize yields or protect species, life history stages or areas. However, spatial closures usually achieve their specific objectives, but this specific benefit does not necessarily flow to other broad-scale objectives (Dichmont *et al.*, 2012). Hence, there is often no single management tool which satisfies all objectives, and that a suite of management tools is needed. For successful co-management arrangements, two critically important and widely discussed types of spatial closures are community-based marine protected areas (MPA) and rotational harvesting as part of a cooperative scheme.

The term MPA often refers to a coastal or offshore marine region that has been defined for management and conservation measures, offering protection to parts of the ecosystem through formal legislation or customary practices. Community based MPAs place local people at the forefront of the planning, implementation and running of marine reserves, providing a sense of ownership and reducing tensions generated by the loss of traditional fishing grounds. Essential to the success of any such programme is a series of extensive educational workshops, open forums, and seminars. Other important factors in the overall success of community-based MPAs include (Christie and White, 2007; Pollnac *et al.*, 2010): (i) relatively small local communities or population sizes; (ii) perceived crisis in terms of reduced fish stocks or CPUE;

(iii) successful alternative income projects (e.g., tourism); (iv) a high level of community participation in decision-making; (v) continued advice from the implementing organization and inputs from the local government.

Properly managed large MPAs, while sometimes more effective at protecting ecosystem functions, fish biomass and biodiversity, may not be feasible in developing world countries or as management tools for artisanal, localized fisheries (Christie *et al.*, 2003). However, community-based MPAs, with their associated limitations, have been one of the few success stories within weak central governments and limitations in resources for design, implementation and enforcement of MPAs in many regions of the world. Moreover, Gutierrez *et al.* (2011) and Cinner *et al.* (2012) identified this spatial management tools as an important attribute for successful co-management of fisheries.

Rotating harvesting strategies often have substantial advantages over quota management systems, particularly when dealing with spatially structured populations (i.e., sub-population with variable degree of geographic isolation). In these situations, there is an option to harvest different subareas separately. Thus, rotation harvesting should consider site-specific differences in biological characteristics (e.g., recruitment, growth and mortality), and attempt to ensure that each area has more or less the same carrying capacity. Economic factors (especially market demand and prices for preferred sizes) are critical to choosing rotation periods for rotating harvest schemes, especially where larger sizes command a higher price, or where there is the need to ensure that a reasonable proportion of larger fecund animals survive to spawning. Although these rotational schemes have been shown successful in many fisheries worldwide, their applicability can be restricted to (Caddy and Defeo, 2003): (i) the existence of at least *de facto* exclusive harvesting rights; (ii) control and enforcement mechanisms to avoid poaching in closed areas/seasons; (iii) presence of efficient management authorities to allocate fishing rights by area or season; (iv) existence of discrete number of population subunits; and (v) existence of alternative means of employment for local fishers and/or processors if a local resource area is closed for a number of years or months.

A closed season or a spatial rotational management scheme is not necessary enough on its own to properly and efficiently manage the fishery, but often requires control and surveillance mechanisms and impacts on access rights that will require strong adherence by fisher. Thus, this particular management tool is adequate and effective in co-management arrangements with strong community cohesion and cooperative harvesting.

- Spatial closures, or time-area closures are one of the tools that are most commonly used by managers for all types of fisheries and management schemes, including co-management.
- However, closed areas or season and spatial rotational management schemes are not necessarily the best tools on their own to manage a fishery, but create a suitable framework for control and surveillance requirements and impacts on access rights, requiring strong adherence by local fishers.
- Time/area closures, and particularly marine protected areas are often successful in co-management arrangements with strong community involvement, group cohesion and cooperative harvesting strategies.

5.4. Control in co-management (MCS related issues)

Fisheries monitoring, control and surveillance (MCS) entails mechanism and processes for effective implementation of agreed policies, plans or strategies for fisheries management. The absence of MCS systems makes a fisheries management scheme inadequate and ineffective. However, not all fisheries managers understand the key role of MCS as an implementing mechanism for fisheries management. The key indicator

for MCS is the level of compliance, and this is affected by many factors (e.g. the number of fishers, the number of vessels, effort and area coverage of patrols, results of patrols, increase in voluntary compliance, etc.).

Mechanisms and tools for effective MCS depend on the social-ecological characteristics of the fishery and the economic and political settings of the system. However, some key tools for MCS for fisheries in general include: (i) appropriate participatory management plans developed with stakeholder input; (ii) enforceable legislation and control mechanisms; (iii) data collection systems – dockside monitoring, observers, sea and port inspections; (iv) supporting communications systems; (v) appropriate logistics such as patrol vessels, aircraft available for rapid deployment to efficiently search large areas, and new technologies (e.g., VMS, satellite, video, infra-red tracking, etc.); and (vi) support of the industry and fishers. This last component is critical for artisanal fisheries where resources for enforcement and monitoring are usually scarce and/or fishing operations and landings are sparse making MCS a very difficult task.

Another element of an effective enforcement, compliance and MCS is the application of consistent and transparent sanctions of sufficient severity. Post UNCLOS instruments provide wider criteria for the application of sanctions in fisheries. The first criteria relates to the application of sanctions in a consistent and transparent manner, which may be achieved through clear regulatory provisions and mechanisms. The second criterion is for sanctions to be of sufficient severity to ensure that penalties outweigh the benefits derived from conducting illegal fishing activities and hence prevent repeated offences. Sanctions may include administrative and criminal penalties depending on where the violation took place.

MCS mechanisms are often poorly implemented in artisanal fisheries and could not ensure that fisheries management measures are adequately enforced and complied. Regulatory agencies used to have very limited budgets and tend to respond late to the problems at hand, once they are more difficult or even impossible to resolve. This situation commonly occurs because many artisanal fisheries lack long-term strategic planning and accountability mechanisms. In addition, almost all MCS procedures directed to control the amount of catch and fishing effort exerted have been weakly implemented in the artisanal, small-scale fisheries, particularly in developing nations. Some of the reasons for weak enforcement include difficulties to control global quotas due to the high number of fishers involved, the easy access to high unit value resources along thousands of km of coasts, and the lack of control at landing sites because of extremely high enforcement costs where surveillance relies on government agencies, which generally have reduced budgets and staff. This is reflected in a lack of compliance in management regulations by the relevant stakeholders (Caddy and Defeo, 2003).

For artisanal fisheries, compliance with fisheries regulations depends greatly on enforcement by resource users (self-enforcement) and not only on fisheries enforcement by national authorities. In fact, the *FAO Technical Guidelines* No 4 on Fisheries Management provides that greater participation in the management process by fishers and interested groups tends to lessen infringement of regulations. Involvement in the management process, through consultations and decision-making process typical of co-managed systems, allow fishers to assume greater responsibility in complying with MCS tools and reduces the responsibility borne by management authorities. This includes: (i) cooperation of fishers with management authorities in providing accurate fisheries data, (ii) willingness to be subjected to independent verification processes, and (iii) provision of additional, and sometimes confidential, information that may assist managers in adopting appropriate fisheries management measures.

In some co-managed artisanal fisheries, the strengthening of local institutions or organizations led to the implementation, by fishers themselves, of effective MCS procedures that: (i) attenuated governmental enforcement costs, (ii) significantly

increased the effectiveness of management strategies based on the control of the amount of catch and effort exerted, allowing the components of this multifaceted system to think that sustainability could actually be achieved in artisanal fisheries (Defeo and Castilla, 2005). In fact, Gutiérrez *et al.* (2011) concluded that both self-enforcement of rules and regulations and MCS mechanisms are important for a successful co-management of artisanal fisheries. Within these, the user's ability and effectiveness in enforcing management regulations (e.g., clear and effective system of penalties imposed by strong operational rules specified, enforced and controlled by local fishers) encouraged compliance on regulations resulting from management measures imposed in each co-managed site by the communities themselves.

- In artisanal fisheries, compliance with fisheries regulations depends greatly on enforcement by resource users (self-enforcement) and not only on fisheries enforcement by national authorities.
- Involvement in the management process, through consultations and decision-making process typical of co-managed systems, allow fishers to assume greater responsibility in complying with monitoring, control and surveillance (MCS) mechanism and reduces the responsibility borne by management authorities.
- In some co-managed artisanal fisheries, the strengthening of local institutions led to the implementation, by fishers themselves, of effective MCS procedures that attenuated governmental enforcement costs, increased the effectiveness of management strategies based on the control of catches and effort, contributing to the overall sustainability of the fishery.
- Self-enforcement of rules and regulations and MCS mechanisms are hence critical for a successful co-management of artisanal fisheries.

6. A legal framework for fisheries co-management: how does co-management fit in national and regional legal frameworks?

6.1. National and international legal frameworks in the Mediterranean

Several legal instruments adopted at the Mediterranean and Black Seas level confirm the trend towards regional co-operation among the States bordering these semi-enclosed seas. Regarding the protection of the marine environment, the main treaties are the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona, 1976; amended in 1995) with its seven protocols, the Convention on the Protection of the Black Sea against Pollution (Bucharest, 1992) with its three protocols, as well as the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (Monaco, 1996). In addition, the Agreement establishing the Mediterranean Science Commission (Madrid, 1919; today the International Commission for the Scientific Exploration of the Mediterranean Sea, CIESM) relates to cooperation in marine scientific research and in the field of fisheries, the two main Commissions include: (i) the General Fisheries Commission for the Mediterranean; and (ii) the International Commission for the Conservation of Atlantic Tunas.

The General Fisheries Commission (formerly Council) for the Mediterranean (GFCM) was established in 1949 as an institution under the auspices of the FAO to co-ordinate activities related to fishery management, regulation and research in the Mediterranean and Black Seas and connecting waters. The GFCM has the objective of promoting the development, conservation, rational management and best utilization of all marine living resources, as well as the sustainable development of aquaculture in the area falling under its competence. Moreover, it is required to apply the precautionary approach, when formulating and recommending conservation and management measures, and to take into account the best scientific evidence available and the

need to promote the development and proper utilization of marine living resources (Article 3). The Commission also exercises scientific and consultative functions, in order to keep the state of the resources and the state of the fisheries under review. Within the GFCM, a number of committees have been established, such as the Scientific Advisory Committee (SAC), advised by various subcommittees, the Committee on Aquaculture (CAQ) and the Compliance Committee (CoC). By a two-thirds majority the GFCM can adopt binding recommendations on conservation and rational management of the resources, as well as measures for their implementation in order to promote convergence and consistency within the fisheries legislation adopted by the parties.

Within several GFCM Members, there has been a lack of coordination between different institutions or agencies, which are entitled to exercise authority in the field of fisheries and related subjects, such as the protection of the marine environment. For example, marine protected areas can be established by both the Ministry in charge of fisheries and the Ministry in charge of the environment. The general view is that overlaps and gaps should be avoided as much as possible, through a clear allocation of competencies and appropriate means of inter-agency coordination (GFCM, 2011). The question of competencies allocated to regional or local authorities should also be taken into consideration in this regard. In addition, in relation with small-scale, artisanal fisheries, the general view from member States is that traditional custom and institutions should be maintained and supported provided that they are consistent with responsible fisheries (GFCM, 2011).

At the national level, access to fisheries resources is generally controlled by States through an official document granting the stakeholder the right to fish, as determined under national legislation or fisheries access agreements. The name of this document, be it "licence", "authorization", "permit", "concession" or other, varies depending on national legislation. Regarding commercial fishing activities, access regimes apply to fishing vessels and individual fishers. Supplementary approvals may be required for certain specific fishing activities. Also recreational fishing activities occurring within territorial waters are often regulated, given their increasing importance in the region and their potential impact on commercial resources. Sometimes, fishing operations conducted solely for the purpose of scientific investigation are not subject to the fisheries regime, but fall under the legislation covering marine scientific research.

In terms of conservation and management measures at the National level, the Article 7.1.8 of the FAO Code of Conduct for Responsible Fisheries (CCRF) mentions that "States should take measures to prevent or eliminate excess fishing capacity and should ensure that levels of fishing effort are commensurate with the sustainable use of fishery resources as a means of ensuring the effectiveness of conservation and management measures". The conservation and management measures that have been frequently adopted in the Mediterranean and the Black Seas are related to the fishing capacity, the fishing effort, the protected areas (so-called "area-based management tools") and species. Moreover, Article 7.7.3. of the CCRF establishes that "States, in conformity with their national laws, should implement effective fisheries monitoring, control, surveillance and law enforcement measures including, where appropriate, observer programmes, inspection schemes and vessel monitoring systems".

- Several legal instruments adopted at the Mediterranean and Black Seas level, and particularly those within the domain of the General Fisheries Commission for the Mediterranean (GFCM) confirm the trend towards regional co-operation among the States bordering these semi-enclosed seas.
- In relation with small-scale, artisanal fisheries, the general view from the GFCM member States is that traditional custom and institutions should be maintained and supported provided that they are consistent with responsible fisheries

6.2. Particular legal needs for co-management

As mentioned in section 3.2, the first pillar for successful co-management implementation relates to the existence of enabling legislation and policies. Moreover, for co-management to become a more mainstream scheme, governments in the region must establish appropriate legislation and policy frameworks, and more fully engage in the process. The establishment of appropriate government policies and enabling legal environments are essential in efforts to both sustain existing local level fisheries management systems and/or to develop new co-management systems.

In order to allow for a policy framework that is supportive of fisheries co-management, several attributes need to be present (McFadyen, 2004; Symes 2012): (i) decentralisation should be encouraged if not implemented within fisheries policy; (ii) the importance of undertaking legal/policy reviews of decentralisation of fisheries management/administration and co-management at the same time to ensure a cohesive and complimentary effect; (iii) an enabling policy environment supportive of co-management, more likely when a wide range of stakeholders are involved in the process to develop policy itself; (iv) fisheries policy content can be supportive of co-management through the inclusion of general statements of principle about the need for participatory, consultative and transparent management of the fisheries sector, and cross-sectoral integration; (v) fisheries policy documents can highlight co-management as a strategy to be used to achieve fisheries management goals (e.g., "fisheries will be managed to ensure the long-term sustainability of resources, for example using a co-management approach"); (vi) policy content should directly or indirectly be supportive of co-management success factors, including access rights, institutional strength of local organizations and their leadership, recognition of existing local fisher community organizations, local political support, appropriate incentives for local users to engage with co-management, and the need for formal legislation to back up/codify community rules and resolve disputes (Gutierrez *et al.* 2011; Cinner *et al.* 2012); (vii) policy should include support for research on how to move beyond pilot approaches to mainstreaming co-management, and on assessing the positive impacts of co-management; (viii) a policy framework supportive of co-management must be kept in place in the long-term so as to ensure gradual improvements and institutionalization of partnership arrangements, based on appropriate provision of financial resources and commitments to institutional strengthening; (ix) co-management initiatives might engage more fully with larger-scale commercial/industrial interests so as to commit them with co-management partnerships; (x) co-management initiatives can be enhanced and supported through appropriate local level research and better linkages between researchers, policy makers and fishers at the local level; (xi) attention must be paid to specifying appropriate scales of co-management.

The legal basis for resource users' participation in resource management is also vital and must address fundamental concerns, which include (Pomeroy *et al.* 2001; Kuemlangan, 2004): (1) who has the right to use the resource; (2) who owns the resource; and (3) what is the legal framework for implementing co-management arrangements, as arrangements may be undermined in the absence of a legal basis. The role of the government in establishing conditions for co-management is therefore crucial. As in previous paragraph, some important considerations to bear in mind when developing legislative frameworks include (McFayden 2004): (i) non-fisheries specific legislation should be considered for its support to fisheries co-management, as well as for its relationship to specific fisheries legislation (either in place or being developed) that is supportive of co-management; (ii) a legal framework supportive of co-management, and supported by stakeholders, more likely when a wide range of stakeholders are involved in the process to develop legislation itself; (iii) co-management initiatives should ideally ensure that fisheries legislation is supportive of them; (iv) fisheries legislation should ideally contain dispute resolution mechanisms to deal with user conflicts, and

to ensure that local rules/regulations do not conflict with national-level legislation and policy; (v) fisheries legislation should specify the extent to which local autonomy in developing management rules and legislation will be accepted; (vi) national fisheries legislation should provide for a broad and flexible legislative framework that enables a choice over co-management arrangements and rules, with detailed mechanisms set out in regulations that can be changed if necessary; (vii) national fisheries legislation should contain specific reference to co-management, or provide indirect support to key success factors that need legislative support.

These attributes will contribute to legislations that are amenable or suitable for the implementation of co-management schemes, the existence of specific legal frameworks are not a pre-requisite for the implementation of co-management *per se*. For instance, Gutiérrez *et al.* (2011) found that legislation on co-management practices at the national level was not a critical attribute for co-management success. On the contrary, political will is the key to the establishment of co-management mechanisms. It is a necessary pre-requisite without which co-management initiatives are unlikely to succeed. It must be reflected in attitudes and demeanours, as well as supported within policy, legislation and actions specific to the fisheries sector (Chuenpagdee and Jentoft, 2007). The nature of policy and legislative frameworks as well as the commitment by governments to co-management is sometimes more rhetoric than reality, with insufficient transfer of powers and financial resources to local levels.

- An existing enabling legal environment is essential in efforts to both sustain existing local level fisheries management systems and/or to develop new co-management systems.
- Although there are many attributes contributing to policies and legislations that are amenable or suitable for implementation of co-management schemes, the existence of specific legal frameworks are not a pre-requisite for the implementation of co-management *per se*.
- On the contrary, political will is the key to the establishment of co-management mechanisms. It is a necessary prerequisite without which co-management initiatives are unlikely to succeed. It must be reflected in attitudes and demeanours, as well as support within policy, legislation and actions specific to the fisheries sector.

7. Identification of capacity-building needs for fisheries co-management

The term "capacities" encompasses the attitudes, knowledge, skills, resources and social recognition that allow a stakeholder to take part in the co-management process. A variety of main stakeholders, including governmental agencies and academic institutions, often benefit from or need support to build their capacity on participatory forms of fisheries management. This may entail changes in their structure, organisational objectives, attitudes, skills and work programmes. The agency staff needs orientation towards understanding people's needs and rights, appreciating their knowledge and practices, and grasping the social complexities of community rules. In addition, technical assistance in establishing the enabling regulatory framework for local empowerment, capacity-building, and training for fisheries management needs to be present. Finally, simplification of stock assessment methodologies and simple ways of communicating its results would benefit the system by enabling fishers to attain greater capacity-building and ownership of the process. However, to be meaningful, a reduction in the complexity of stock assessments must be accompanied by an increase in the degree of knowledge transfer between stock assessment scientists and managers and fishers (Freire and Garcia-Allut, 1999; Walmsley *et al.*, 2005).

Capacity-building is critical to empower fishing communities to actively participate in fisheries co-management. In general, local user's motivation, an attitude that cannot be provided from outside, rather than external support, is an essential condition for successful co-management. The first "capacity" that should be supported to develop is the capacity to think collectively and develop an internal consensus on what is needed to be done or which local capacities are needed. Then, given that users have identified their own capacity needs, they have then a strong motivation to acquire the relevant knowledge and skills.

The capacity of individuals within the users' organization to participate effectively in fisheries co-management must be enhanced through capacity-building targeted to: (i) understanding co-management theory and practice; (ii) understanding how to organize and participate effectively; (iii) communicating information about fishery management and business administration to stakeholders; (iv) understanding how to participate in the negotiation process; (v) determining mission and strategy of the co-management plans; (vi) developing the organizational culture and structure (management methods, organization structure, and competence); (vii) developing the organizational interaction process (communication, planning, building consensus, research/development of policies, etc.); (viii) developing techniques in conflict management; (ix) understanding the source of information, understanding infrastructure and finances; and (x) understanding the importance of data collection, analysis, stock assessment and monitoring of their own resources.

Besides capacity-building directed to managers and users, awareness and capacity-building amongst senior decision-makers may be also a critical investment needed to ensure on-the-ground environmental and social sustainability at the community level (Wiber *et al.*, 2004). It is important to consider that the capacity-building process is inevitably time-consuming and effective results may take years to unfold.

In summary, "capacity-building" initiatives in co-management processes can support main actors to: (i) understand what co-management entails and how stakeholders can organise themselves to participate proactively; (ii) master knowledge and information about the fishery resources at stake, including knowledge of existing environmental problems, needs, constraints and opportunities (including the costs and benefits of various management options), and assess relevant changes; (iii) foster participatory and communication skills, attitudes and behaviours needed to learn from users as well as methods for participatory learning and action among technical and scientific staff; (iv) become a recognised and legitimate actor, which in most cases will imply taking on a legal identity; and (v) deal effectively with agenda of meetings, records, accountings, financial reports, proposals, etc.

- Capacity-building is critical to empower fishing communities to actively participate in fisheries co-management.
- In general local user's motivation, an attitude that cannot be provided from outside, is an essential condition for successful co-management.
- The first "capacity" that should be supported is the capacity to think collectively and develop an internal consensus on what is needed to be done or which local capacities are needed.

CONCLUSIONS AND SALIENT ISSUES

Fisheries have taken place in the Mediterranean Sea for millennia. Such a protracted fishing tradition resulted in the emergence of self-management schemes that developed in the Middle Ages with formal structures – fishing guilds – some of which are still in place (*Cofradias, Prud'hommies*). Self-management of fishing activities is a global phenomenon and occurs there where there is a long fishing tradition by well-

structured coastal communities. Modernization of fisheries and a strong centralization of management in recent times weakened self-management and increasingly alienated fishermen, often resulting in mismanagement and overfishing.

Co-management may be considered a natural adaptation and evolution of former self-management schemes. Joint management by fishers, administrations, scientists and other stakeholders through "co-management committees" or equivalent arrangements often results in effective rules adapted to local realities, real time adaptive management and high compliance due to strong sense of ownership of the management process by stakeholders. Additionally, co-management has the potential for strongly reducing the costs of control and monitoring, which could be largely assumed by fishers themselves. In summary, co-management has the potential to represent an excellent delivery mechanism for sustainable fisheries in the Mediterranean.

Based on the present document, we recommend a progressive implantation of fisheries co-management in the Mediterranean region built on the following elements:

1. Establishment of an active network of fisheries co-management pilot cases in the Mediterranean: such a network should include at least one case per country, whenever possible; a particular effort should be made to ensure a good coverage in the south and the east of the region.
2. GFCM, working with its Member countries and other partners, would facilitate a smooth functioning of the co-management network, including the compilation of good practices, the internal flow of information among members and the wide external dissemination of main achievements in view of encouraging and supporting replication to other fisheries in the region.
3. Evaluation of capacity-building needs for fisheries co-management based on first lessons learned from pilot case experiences and other sources: a capacity-building programme supporting co-management in the Mediterranean region should then be established and adequately funded.

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FULL PAPERS

Co-management: getting States and the fishing sector to share responsibilities and dialogue on the sustainability of the sea

Fundación Lonxanet para la pesca Sostenible Team
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ABSTRACT

There are many factors in fisheries that encourage a productive rationale oriented towards the overexploitation and potential collapse of fisheries resources. The market, with its fragile regulations and lack of transparency, is one of them. Centralized models, their frameworks and dynamics from within fisheries are managed, are another factor leading to the intensification of the fishing effort. Centralized management models in modern States – pushing management from the top – have led to a significant dissociation between States and civil society. This dissociation has rendered management ineffective. Centralized models, supported by powerful and expensive fishery regulatory and control systems, have been unable to prevent a productive behaviour based on a maximization strategy in the fishing sector, leading to bad practices (poaching and illegal fishing). Given this situation, how should sustainability be addressed in the management of fishery resources? Strengthening the centralized management models or turning to new models of governance? How can a fragmented artisanal fishing sector address it? This paper shows, through two case studies (the Marine Reserves for Fishery Interests "Os Miñarzos" and "Ría de Cedeira"), what the keys to a paradigm shift are, and how equally-based co-management is a fundamental tool for opening up dialogue and collaboration between States and the fishing sector.

INTRODUCTION

According to the FAO, 85 percent of world fisheries are fully exploited, overfished or depleted[1]. In the region of the Mediterranean, the situation of stocks is one of serious overfishing. More specifically, 95 percent of the fish population of the Mediterranean and the Black Sea is overfished[2], according to the Expert Group for Mediterranean fish stocks, part of the European Commission Scientific, Technical and Economic Committee for Fisheries (STECF).

There are reasons for concern about the situation of fisheries, because of both the global scale thereof and the harshness of the impact. A food crisis would be the most dramatic consequence. This deterioration, however, also affects the fishing sector itself and the social and economic fabric of regions that depend most on fishing, leading to early drop-out of the activity, no generational replacement and the consequent impoverishment of these regions and increase in migration.

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[1] FAO. 2012. The world status of fishing and aquaculture 2012. Rome. 231 pages.

[2] The TAE curve if strictly monitored and enforced, days are strictly defined and directly tied to fishing mortality, and if all vessel days were fully utilized would be perfectly inelastic (i.e. vertical in shape).

Almost all countries make efforts to regulate fishing under criteria of sustainability. However, the global situation of the oceans has not improved. Only 1 percent of the world fisheries seem to recover from overfishing[3]. On the contrary, there is a production logic that prevails in the world scenario, making countries' efforts to reduce this trend quite useless and pushing producers to keep on increasing and intensifying fishing catches, thereby increasing bad practices (poaching and illegal fishing).

FACTORS THAT LEAD TO OVERFISHING

What are the root causes of this situation? There are multiple factors in fishing that favour production logic aimed at maximising catches. The main reasons are market forces, increased competition for resources that are becoming scarcer and scarcer and centralised fishery management models.

The influence of market forces, with their fragile regulations and lack of transparency, is one of them. The market does not wish to hear about sustainability; and countries, given their growth targets, implement policies based on market incentives and consumption, which intensifies the problem.

Increased competition for resources that are becoming scarcer and scarcer is another factor that aggravates the situation. It encourages individualism, the fragmentation of the sector and makes it difficult to implement collective solutions inspired by the general interest. When this happens, equal opportunities for access to resources are shattered in favour of the most technical fleets (industrial fleets). The rights of access to resources are built on the basis of financial and technological capacity to the detriment of the less technical fleets. Furthermore, many management systems redistribute fishing rights (quotas) in an unequal and unfair way, making inequality even more pronounced and denying basic rights to people who have historically depended on fishing.

Centralised models, the architecture and dynamics fishing resources are managed with – this is the third factor that leads to the intensification of fishing. The public authorities define the regulations and propose how to run fisheries, by means of political management with assessment from scientific institutions. In the case of the Mediterranean, some authorities consult the fishing sector – mainly via the regional consulting boards – but they are consultants and their proposals are not binding. Management models in modern countries are characterised by a top-down focus, i.e. they are hierarchical and based on an expensive control system to make sure that the fishing industry complies with the rules. This system has led to a significant disassociation between governments and civil society, creating a breach in which relations between the two parties are marked by mistrust. In such a scenario real collaboration is not easy. The result is inefficient and failed management, in which there is never enough control and it becomes impossible to solve the problem – a situation in which we all lose. Countries' targets for sustainability are opposed to their targets for maximising the fishing industry.

THE NEED FOR A NEW MODEL OF GOVERNANCE AND FISHERY MANAGEMENT – CO-MANAGED MARINE RESERVES AS A TOOL FOR CHANGE

Faced with this brief diagnosis, how should we take on sustainability in the management of fishery resources? By reinforcing centralised models or designing alternative models? How could a fragmented and individualist fishing sector take it on?

The Lonxanet Foundation for Sustainable Fishing[4] is a small civil organisation that has been accompanying local artisanal fishing communities for over 12 years in the implementation on of human, economic, social and environmental projects. We believe that a new model of management and governance is both possible and necessary.

[3] FAO, 2012.
[4] www.fundacionlonxanet.org

The challenge is to restore trust in the fishing sector itself and between the sector and the State. In order to generate trust it is necessary to work with the actual sector and with the state on participative processes based on dialogue. In these processes it is necessary to incorporate principles of transparency, representation, participation, to build up a culture of dialogue focused on trust and joint responsibility.

The Lonxanet Foundation started up a process of this kind in 2003 in Lira, a coastal community in Galicia (Spain), made up of 61 boats and 350 fishermen. The process came to a conclusion in 2007 with the creation by decree of a marine reserve of fishing interest jointly and equally managed by the fishing sector and the State, under the name of "Os Miñarzos" (2 074 ha). In 2006, a new process was started up in the community of Cedeira (48 boats and about 126 fishermen), which culminated in 2009 with the creation of the jointly managed marine reserve of fishing interest "Ria de Cedeira" (720 ha). These initiatives encouraged us to scale up the process with a proposal to amplify the existing marine reserves. We are currently working with 12 fishing communities, 914 boats and about 2 000 fishermen.

Despite the fact that the legal set up is a marine reserve, there are two major differences in these experiences in comparison to other marine reserves in the world – the process of collective construction that led to the design thereof and the representation and functioning of the managing bodies.

THE IMPORTANCE OF THE COLLECTIVE CONSTRUCTION PROCESS AND THE METHODOLOGY TO UNDERTAKE IT

From the methodological point of view of the design for the marine reserve, the changes made in comparison to other reserves include a modified attitude of the facilitating entity towards fishermen and the methodological focal points adopted. Throughout the process the entity has had a low and neutral profile. We adopted a bottom-up approach; we applied participative methodologies and community mediation, in an inclusive, open and flexible way, checking the legitimacy of each step we took. A systemic and holistic approach to the social situation enabled us to integrate the complexity throughout the process. Starting with a fragmented and divided fishing sector, the main challenges were to construct a common expectation for the future, encourage communication, for fishermen to build up trust in themselves (awaken collective awareness) and generate a spirit of necessary social entrepreneurship and autonomy.

In the process of creating the marine reserves, fishermen have taken part in the design and collectively defined the most suitable fishing resources management plan for sustainable fishing. Proposals for regulation were more restrictive than those of the State itself. Furthermore, they incorporated criteria of spatial management which includes no-take zones. By integrating local ecological knowledge into scientific knowledge in the management proposals, the fishermen's vision of sustainability was incorporated and more coherent and realistic management measures were guaranteed.

The process of collective construction and transformation is slow and complicated, but it is necessary, not just to achieve consensus in the proposal but also to increase the fishing sector's commitment to sustainability targets. In order to involve it in this process it was necessary to point out the advantages of constructing a model based on the general rather than individual interest. All this is boosting change, from a more competitive mentality to a more cooperative one. It is almost impossible for the fishing sector to consider going back to the previous scenario – it will keep on defending the new values in the future despite all the difficulties.

CO-MANAGEMENT AS A FUNDAMENTAL TOOL FOR OPENING UP DIALOGUE AND COLLABORATION BETWEEN STATES AND THE FISHING SECTOR

The other major difference in the marine reserves in Galicia is that their relationship with the State is more symmetrical and horizontal: it is the co-management body of the marine reserves. The co-management body is made up of representatives from the public authorities and the fishing sector in equal numbers (with a right to opinion and vote). Scientific institutions, NGOs and other entities can be incorporated as advisors.

There are four members representing the regional government (three appointed by the Fishing Department and one by the Environmental Department). There are also four representatives from the fishing sector (one appointed by the National Federation of Cofradías, another by the Provincial Federation of Cofradías and two more by the local fishing *cofradía* and the promoter). The co-management body was set up thus in order to emphasise the joint responsibility for management between the State and the fishing sector.

The main purpose of the representation of the public authorities on the co-management body is to guarantee, from the point of view of centralised management of criteria in environmental, social and economic sustainability, the general present and future interests of all Spanish citizens, whether fishermen or not. The main purpose of the representation of the fishing sector is to guarantee and defend, with criteria of environmental, social and economic sustainability, the general present and future interests of the fishing sector as opposed to individual interests, for both fishermen who fish in the reserve and those who do not, contributing proposals for improvement. Assessment from the representatives from the scientific community is also vital to evaluate and scientifically defend the management plan presented to the co-management body for its approval. NGOs take part as critical and constructive observers, procuring inclusive dialogue that helps to take decisions with greater transparency and fairness.

Co-management is a fundamental tool for opening up dialogue and collaboration between the State and the fishing sector. These management models favour dialogue and distribute responsibility mainly among fishermen and the public authorities, instead of delegating onto one sole player – the State – all responsibility in the management of common assets.

Shared responsibility has been favoured: the sector's fulfilment and acceptance of regulations has improved, as it is the fishermen themselves who propose the rules. The number of penalties has dropped significantly, as has social conflict.

Collaboration among users has been promoted (as well as among scientific organizations and NGOs) in surveillance and monitoring, resulting in more realistic and reliable data. We are even providing ways to collaborate in the financing of the management thereof (scientific follow-up, surveillance and control, etc).

Moreover, the co-management body enables more flexible, adaptive and efficient management.

THE MAIN OBSTACLES IN JOINT FISHERY MANAGEMENT IN THE CASE OF THE OS MIÑARZOS MARINE RESERVE

There are still certain challenges to overcome in the functioning, despite the fact that it has been reasonably efficient. Neither the representatives from the public authorities nor the fishermen share the same cultural matrix. In the management body, the representatives from the authorities use a more technical language, which is not always understood by the fishermen. Language, the intrinsic position of power and a superior strategic handling of meetings are advantages associated with the representatives from the authorities. Fishermen are at a disadvantage and suffer prejudice, especially in the early stages of the MB. This asymmetric power relationship was transferred to the co-management body. The players do not see each other as equals, and in this regard the fishermen lack a strategy for negotiation.

Another significant hurdle is the lack of willingness by the representatives of the public authorities to reinforce these instruments of dialogue. They do not seem to see the perfect opportunity to build bridges between the authorities and the fishing sector. In fact, last year the regional government of Galicia has shown a deliberate lack of interest. Despite the fact that the reserve is shared with the European Fisheries Fund (EFF) and the national government, the regional government has withdrawn its financing for the scientific surveillance and monitoring of the Reserve. Their reason is the economic recession. The annual cost, however, was under 20 000 euros[5], a small amount if we consider the value of a marine reserve in environmental and socio-economic terms for the population that depend on these ecosystems.

Finally, there are no clear devices for establishing communication between the fishing sector and its representatives on the co-management body. There was a preliminary protocol for communication between the fishing sector and the co-management body, although it was never fully implemented. Individualism, rivalry among fishing communities and resistance to change, etc. have all contributed to this.

The most serious obstacle is the lack of a political vision among our politicians for the value of this management tool as an opportunity to change the management model when it has been internationally recognised[6].

REQUISITES FOR IMPROVING THE EFFECTIVENESS OF CO-MANAGEMENT

These obstacles do not invalidate the co-management model – on the contrary, they reinforce it. All these insufficiencies are reparable. The model requires learning and time to improve its efficiency. In fact, in other experiences of co-managed reserves such as the Ría de Cedeira, these problems have been minimised significantly, and consequently efficiency has improved.

It is necessary to apply an action programme aimed at reinforcing these instruments, to keep on working with fishermen to improve their communication skills with the authorities and to optimise their presence and participation in the co-management body meetings.

A skills training programme is also necessary to work with the authorities in the same direction.

These models are not very numerous but they are changing traditional management models in favour of others which recognise the role of fishers as a determining factor for the sustainability of fishing resources. Increasing control and surveillance systems with the subsequent increase in public spending does not solve the problem of overfishing and does not involve fishermen in joint responsibility.

Building bridges and links from one to the other, when the breach between politicians and society is so deep, is one of the necessary paths to solving the issue of mutual mistrust.

Shared responsibility in the management of common goods is a fundamental key to the collective achievement of sustainability. It also leads to a more articulated society. Trust building as the main driving force is the only possible way to take on global and complex problems and to build the world and a better future that we all want and need.

For further information please visit www.fundacionlonxanet.org or send an e-mail to antonio.garcia.allut@fundacionlonxanet.org

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[5] According to notification from the Lira *Cofradía*.

[6] http://webtv.un.org/search/oceans-sustainable-development-dialogues-rio20/1697291323001?term=oceans

The Co-management Committee of the Catalan sand-eel fishery: a bottom-up approach successfully delivering on sustainability for fish and fishing

Catalan sand-eel fishery Co-management Committee[1]
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ABSTRACT

The sandeel fishery in Catalonia targets two species, *Gymnamodytes cicerellus* and *Gymnamodytes semisquamatus*, which are small short-lived forage fish typically found in shallow sandy bottoms in the Mediterranean. The fishery is based on small-scale seines which operate on a daily trip basis, and landings are entirely aimed at direct human consumption. The Co-management Committee, created in April 2012 with the responsibility to manage the fishery, proved to be a watershed in the performance of the fishery. The Committee is composed of representatives of the five main pillars: fishermen, Catalan authorities, Spanish central authorities, scientists and NGOs, all on equal footing with respect to decision-making regarding the rules and their implementation. A regular follow up of the fishing activity is being made by a permanent commission of the Committee which is meeting once a month. The functioning of the Co-management Committee and the permanent adaptation of the management and control measures has proven to be extremely successful. The first very encouraging and promising results can be summarized as follows: 1) a strong sense of ownership of the management process among all relevant stakeholders resulting in very high adherence to the rules; 2) profits for fishermen had multiplied per three in spite of fishing effort being reduced by half, basically due to the eradication of a previously existing black market and to the implementation of an individual daily quota; and 3) a positive social impact on the local communities through an increment of vessels' crew. The

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experience is also being highly instructive for all stakeholders as regards the relevance of bottom-up participative approaches in improving fisheries management. Moreover, the strong buy-in from the administrations involved crystalizes in their promotion of the replication of the model to other fisheries. The Co-management Committee of the Catalan Mediterranean sandeel fishery brings in a novel participative, bottom-up approach to the management of fisheries.

INTRODUCTION

The sand-eel fishery in Catalonia targets two species, *Gymnamodytes cicerellus* and *Gymnamodytes semisquamatus*, which are small short-lived forage fish typically found in shallow sandy bottoms in the Mediterranean and adjacent east Atlantic waters (Sabatés *et al.*, 1990). Individuals of both species rarely reach 15 cm length, are easily distinguished by their color, and known in Catalan as "*sonso blau*" (blue sand-eel) which represents most of the catch, and "*sonso ros*" (blonde sand-eel), respectively.

Unlike the industrial sandeel fishery in the North Sea harvesting hundreds of thousands of tonnes for reduction to fishmeal, the Catalan fishery is based on small-scale seines and yields less than one thousand tonnes of catch annually. Boats operate on a daily trip basis and landings are entirely aimed at direct human consumption, as the species is highly appreciated in the region and fetches a good price at the local markets.

The currently authorized fleet is limited to 25 vessels operating from 7 different fishing ports along the Catalonian coast (Figure 1). The number of fishermen on board is either 2 or 3 meaning that the total fishermen participating in the fishery could oscillate between 50 and 75. The fishing gear currently used (called "*sonsera*" after the fish called "*sonso*" in Catalan) has two lateral wings with a maximum length of 125 m followed by a cod-end of 30 m. The maximum height of the gear is 20 m from the surface.

REGULATORY FRAMEWORK

After a fishermen's initiative, the first regulatory framework specific for the fishery was adopted in 1987. A key element of this initial regulation was the implementation of a seasonal closure during the reproduction period. This period, proposed empirically by the fishermen following their traditional knowledge and observations, was set from 15 December to 1 March. However, in spite of the management measures in force it is widely acknowledged the fishery was plagued with huge underreporting of catches and resulting black markets.

In 2006, the European Union adopted the first comprehensive regulatory framework concerning management and technical measures for the European countries in the Mediterranean, the so-called "Mediterranean Regulation"[2]. One of the pillars of this regulation is a provision for the compulsory adoption of management plans by Member States for fisheries conducted by trawl nets, boat seines, shore seines, surrounding nets and dredges within their territorial waters not later than December 2007. With the specific mention of boat seines this provision directly affects the *sonsera*. Moreover, the same regulation adopts technical measures related to the mesh size, and the minimum distance to the coast and depths allowed for towed nets, which have also impact on the fishery. From July 2008 the mesh size for towed gear was established either at 40 mm if square or 50 mm if diamond shaped at the cod-end; and the use of the gear was prohibited within 3 nautical miles of the coast or within the 50 m isobaths where the depth is reached at a shorter distance from the coast. Both technical measures, after the same regulation, benefit from a transitional derogation until the end of May 2010.

[2] Council Regulation (EC) No 1967/2006 of 21 December 2006.

However, both measures may even benefit from a permanent derogation if duly justified with scientific evidences and in the context of a management plan. An indispensable additional requirement for vessels to obtain the later derogation (minimum distance to the coast) is to have a track record in the fishery of more than five years without any possibility of a future increase in fishing effort. This later measure had a crucial impact in the size of the fleet targeting sandeel in the Catalan region since it resulted in an effective close list of 25 vessels allowed to fish for the species.

The needed management plan for the fishery addressing the mentioned derogations was initially sent to the European Commission in 2010, and revised versions of the plan in 2011. In January 2012, the submitted plan was rejected due to the lack of scientific study supporting the proposed measures and derogations. Therefore, the fishery was deemed illegal and forced to close, thus leading to a huge crisis in the sector, which approached the NGOs, scientists and the different administrations calling for support. After the agreement of the members of the four groups (fishing sector, scientists, administration and NGOs) the Co-management Committee for the sandeel fishery in Catalonia was created in April, 2012 (Lleonart *et al.,* 2014).

After a remarkable dedication and commitment of each of the five pillars constituting the Committee working together to unblock the situation, its members succeeded to get the approval for the development of a "scientific fishery" under highly strict and precautionary rules with the purpose of carrying out the scientific study needed to develop the required management plan during the following 18 months. The plan, after approval by the competent authorities, would allow the opening of the commercial fishery for the 2014 fishing season. The legal provisions allowing for the scientific fishery are specifically stated in the so-called "EU Control Regulation"[3] by which a Community fishing vessel shall be authorized "fishing for scientific purposes" only if "indicated in a valid fishing authorization". Moreover, the same regulation also allows for the commercialization of the catches when carried out for scientific purposes. In addition, an authorized fishing for scientific purposes would be exempt from the obligation of compliance of the technical measures provided by the Mediterranean Regulation as clearly stated in its first article.

WHY CO-MANAGEMENT?

Fisheries management through co-management transfers the management responsibility to all stakeholders involved in the fishery. Under this innovative approach, management measures, including monitoring and control measures, are jointly designed by all the involved stakeholders. The full participation of the fishing sector in the decision-making process is particularly relevant since it ensures their proactive participation and genuine commitment to sustainability (Nielsen *et al.,* 2004). This commitment is crucial in providing a real incentive for a thorough adherence to the management rules. This management approach also properly recognizes the social and cultural values of the fishing sector and therefore their long standing tradition particularly relevant in coastal regions (Castilla and Defeo, 2001; Pomeroy, 1995).

THE CO-MANAGEMENT COMMITTEE

The Co-management Committee of the sand-eel fishery was created with the aim of guaranteeing the long-term sustainability of the fishery by carrying out all the needed actions for the purpose. Those actions, in this particular case, included: 1) the design of the scientific study, the fundamental basis for the adoption of the required comprehensive management plan for the species; 2) setting the rules for the fishery

[3] Council Regulation (EC) No 1224/2009 of 20 November 2009

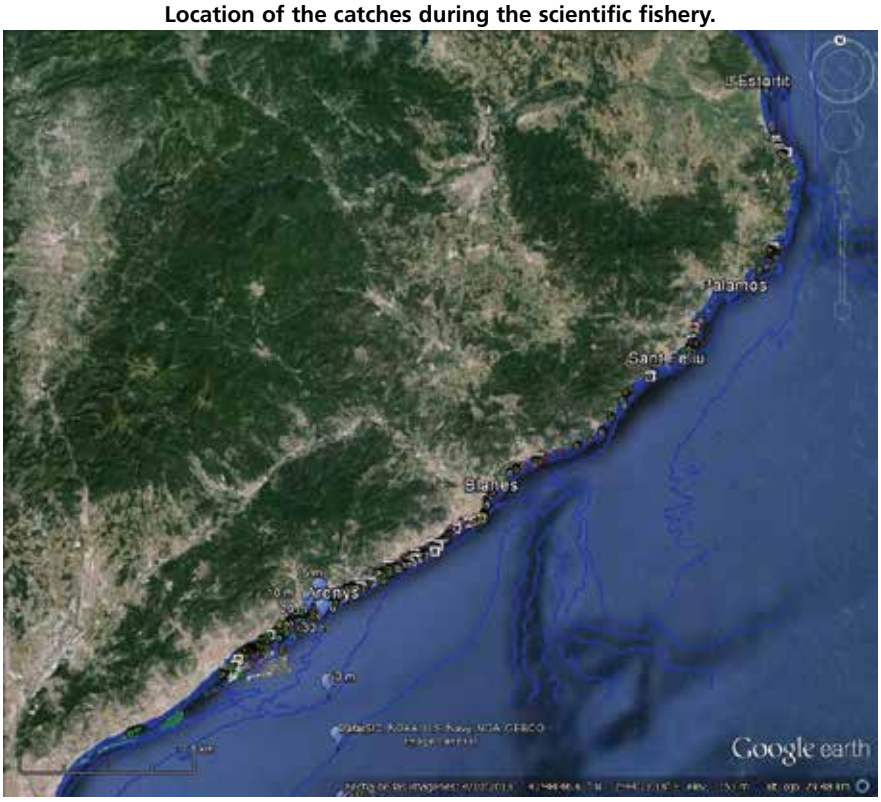
under an adaptive management approach during the scientific fishery; and 3) a close monitoring of the activity including assessing compliance to the rules in force, and agreement on sanctions if applicable.

Members of the Committee agreed on a formal composition of five pillars, each allocated to representatives of the fishing sector, the Catalan authorities, the Spanish central authorities, scientists, and NGOs, respectively; all on equal footing with respect to decision-making regarding the rules and their implementation. Two bodies, the plenary and the permanent commission, compose the Committee. The permanent commission made of ten members (two per pillar) works as a technical working group for the close follow up of the fishery and meets at least once a month. During this monthly meeting decisions are taken by consensus whenever possible and at least by a majority of seven votes. The plenary of the Committee meets once a year or by petition of the permanent commission. The secretariat of the Committee is assumed by the Catalan administration and meetings usually take place in its headquarters.

THE SCIENTIFIC FISHERY

The scientific fishery was authorized until 15 December 2013, when the next seasonal closure confirmed by the current scientific study should start. The Committee designed the characteristics and measures to be in place during the scientific fishery, and established an associated "compliance protocol" in order to ensure strict adherence to the rules during the study. The maximum number of fishing vessels operating simultaneously during the scientific fishery was set at 10 out of 25 usually operating in the fishery. In order to facilitate the participation of all operators in the scientific study, a calendar establishing the names of the vessels operating per week allowing the rotation of all vessels was agreed. The biological sampling was planned to take place during 4 fishing trips per month during 12 months (making a total of

FIGURE 1
Location of the catches during the scientific fishery.



Source: Data were registered in the logbook by the fishermen (circles) and by scientists on board during the scientific sampling (squares). Different colors correspond to different months.

46 fishing trips from August 2012 to July 2013). During the whole period assigned for the scientific study, the fishing vessels not authorized to fish according to the adopted calendar should stay at their base port.

For the purpose of the scientific study, the authorized vessels should complete a catch document after every daily trip. The catch document includes basic information of the activity such as the date of the fishing trip, vessel and fishermen details, port name, exit and entrance time, and place of the first sale market. It also contains detailed information about the catch such as its time, geographical coordinates, percentage of each of the two sandeel species caught, total weight, and accompanying species. The completed catch document should be handed to the corresponding fisheries association (*cofradía*) at the moment of arrival in port. The fisheries association should send the documentation to the administration within the next 24 hours.

MANAGEMENT MEASURES DURING THE SCIENTIFIC STUDY

The main management measures agreed for the period during which the scientific fishery took place were:

- The *sonsera* fishing gear can only operate in sandy bottoms and never over marine phanerogams beds or rocky bottoms;
- The exit and entrance of fishing vessels, landing and commercialization of the catches can only take place in the following fishing ports and markets: Barcelona, Badalona, Arenys de Mar, Blanes, Palamós, Sant Feliu de Guíxols and L'Estartit;
- The activity can take place only from Monday to Friday (except if holiday) within a specific timeframe;
- A maximum daily catch per vessels was originally agreed at 500 kg for vessels taking on board two fishermen and 660 kg if more than two. Additionally, catches during the 2013 fishing campaign (from 1 March to 15 December) should not exceed those of 2012 which amounted to 819 tonnes. Therefore, the initially set daily catches already underwent adaptive variations later agreed during the monthly meetings of the permanent commission.
- Commercialization of by-catch is forbidden (the level of by-catch is very low and species can be returned back alive to the sea).
- Associations of vessels from the same base port for the joint management of their daily catch may be established after its approval by the permanent commission. None of the vessels participating in the associations can stay at port.

THE CONTROL PROTOCOL ASSOCIATED TO THE SCIENTIFIC STUDY

The control of the fishing activity is regulated by a control protocol adopted by the Committee, which includes:

Strict control of the daily catch: Up to 10 percent excess of the daily catch is allowed from Monday to Thursday. On Fridays, the daily catch should be adjusted to compensate potential over-catches during the previous four days. If there is an excess of the mentioned 10 percent of the daily catch, benefits from the commercialization of the catch are donated for beneficence purposes, and, its accumulated excess during the month are deducted from the catching possibilities of the following month.

Landing control: All vessels should land their total catch in their base port. The fish, once landed, should be transferred to standardized boxes to be weighted at the fish market associated to the base port.

Market measures: As a general rule, the fish should be sold at the fish market associated to the base port, where the first sale note is generated. If the first sale is to take place in a fish market associated to a different fishing port, the fish should travel together with a transport document. In this case, the destination fish market will generate the first sale note. To guarantee a proper control of the first sale notes by the

Co-management Committee, the first sale should take place only within the Catalan territory.

Fishing time: The exit hour is either 6:00 or 7:00 am (according to the month of the year) and the gear cannot be set before dawn. Entrance to port should be before 2:00 pm.

Disciplinary measures: Non-compliance to the rules established by the control protocol shall be studied and evaluated by the permanent commission of the Committee, which will apply disciplinary measures accordingly. These measures could even imply the exclusion of the vessel of the scientific study to which the protocol applies.

FUNCTIONING OF THE CO-MANAGEMENT COMMITTEE AND INITIAL RESULTS

The permanent commission of the Committee is meeting once a month to analyze the fishing activity during the previous month, including the scientific sampling and evolution of the scientific study, the catch levels and associated compliance measures, communications and petitions from the sector (such a variation of calendar of a specific vessel, a petition of a new vessels association, etc.), and disciplinary measures if applicable. It is noteworthy that during the more than a year of life of the Committee, all decisions of its permanent commission have been adopted by consensus with full agreement of all its members. Those decisions included a continuous improvement of management measures by adapting the original set of rules to the daily reality. A few sanctions have also been adopted.

The functioning of the Co-management Committee and the permanent adaptation of the management and control measures has proven to be extremely successful. Among the main reasons of this success has been the trust between all members of the committee and their huge commitment to working together towards the same objective. Indicators of the first very encouraging and promising results can be listed as follows:

- The sense of ownership of the management process among all relevant stakeholders resulted in a very high adherence to the rules;
- Fishing effort has been reduced by half. However, profits for fishermen had multiplied per three. There are basically two reasons for that: the elimination of the black market that was existing prior to the current management model, which overloaded the market by strongly reducing prices; and the strict control of the amount of fish at the auction market through the implementation of an individual daily quota;
- The model had also a positive social impact on the local communities since, due to the profitability of the fishery, the owners of vessels who operated with two fishermen on board had decided to increment their crews to three;
- The experience has been highly instructive for all stakeholders as regards the relevance of bottom-up participative approaches to dramatically improve management success;
- The strong buy-in from the two administrations involved, who are already promoting the replication of the model to other fisheries.

A management plan based on the scientific findings was agreed by the Committee and recently submitted to the competent authorities. The formal approval of the management plan, expected by March 2014, will allow the commercial fishery from its 2014 fishing season, which starts after the seasonal closure in March. The Co-management Committee will continue carrying out its functions in the new context of the approved management plan for the commercial fishery.

ACKNOWLEDGEMENTS

The authors wish to thank in particular all sandeel fishermen of Catalonia, who strongly committed to the data recording and biological sampling used for the scientific assessment of the fishery. The field and laboratory work of Ana Isabel Colmenero, Alfredo Garcia de Vinuesa and Elia Vallejo is acknowledged. The authors also wish to highlight the excellent collaboration among all members of the organizations participating in the co-management committee who fully supported the process with time and resources. In particular we wish to mention Mercè Santmartí, former Director General of Fisheries and Maritime Affairs of the Catalan government, and Jordi Ciuraneta, current Director General of Fisheries and Maritime Affairs of the Catalan government. The contribution and commitment of Anna Rosa Martínez, former representative of Greenpeace is likewise acknowledged, as well as the contribution of Luigi Ceccaroni from the same organization.

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How could we convince fisheries stakeholders to establish no-take zones? Lessons from small-scale fisheries in Gökova Bay (eastern Mediterranean), Turkey

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ABSTRACT

This study aims to share the experiences and procedures followed on the way to establish 6 separate no-take zones (NTZ) within the marine protected area (MPA) in Gökova Bay, eastern Mediterranean, Turkey. Although many small and large budget projects and studies have been carried out in the Gökova Bay in the last decade pertaining directly or indirectly to small-scale fisheries, we have observed a falling rate of production and increasing unhappiness among fishermen. Over a couple of years, fishermen began to suffer from puffer fish damage (*Lagocephalus sceleratus*), which had been firstly recorded in their fishing zones in 2003. In the following years, landings of a commercially significant species, caramote prawn (*Penaeus kerathurus*), dramatically decreased in the area. Through illegal spearfishing – especially practiced during the night times by light and scuba equipment – large amounts of grouper species were harvested. This discontent peaked in 2009. We studied the production quantities and income records of local cooperatives between 2006 and 2009; the comparison revealed serious declines. Traditional management tools were insufficient neither for the fisherman nor for the preservation of the fish. We also detected a significant decrease in the incomes and catch quantities of fishermen, be them working independently or as cooperative shareholders. In 2010, we started organizing a series of meetings within the scope of a UNDP GEF Small grant Programme (GEF/SGP) project and invited all shareholders, fishermen leaders, cooperative managers, representatives of legislative bodies, scientists who had worked in the area as well as NGOs. The topic was obvious: to eradicate illegal fishing in Gökova Bay, to include all fishermen and shareholders in the management and revive the fisheries of the area to its days of abundance. To accomplish this, we observed that traditional management tools were insufficient and NTZs should be established within the MPA, and that both fishermen and NGOs should partake in the fight against illegal fishing. In July 2010, a number of 6 NTZs were established; a declaration was passed to regulate fisheries and fishing in the bay. This was a first success of the co-management movement. Efforts for establishing NTZs in the Gökova MPA also contributed to the development of co-management, which indeed is an important approach to fisheries management. The evaluations in the following three years contain plenty of information and experience that could well be the subject of another study.

INTRODUCTION

In our days, we face the consequences of diminishing resources and deterioration in the marine areas due to excessive use. The fact that underwater world is not visible to naked eye could be leading to the indifference of people towards the conditions of underwater living resources; however this attitude also results in a diminution of the services complex underwater ecosystems like fish stocks offer and thus confront us with further serious problems, solutions of which scientists and managers are looking for. The establishment of MPAs and NTZs and successful protection and management of these zones appear to be the foremost remedies for a sustainable use of marine resources and to overcome these problems. Traditional fisheries management measures and tools are not sufficient to protect biodiversity and ensure sustainability in marine fisheries (Holland and Brazee, 1996; Roberts, 1997; Ramos Esplá *et al.*, 2004). Despite long years of debate, for the last two decades ecosystem-based fisheries management (EBFM) and MPAs as tools for this approach, and more importantly NTZs, are considered as the most effective to improve fish stocks and the ecosystem as well as for a successful fisheries management (Holland and Brazee, 1996; Badalamenti *et al.*, 2000; Roberts *et al.*, 2001; Salm *et al.*, 2000; Sumaila *et al.*, 2000; Ramos Esplá *et al.*, 2004).

MPAs cover only 2.3 percent of world seas (Spalding *et al.*, 2012). In the Mediterranean, however, this ratio is 1.08 percent and NTZs merely account for 0.1 percent of the whole Mediterranean (Gabrié *et al.*, 2012). In Turkey, special environmental protection areas (SEPA) cover 2 866 km^2 marine and 10 493.08 km^2 land areas. The protected coastal line accounts for approximately 15 percent of the Turkish coastal line, with 1 134 km (Aktaş *et al.*, 2011). Although the situation hardly differs from that of the Mediterranean in terms of NTZs, co-management approaches in recent years have led to important steps and declarations of NTZs one after the other with the attendance of fishermen.

This study aims to share the experiences and procedure followed on the way to establish 6 separate NTZs within the MPA in Gökova Bay, eastern Mediterranean, Turkey.

FIGURE 1
Map of Gökova Bay and protected area (Southern Aegean Sea), Turkey

Source: AktaŞ *et al.*, 2011.

MATERIAL AND METHOD

Study site, background information and fisheries features of the Gökova Bay

There are a total of 16 SEPAs in Turkey. Part of the Gökova Bay including both marine and land areas was determined and declared as a SEPA by Decree no. 88/13019 of the Cabinet of Ministers (dated 12 June 1988). Afterwards, the border change of the Gökova SEPA was approved by Decree no. 90/1117 of the Cabinet of Ministers (dated 22 October 1990) (Aktaş *et al*., 2011). Considering only the marine area, Gökova Bay is one of the 8 special MPAs in Turkey (Figure 1). With a land area of 270 km^2 and a marine area of 827 km^2, the economy of the region relies on tourism, agriculture and fishing. Fishing in the region has developed as small-scale due to the conditions of the coastal line, the geography and productivity of the bay as well as the status of the area pertaining to conservation.

The Gökova MPA is abundant with eggs and larvae, reaching 667 eggs per m^2 in patches. The diversity of species is also relatively higher. Researchers have identified 723 macroscopic species belonging to 19 systematic groups within the Gökova MPA. Thirty-four of these species are protected under national and international treaties. Twenty-six species have moved to the Mediterranean through various routes and some have even become dominant over the local species in time (Okuş *et al*., 2006).

Three main settlements in the study area (Akyaka, Akçapınar, Sarnıç) also have their own fishery cooperatives. The Akcapinar Fishery Cooperative of Gökova and neighbourhood was established in 1973. The fishermen of Akyaka established their own cooperative in 1992. With the Akyaka Fishery Cooperative, not only a more organized fishery began in the bay but also relations improved with other stakeholders. Lastly, in 1999, a limited number of fishermen from the village of Sarnıç came together to establish the Sarnic-Akbük Fishery Cooperative. All these cooperatives had the aim of marketing the members' products at better prices and eliminate fishmongers. Cooperatives which helped to stop dynamite fishing are now fighting against illegal spearfishing which is practiced with scuba diving equipment (especially during night times using lights). Also, many of the fishery cooperatives have helped their members to market their own products and fight illegal fishing.

Today, there are 77 members of the fishery cooperatives with fisheries activities in Gökova. In all three fishery cooperatives, groups are small enough to retain the interest of fishers; additionally, there is no evidence of corruption, larceny or other dishonest activities in any of the cooperatives. All have been formed on the basis of local initiatives, in response to the fishers themselves (Ünal *et al*., 2009). All three cooperatives have managers. Two of them, which also offer marketing services (Akyaka and Akçapınar), have a full time employee. The salaries of the managers are symbolic as they are paid below the minimum wage. None of the cooperatives in the region has a professional manager. Almost 99 percent of the cooperatives' revenues come from marketing fish.

A total of 100 vessels are located around the Gökova MPA. Approximately 15 more vessels arrive occasionally from neighbouring areas. Gillnet and longline fisheries dominate the small-scale fishery in the bay. Species that belong to Sparidae and Epinephelinae are the target species in this region.

Although small-scale fishing dominates the fishing activity with about 115 fishing boats presently operating, there are 2 local purse seiners localized in the bay. Small-scale fishing boats are 6–12 meters in length, locally built and made of wood. Usually each boat is operated by one or two fishermen. They use gillnets, trammel nets and longlines. Additionally, the small-scale fishery provides more employments (approx. 200 fishers) than large-scale fishery all around the Gökova MPA.

Illegal fishing is considered to be the most important problem among local traditional fishers. It has disastrous environmental and socio-economic impacts in the Gökova Bay. It causes the depletion of local and high valued fish stocks which

play a vital role in traditional fishermen's life in Gökova Bay and it contributes to the decreasing income of local fishermen and unfair competition. Fishery cooperatives and coastguard succeeded to stop fishing by dynamite in the region a long time ago, but illegal spearfishing – especially practiced during the night times by light and scuba equipment – replaced dynamite fishing (Ünal and Erdem, 2009). Illegal fishing with spearfishing is practiced by professional divers (usually outsiders) with the help of a light source and scuba equipment at night time in many different locations of the bay. Cooperative authorities report that 2.5 tonnes of groupers, 1 tonne of *Dentex dentex*, 1.5–2 tonnes of *Dicentrarchus labrax* are caught in this way each season. It can be ascertained through the reports of cooperative authorities that the amount of illegally caught *Epinephelus aeneus, E. alexandrinus, Epinephelus guaza, Dentex dentex and Dicentrarchus labrax* is larger than the cooperative's annual catch of these species (C. Gorgun, pers. comm.). Pufferfish, (*Lagocephalus sceleratus*), firstly observed and recorded in 2003 in the Gökova Bay from the eastern Mediterranean by Akyol *et al.* (2005), has also been a serious problem threatening the gear and catches of fishermen.

Data

The study is based on three types of secondary data sources: earlier studies, quantitative data from cooperative records, qualitative data and information collected from prominent and experienced fishermen of the area.

Meetings with stakeholders

Meetings with stakeholders were held at three levels.

a) Information on catch zones, fish stocks and socio-economic conditions of fishermen were discussed in the first meetings attended by all stakeholders, especially the fishermen, with data gathered through scientific studies as well as surveys with fishermen or collected directly from cooperative records. Also in each meeting, an experienced and respected fisherman of the area was invited for the keynote speech and the information he gave was examined.

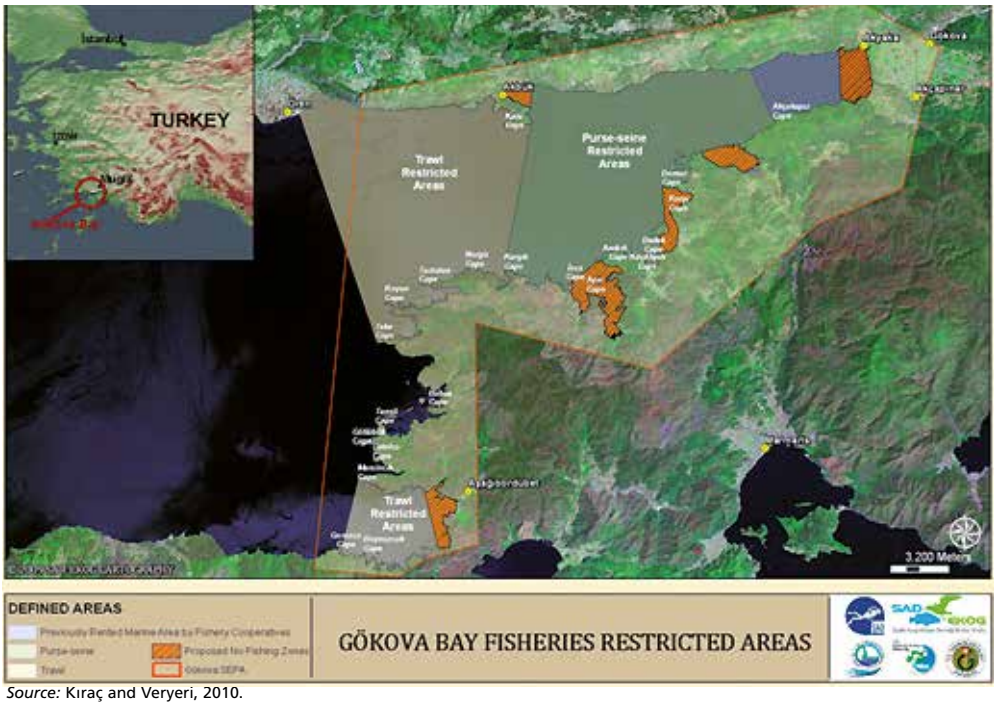
b) During the meetings, MPAs and NTZs were introduced along with successful examples from the world and the Mediterranean, which the stakeholders were also asked to contemplate on. Points were raised on the impossibility to sustain fisheries through traditional management measures such as minimum mesh size and minimum landing size and the need to adopt a new approach. The stakeholders were told that they needed to take on a role in this, that a new management approach and declaring NTZs could be profitable in the mid and long terms. At this point the fishermen were given time to think and asked to hold meetings among themselves in order to propose potential NTZs.

c) In the last phase, a request to close the potential zones proposed in the discussions to all kinds of fishing activities was brought to the managerial boards of cooperatives in the area for voting. Cooperative managers, NGO representatives, scientists studying or carrying projects in the area and representatives of related authorities came together in the capital, Ankara, for a final full-day meeting where the grounds on closing these areas to fishing activities, prospective profits, threats and problems were discussed in the details.

RESULTS

Among all stakeholders, a consensus was reached on declaring 6 critical areas as NTZs within the Gökova Bay (Figure 2). These areas were announced in the issue 27 637 of the Official Gazette (dated 10 July 2010) and appeared in the fishing notification which regulates fisheries.

FIGURE 2
Designated NTZs in Gökova Bay (eastern Mediterranean), Turkey



Source: Kıraç and Veryeri, 2010.

The NTZs shown in figure 2 were published in the Official Gazette in 2010 and were applied through fishing notifications which cover the existing regulations of commercial and recreational fisheries. These areas and their coordinates are shown below.

Any kind of fishing activity is prohibited in six selected areas within the Gökova Bay since 10 July 2010. The closed fishing areas in the Gökova Bay are as follows ("(16) In Gökova Bay):

- In Akbük harbour; at the eastern part of the line connecting 37° 01, 431' N – 28° 06,863' E and 37° 02,108' N – 28° 06,915' E;
- In Akyaka; at the eastern part of the line connecting the point 37° 03,041' N – 28° 18,600' E and 37° 01,540' N – 28° 18,600' E;
- In Çamlı; at the southern part of the line connecting the Çapa nose (37° 00,044' N – 28° 13,250' E) and the point 37° 00,240' N – 28° 14,731' E;
- At the eastern part of the line connecting Boncuk bay – Karaca harbour (36° 59, 016' N – 28° 11,828' E) and Dedek nose (36° 56, 967' N – 28° 11,618' E);
- At the south-eastern part of the line connecting English harbour (Değirmen Bükü) (36° 56, 170' N – 28° 08,358' E) and (36° 56,812' N – 28° 09,542' E);
- Bördübet harbour; at the eastern part of the line connecting two points (36° 49, 800' N – 28° 02,649' E) and (36° 48,156' N – 28° 03,176' E).

Although the declaration of NTZs relied on almost a decade of experience and well-formed relations, the solid results were obtained through a small-scale UNDP project (Kızılkaya and Yıldırım, 2010) in 2009.

The TAGEM project (2001–2004), the OCEANOS project (carried out between 2005 and 2006 on "The Identification of biodiversity in marine and coastal areas of Gökova Special Protection Area"), the EU SMAP III project-MED/2005/110-655 (SMAP III Gökova project, "Preparation and implementation of the integrated management action plan in collaboration with stakeholders for the inner Gökova Bay and the Sedir Island within Gökova SEPA", a 3-year project that ended in the first quarter of 2009), the Gökova ICMM project (from January 2009 to November 2010,

with a main objective to design a draft integrated coastal and marine management planning of the Gökova SEPA) and the "Strengthening the system of marine and coastal protected areas of Turkey" Project (2009–2014; aiming to facilitate the expansion of the national system of marine and coastal protected areas and to improve its management effectiveness) are noteworthy projects in terms of contribution to the process.

However an UNDP GEF project, the UNDP GEF project TUR/SGP/OP4/RAF/, (Kızılkaya and Yıldırım, 2010), started on May 2009 by the authors of this paper through the Underwater Research Society (SAD), was the milestone. The aim of this project was to close certain areas to fishing activities and thus to contribute to the improvement of the ecosystem. The fishermen stood against the idea at the first meeting, but, through further meetings and awareness studies, they became part of the project where they helped determine which areas to close. On 6 December 2009, a second local meeting was held in Akyaka (Gökova) with the participation of leaders of all fishery cooperatives, two respected and experienced fishers who were not members of cooperatives, scholars from fisheries department of the Ege University and Muğla University and the project team. Proposed closed fishing areas were decided upon considering the results of previous projects and taking into consideration demands of fishers. As the project continued, the project manager attended an international advanced course on the "Establishment of marine protected areas and management for fisheries" held in Zaragoza, Spain, in 2010 and introduced the project for establishing closed fishing areas in the Gökova Bay to receive expertise opinions, contribution and advice from international experts. Another meeting was held later to reach the final level, with the attendance of local fishery cooperatives, SAD and scientists on the scale and location of these areas. During the same month, on 26 March 2010, all representatives – Directorate General for Fisheries and Aquaculture (DGFA), Environmental Protection Agency for Special Areas (EPASA), Coast Guard Command, Undersecretariat of Maritime Affairs, General Command of Gendarmerie, SAD, universities, and fishery cooperatives from Gökova – gathered in Ankara and agreed unanimously to close these areas to all fishing activities. Stakeholders also agreed at this meeting to increase the protection around the Gökova Bay, especially in these areas. Soon after, in the last meeting held in Ankara, on 10 July 2010, a total of 6 areas and approximately 24 km^2 (the coordinates and names of which appeared in notice 2010/25 of the Official Gazette, issue 27637) were closed for all types of fishing activities. However, shore-based recreational fishing (angling) was permitted in two of these areas (Akyaka and Boncuk) which were announced in the issue 28388 of the Official Gazette (dated 18 August 2012).

The project titled "Towards community centered marine conservation in Gökova Bay, Turkey" and funded by Flora Fauna International started by the Mediterranean Conservation Society has a powerful impact on the effective protection of NTZs. The organization bought two boats, trained two of the fishermen and employed them as rangers. Their salaries are paid from the project budget and they are guarding the NTZs on a 24/7 basis, in coordination with the Coast Guard Command. The latest NTZs evaluation meeting was held on 6 September 2013 with the support of the project "Strengthening the System of Marine and Coastal Protected Areas of Turkey", and attended by all representatives of the stakeholder groups, especially the fishermen. Full support to continue NTZ was ensured in the meeting whereas a revision in two of the areas was decided.

DISCUSSION AND CONCLUSION

Fishermen are aware of overfishing and its consequences. Sala *et al.* (2011), in their study on certain coastal areas of Mediterranean including Gökova, report that there is an important loss of biodiversity due to serious desertification in the rocky habitats of Eastern Mediterranean. The study revealed that algae, which are the key species of

rocky habitats, are consumed by the Siganus spp. of Red Sea origin, revealing how the Mediterranean ecosystem is being altered by an invading species. During the meetings, fishermen were introduced with the results of such studies, and were explained how the loss in biodiversity and damage in the ecosystem play a role on decreasing fish stocks and that MPAs and NTZs could contribute to the resilience of the ecosystem against such invading species and loss of biological diversity.

Fishermen tend to agree with NTZ declaration only when transparent communication is made and when the results of scientific studies are shared with them and they are included as a party in the decision-making process. Six areas declared as NTZs, formerly used as catch zones by fishermen in the Gökova Bay, are a good example of this. Despite 3 years have passed since their declaration, the fact that these zones are still intact and better protected than before, the monitoring activities and annual evaluation meetings are noteworthy developments which raise hope for future studies. Co-operation and co-management have already begun in Gökova Bay fisheries. With a considerable part declared as SEPA, the required basis has now been established in Gökova so that its fisheries be specially managed as well.

One must also emphasize on Ornat's (2006) observation that one of the key elements affecting the success of NTZs is stakeholder participation. On the other hand, Yagi *et al.* (2010) reported that at least 1 161 MPAs exist in Japan. Out of these, 1 055 are implemented in conjunction with fishery regulations under the form of NTZs. More than 30 percent of the individual MPAs in Japan were established by self-imposed instruments agreed by members of fishery co-management organizations.

Although there are no more than a dozen of NTZs declared through the proposals and consents of fishermen or cooperatives in Turkey, the NTZs declared in Gökova, Datça and Kaş in recent years matter as a promising start. Increasing this number depends on the successful management and protection of the existing areas and their ability to offer a solid profit to both the fishermen and the ecosystem. Proper protection, control and monitoring activities in the NTZs are of utmost importance. At this stage, the gravity of the roles of decision-makers, scientists and NGOs in maintaining coordination is more eminent than ever.

ACKNOWLEDGEMENTS

The authors would like to thank Can Görgün and Taner Özcan from the Akyaka Fishery Cooperative, Muhammed Aslan from the Akcapinar Fishery Cooperative of Gökova and neighbourhood, Mustafa Uysal from the Sarnıç-Akbük Fishery Cooperative, Turgay Türkyilmaz, Hamdi Arpa from the Directorate General for Fisheries and Aquaculture, Harun Güçlüsoy and Güner Ergün from UNDP-Turkey and TVKGM respectively, board members of the Underwater Research Society and Mediterranean Conservation Society, as well as many others whose names are not mentioned here.

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ABSTRACTS

Oral contributions

GESTION DURABLE DE LA PÊCHE ARTISANALE. ACTIONS MENÉES PAR LA FONDATION MOHAMMED VI POUR LA PROTECTION DE L'ENVIRONNEMENT DANS LA MARCHICA (NADOR)

Najia Fatine

La Fondation Mohammed VI pour la Protection de l'Environnement, sous la présidence de Son Altesse Royale La Princesse Lalla Hasnaa, a pour mission principale la sensibilisation, l'éducation et la formation dans le domaine de la protection de l'environnement et du développement durable. Depuis sa création en juin 2011, la Fondation engage et mène des initiatives locales et nationales notamment en faveur de la protection du littoral, œuvre pour l'émergence de solutions de développement économique durable compatibles avec la préservation et la valorisation des écosystèmes et des ressources naturelles et accompagne des départements ministériels et des collectivités territoriales dans leur volonté de dépolluer et de valoriser la façade méditerranéenne du Royaume. C'est dans ce cadre, et au vu des résultats sur le terrain des actions concrètes en faveur de la protection du littoral et de la valorisation du patrimoine environnemental du Maroc, que le Programme d'Action pour la Méditerranée, dépendant du Programme des Nations Unies pour l'Environnement avait nommé, en octobre 2007, Son Altesse Royale La Princesse Lalla Hasnaa, ambassadeur de la côte. Les avancées actuelles du Maroc dans le domaine de l'environnement et du développement durable (la création du Conseil économique, social et environnemental, la Charte de l'environnement et du développement durable, etc.) et les engagements internationaux de notre pays vont certainement favoriser la promotion des modes de production et de consommation durables et assurer une gestion durable des ressources naturelles. La Fondation joue un rôle de fédérateur en mobilisant divers partenaires, parfois d'intérêts divergents, autour de projets communs concrets dont notamment ceux de la mise à niveau environnementale des plages, de la protection du littoral et ses sites d'intérêt biologique et écologique (projets d'appui au développement durable de la lagune de Marchica, de la réserve de biosphère intercontinentale de la Méditerranée, de la Baie d'Oued Eddahab, etc.) où l'activité de la pêche est présente. Ainsi, la Fondation œuvre notamment par la promotion de la pêche durable et le renforcement de la sensibilisation des pêcheurs à l'exploitation rationnelle des ressources du littoral et aux bonnes pratiques contribuant au respect des écosystèmes, qu'elle exploite notamment par: (a) l'intégration de l'approche écosystémique permettant de mettre en relation les ressources côtières, leurs usages et les impacts des activités sur l'environnement, l'économie et la société; (b) l'information, la formation et la sensibilisation sur de la biodiversité marine, les espèces à protéger et sur les défis environnementaux à relever afin de rendre les pêcheurs plus responsables et respectueux de l'environnement; (c) le suivi environnemental des écosystèmes côtiers, l'actualisation régulière des indicateurs environnementaux permettant d'évaluer l'impact des actions entreprises sur la qualité des écosystèmes; (d) la valorisation des aires marines protégées pour en faire des lieux privilégiés d'éducation et de sensibilisation. L'approche adoptée par la Fondation et les résultats du projet d'appui au développement durable de la lagune de Marchica seront présentés, notamment le plan de gestion durable de la lagune de Marchica et de son environnement, en particulier pour l'activité pêche et la gestion des ressources

halieutiques: (a) les actions pour une utilisation rationnelle et optimale des ressources naturelles de la lagune et de son environnement; (b) l'élaboration de plan d'actions concertés et partagés entre tous les acteurs locaux; (c) les différents usages actuels et futurs de la masse d'eau (espaces naturels aquatiques protégés, sports nautiques, pêche, algoculture, stations d'épuration/effluents liquides, baignade, conchyliculture, etc.) et mise en cohérence de ces usages; (d) les actions pour une pêche durable et rentable pour les pêcheurs de la lagune par l'organisation et la valorisation de l'activité de pêche dans la lagune (points de débarquement, village des pêcheurs, indicateurs de suivi,etc.).

LA MÉDITERRANÉE ET LA GESTION DE TERRITOIRES HALIEUTIQUES: UN NOUVEAU MODÈLE DE PRODUCTION DURABLE ET RESPONSABLE

François Féral and Bertrand Cazalet

Depuis les trois dernières décennies, la FAO a ouvert de nombreuses pistes de réflexion sur la gestion des pêcheries. Les États confrontés à la surexploitation de la plupart des stocks et à de nombreuses crises socioéconomiques s'engageaient dans des spirales interventionnistes illustrées par des reconversions, des sorties de flottes et une reconfiguration de l'administration halieutique. La Méditerranée a pu apparaître comme un cas d'étude emblématique de ces nombreuses problématiques et des études ont été engagées pour mieux connaître la dimension anthropologique de ce dossier, en approfondissant la connaissance des facteurs économiques, juridiques, historiques ou sociologiques des populations maritimes en Méditerranée. Dans un même temps, les pouvoirs publics s'interrogeaient sur le rôle de la société civile comme acteur majeur du développement en concordance avec les impulsions venues des marchés: l'idée de décentralisation fut alors largement documentée. Ces deux mouvements ont fait apparaître la dualité des modes de production halieutiques bien illustrés par l'évolution des pêcheries de Méditerranée: (a) un mode de production halieutique entrepreneurial prenant pour modèle l'ingénierie industrielle, appuyé sur une administration scientifique et un régime de police administrative étatique; (b) un mode de production traditionnel, artisanal, appuyé sur des disciplines de groupe décentralisées et se référant à des territoires de pêche. Le village de pêcheurs, la prud'hommie, les *cofradías*, les coopératives de pêcheurs, etc. apparaissent comme des institutions de discipline collective qui tirent leur origine des modèles traditionnels de gestion et d'allocation des ressources. Leurs principes de fonctionnement reposent sur la définition de «territoires halieutiques» pris en main par un groupe de professionnels se dotant d'une discipline. Celle-ci est illustrée par la limitation des efforts de pêche et des capacités de capture formalisés dans des normes locales: calendriers de pêches des petits métiers, zones et périodes interdites, taille et configuration des engins de pêches, règlement des litiges d'accès, hiérarchisation des métiers, etc. L'étude de ces groupements révèle une forte capacité d'encadrement et de gouvernance décentralisée qui fut récemment déstabilisée par la logique industrielle et interventionniste. À l'heure où se mettent en place des réseaux d'aires marine protégées, comment ne pas évoquer en parallèle la gestion halieutique territoriale traditionnelle des côtes de Méditerranée? La communication se propose de présenter une analyse institutionnelle des groupements de pêcheurs de Méditerranée occidentale en contrepoint de la gouvernance administrative et entrepreneuriale qui s'est substituée à ce mode de gestion universel mais qui sera illustré par la Méditerranée orientale. Il ne s'agit pas d'une contribution folklorique destinée à réhabiliter le passé pécheur de la Méditerranée, mais de proposer une analyse approfondie des mécanismes et des principes de gestion territoriaux et juridiques qui ont fonctionné pendant des siècles comme modes de régulation et d'accès à la ressource. Celle-ci pourrait inspirer de nouveaux modèles de gestion spatiale et décentralisée pour une pêche responsable.

Posters

AN EXPERIMENTAL MANAGEMENT OF THE OCTOPUS FISHERY IN SARDINIA

Danila Cuccu, Marco Mereu, Blondine Agus, Maria Cristina Follesa, Alessandro Cau and Angelo Cau

In Sardinia, the largest segment of the fleet (about 80 percent) is represented by small-scale fisheries, whose productivity for the year 2011 was 5 056 tonnes equal to an induced 35 290 million euros (Irepa, 2012). These are almost all family business small boats that operate primarily with passive gear such as nets, lines, pots and/or traps. The specificity in the use of gear is closely related to the time of year and the depth in which they operate. In particular, the fishery by traps with bait (*Carcinus aestuarii*) is usually carried out in spring–summer within a depth of 50 metres and brings to catch the common octopus *Octopus vulgaris* (Cuvier, 1797) with a very low by-catch (Cuccu *et al.,* 1999). Among the Italian regions, Sardinia is the largest producer of octopus, with 1 672 tonnes and 9.3 million euros of profits in 2011 (Irepa, 2012). However, FAO statistics show continuous temporal fluctuations of the octopus landed on the island, particularly in the last decade; in fact the production has decreased from 3 400 tonnes in 2001 to 1 586 in 2010. This negative trend reflects the more general decline that has been registered worldwide for this species (FAO, 2006 and 2013). Despite the lack of Italian measures to regulate the fishery of *O. vulgaris*, the autonomous region of Sardinia has put in place some regulations setting the minimum landing size (300 g) and limiting the number of traps (i.e. Decree n°22 of 17/07/2002). Regional annual fishing bans, were decreed with differences in the timetable according to the different maritime districts to protect the recruitment (Decrees n°A/68 2067 of 29/08/2008 and n°A/87 2067 of 08/09/2009). In the absence of fishing bans, despite the regulation of the minimum size, starting at the end of the summer in conjunction with the bulk of recruitment (Cuccu *et al.*, 1999) the capture and illegal marketing of undersized octopuses (<300 g) can pose a problem. Only a few fishermen, under their own decision, stop the trap fishery and divert towards other artisanal activities. In the belief that the problem of octopus fishery should be addressed at national level taking into account the socio-economic and bio-ecological aspects, we report an experimental management that fishermen and researchers have carried out in a maritime district of central western Sardinia. This experience is based on the annual monitoring of the commercial octopus fishery by traps. Small specimens are tagged and placed in a restricted sea area where the fishery has been temporary banned. Moreover, on the ground of this area some artificial dens have been laid as shelter and for the spawning. The recapture of tagged specimens inside the area of release and nearby suggests that saving the youngest octopuses from the trade could be a guarantee for the fishery in the following year, in accordance with the validity of a regulation on the minimum commercial size. At the same time, the presence of spawning females inside the artificial dens confirms the effectiveness of this experiment to create spawning area. However other results like the different sizes at maturity in the two genders (Cuccu *et al.,* 2013) and also the possible temporal skidding of the recruitment among the years, show the need of flexible regulations to be determined on the basis of an annual monitoring at local level in close cooperation with the fishermen.

REVIEW OF SMALL-SCALE FISHERIES ASPECTS IN GREEK WATERS: AIMING TOWARDS THE IDENTIFICATION OF SCIENCE PRIORITIES THAT MAY CONTRIBUTE TO THE EFFECTIVE MANAGEMENT OF THE SECTOR

Paraskevi K. Karachle and Vassiliki Vassilopoulou

Small-scale fisheries (SSF) is a sector of high importance for the European Union, as clearly indicated in the reformed Common Fisheries Policy (CFP). In the Mediterranean Sea, and particularly in Greece, SSF are characterized by a great spatio-temporal heterogeneity. With a Greek coastline of more than 18 000 km and numerous islands and islets, SSF is crucial for supporting local communities, especially in distant areas from the mainland; it accounts for a high number of vessels (94 percent of the Greek fleet) and has a high contribution in the overall fisheries production (55 percent of the total landings in 2008). In this study, we present an overview of the existing information on SSF in Greece, with respect to: (a) catch species composition and production; (b) discarding; (c) *métiers* identification (both in terms of gear used and targeted species); (d) socio-economic data; (e) small-scale fishers' perspectives. Our results revealed that SSF in Greek waters still remain understudied, with relevant information existing only sporadically and for a restricted spatial coverage. Yet, all available data indicate: (a) the multi-gear (approximately 18 different gear) and multi-species (more than 60 target species) nature of the fisheries corresponding to numerous *métiers* (in some cases almost as many as 21); (b) the local character of the practice, with significant differences appearing between areas; (c) low discarding (ranging between 3.2 and 14.7 percent); (d) the "traditional-family" nature of the profession, with the majority of small-scale fishers being full time professionals, with their livelihoods depending exclusively on the viability of the sector. Therefore, it is essential to undertake targeted studies in order to identify the peculiarities of this highly diversifying sector and hence to "collect data on fleets and their fishing activities" that would provide the "best available scientific advice", as highlighted in the CFP. Proper characterisation of the different *métiers* should be conducted, and an effective registry and monitoring system should be established in selected representative areas that could serve as pilot cases aiming to shed light on approaches, drivers and incentives on a local basis. In parallel, interaction with fishers is considered of key importance since it would result in gaining from their knowledge, along with raising their awareness on critical issues of ecosystem sustainability, as well as promoting the "co-management" concept. We consider that the "regionalization and further stakeholder involvement" foreseen in the new CFP appears to be towards this direction and will enable the establishment and implementation of more effective SSF management measures.

ESTIMATING FISHING PRESSURE FROM COASTAL FISHERIES USING MULTI-CRITERIA DECISION ANALYSIS METHODOLOGY

Stefanos Kavadas, Irida Maina, Vassiliki Vassilopoulou, Dimitris Damalas and Maria Pantazi

The aim of this work was to provide a tool for mapping the distribution and intensity of fishing pressure of the coastal fishing fleet by bathymetric stratum. The Greek coastal fishery is characterized by an enormous number of professional fishing vessels operating in the coastal zone, most of them not equipped with a geographical positioning control system. Our aspiration was to estimate fishing pressure from coastal fisheries (FPc) applying a multi-criteria decision analysis methodology on currently available geospatial data. The estimated coastal fishery suitability index (Sc) and the spatial coastal vessels activity index (Ac), for the registered vessels by port, have been used

as an input to estimate FPc based on a fuzzy product process. A simulation process including pair-wise comparisons of pressure importance, based on the minimization of a consistency ratio, was used as a measurement method in the analytic hierarchy process (AHP). In the model, an additional fishing capacity indicator was computed based on the length and internal volume (GT) of the vessels. Spatial interpolation techniques and a fuzzy membership (FM) function have been used for the estimation of the Ac. Sensitivity analysis was applied to the weights of the decision criteria and the performance values of the alternatives were estimated according to the AHP. The optimal interpolation result was defined by a cross validation process; four different scenarios were investigated in order to select the most suitable formulation for the FM function. Finally, visualization was obtained by spatially mapping the estimated fishing pressure index, derived by a spatial clustering process. For the implementation of the model, the fishing area of Patraikos Gulf and the outer part of Ionian Sea were selected, a marine region characterized by an intense fishing footprint and continuous conflicts among numerous coastal and open-sea fisheries.

SUSTAINABLE DEVELOPMENT OF BARDAWIL LAGOON FISHERIES

Sahar Fahmy Mehanna

The Egyptian Mediterranean coast features six lakes or lagoons which are located along the Nile delta coast (Northern delta lakes) and at the east of the Suez Canal (Port-Fouad and Bardawil). These lakes are namely, from west to east, Mariut, Edku, Burullus, Manzalah, Port-Fouad and Bardawil. All of them, with the exception of Lake Mariut, are directly connected to the sea. The northern lake fisheries play an important role in Egyptian economy, since they provide a rich and vital habitat for estuarine and marine fish and their regeneration, and more than 75 percent of Egyptian lakes' production is harvested from them. Also, they are internationally important sites for wintering water birds, providing valuable habitat for several hundred thousands birds. Many challenges are facing the sustainability of our northern lakes: overfishing, illegal and destructive fishing gear, degradation and habitat loss, decreasing of salinity levels that damaged the fish habitat and nursery of some marine high–valued fish, pollution and waste disposal. Moreover, the low awareness of fishermen about environmental issues as well as management plans and their importance, combined with a limited understanding of the role of protected areas and their value (at both teh local and national levels) are some of the basic factors, which hinder proper fisheries management in the northern lakes and threaten their integrity in the long run. The Bardawil lagoon is one of the northern lakes in Egypt which plays an important role in lakes' fisheries since it is the least polluted wetland in Egypt and most of its catch is exported. It is a prominent landform feature of North Sinai and an important source of local fish in Egypt, such as seabass, seabream, sole, grey mullet, eel, meager and white grouper. The total annual commercial landings in the Bardawil lagoon varies between 2 226 and 5 410 tonnes (1995–2011) corresponding to a value of almost 96 million EGP. About 3 000 local fishermen are working in the lagoon using different kinds of fishing gear, some of them being very harmful to the lagoon ecosystem. The present work addresses the assessment of the fishery status of the lagoon as well as its socio-economic situation. It also gives a complete picture of the trophic levels in the lagoon and the life history of the commercial species. Finally, it proposes a future plan for the rational exploitation of the lagoon considering the ecosystem approach for its management.

Source: Women collecting clams in the sea shallows, Tunisia ©FAO/Giulio Napolitano.

Thematic Session III

Integration of small-scale fisheries in marine protected areas (MPAS)

Source: Fishermen preparing to set out to sea to fish, port of Dikky, Morocco ©FAO/Abdelhak Senna.

BACKGROUND DOCUMENT

Integration of small-scale fisheries in marine protected areas (MPAs)

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Edited by Chloë Webster, Scientific Officer – MedPAN

FOREWORD

Note to readers: This document has been prepared to inform discussions among the participants to the thematic session III on "Integration of small-scale fisheries and Marine Protected Areas (MPAs)" (namely MPA managers, scientists, decision-makers and fishermen). As such, the document does not have the ambition to be exhaustive in its review nor to stand as a purely scientific or theoretical contribution. Although the author comes from the human and social sciences perspective (public law), the content of the document has naturally taken a multi-disciplinary approach, essential to integrating the array of issues relating to small-scale fisheries and MPAs in the Mediterranean.

The purpose of this document[1] is to draw up a background paper for thematic session III on "Integration of small-scale fisheries and Marine Protected Areas (MPAs)" of the First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and the Black Sea, taking place from 27–30 November 2013 in Malta.

The work initially focused on the bibliographical and multidisciplinary analysis of existing data on this topic throughout the world and in particular the Mediterranean. Most references used are studies looking at case studies on the local level from the viewpoint of several disciplines. A number of consolidated pieces of work with an international reach (Garcia *et al.* 2013), or a regional reach (Francour *et al.* 2013), have also contributed to an overall reflection on the generally complex relationship between Marine Protected Areas (MPAs) and the fishing sector.

Following on from the initial phase, the analysis focused on the Mediterranean basin and professional artisanal fishing activities otherwise known as "small-scale fishing"[2], in order to provide the appropriate elements for the operational and applied dimension of the objectives of the Regional Symposium. Even if the focus is on small-scale fishing, mention of the context is important as it is one of sharing sea space, having different activities coexist with sometimes conflicts of uses. These conflicts can be with other professional fishing sectors (industrial and semi-industrial) and/or with non-professional techniques (recreational and competitive). We will not be looking at these other components of fishing "practices" here, but they will obviously be mentioned to illustrate the discussion and describe or weight various Mediterranean realities.

Lastly, this document aims to contribute to strengthening the ties between stakeholders, whether fishermen or MPA managers, in light of shared/negotiated governance or even co-management. Examples of constructive and fruitful initiatives are used to support recommendations. However, over and above the policies implemented by Mediterranean States and regional instances, fisheries and MPAs remain affected by often contrasting issues with often clashing representations, objectives and interests which favour mutual mistrust.

[1] Instigated by the MedPAN organisation (network of managers of Marine Protected Areas in the Mediterranean) and the General Fisheries Committee for the Mediterranean (GFCM).
[2] Both expressions will be used in the French version.

This all points to the fact that the optimal integration of small-scale fishing into MPAs is as yet limited while it also occurs unevenly on a Mediterranean scale. Therefore, extra efforts in terms of developing closer ties, cooperation, dialogue and commitments, are more than justified, as advocated by the symposium.

The worlds of fishing and conservation have ignored each other for many years and have sometimes been in conflict, some quite extreme. But their convergence is gradually becoming unavoidable (Garcia, 2002), in particular with the imperative for a balanced, prudent, adapted and sustainable exploitation of non-expandable oceans; and of its resources that are exhaustible and sometimes difficult to renew. MPAs and fisheries follow the same logic in that they share the same marine space, living and work place, management area and a common evolution.

INTRODUCTION

This document has been developed for the First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and the Black Sea and its thematic session III on "Integration of small-scale fisheries and Marine Protected Areas (MPAs)". The main objectives of this Symposium were to: 1) renew and encourage political commitment in favour of small-scale fishing; 2) agree on a possible road map for the progressive implementation of operations supporting the sustainable development of small-scale fishing; 3) examine the instigation of a regional cooperation project for small-scale fishing and; 4) lay down the foundations for a platform allowing stakeholders to be directly involved and take part in the management of small-scale fishing. The reflections and exchanges taking place during the Symposium fall into the more general framework of the *International Guidelines on Securing Sustainable Small-scale Fisheries* (SSF Guidelines). These voluntary texts (principles, criteria and recommendations), which will be definitely adopted by the FAO in 2014, are complementary to the *Code of Conduct for Responsible Fisheries* of 1995.

In its technical directives for responsible fisheries, the FAO already laid down the conditions necessary for the sustainable development of fisheries, but without particular focus on the small-scale sector. Even if the definition of small-scale fishing is still vague and the subject of diverging opinions, it is characterised in the Mediterranean by its relatively homogenous and highly predominant nature (80 percent of fishing units). In order of priority, its characteristics are:

- predominant coastal fishing, with a daily scope of action generally limited to 5 nautical miles, using boats of less than 12 metres; multi-species fishing conditioned by space and time (zones, periods, etc.);
- a historically community-oriented organisation of the sector with regards regulations concerning access and fishing effort whether individual or collective, and
- fisheries that maintain a marked cultural and sometimes traditional dimension, together with a structuring role in coastal economies.

The Directives 4 on fishing development (FAO, 1999), 4.2 on the systemic approach (FAO, 2003) and 4.4 on MPAs and fishing (FAO, 2011) underline "the necessity to maintain ecosystems and productivity in a good state, or improve them, so that fisheries can be maintained and strengthened for the current and future generations" (FAO, 2002, p.11). Directive 4.4 reminds us that:

> "MPAs and MPA networks can constitute an important management tool, especially for achieving both biodiversity conservation and direct fisheries management objectives. However, there are many management options in addition to MPAs that may produce better effects. The management context needs to be understood and combinations of appropriate measures implemented accordingly" (FAO, 2011, p. 37).

In the light of global and theoretical reflections on fishery management, the spatial-based approach to fisheries management forms part of the tools and methods intended to contribute to the systemic management of fisheries. Indeed, consideration of the interactions between resources and the ecosystem can be optimised through an improved spatio-temporal management of fishing activities in which the MPAs can play a central and pro-active role in favor of small-scale fisheries. When applied to the Mediterranean, this management mode can be defined as follows (Pipitone, 2012):

> "Spatial planning aims at reducing or avoiding user-user or user-environment conflicts whenever multiple uses of space and resources occur, which is generally the case in fisheries. Spatial approaches in fisheries management make use of a number of initiatives that span from marine reserves to temporal or permanent single-gear restrictions. Mediterranean fisheries, which are multispecies and multi-gear, call definitely for a spatial approach to their management".

According to directive 4.2, the spatial dimension incorporates, in particular, the use of "marine protected areas where fishing may be totally banned, or areas intended for multiple uses" (FAO, 2002, p. 34).

To summarise, the content of the first points regarding spatialised fisheries management entails three aspects: 1) regulation of access and conflicting uses; 2) spatial, temporal and/or technical regulation of fishing activities; 3) assessment of the cost-benefit ratio of spatial restriction measures for fisheries: What effects? What extent? For whom?

Besides their functions and potential benefits for small-scale fishing mentioned above, what is exactly a marine protected area? The definition most commonly used internationally is provided by IUCN (first provided by Kelleher and Kenchington in 1992; then at the World Conservation Congress in 1996, and the most recent provided in Dudley *et al.*, in 2008)[3]. From there, a regional definition was adapted to the Mediterranean by the MedPAN Network with the Barcelona Convention's Regional Activity Centre for Specially Protected Areas (RAC/SPA), referring to an MPA as:

> "A clearly defined marine geographical space – including subtidal, intertidal and supratidal terrain and coastal lakes/lagoons connected permanently or temporally to the sea, together with its overlying water – recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (Claudet *et al.* 2011).

The notion of MPA is however sometimes complex to understand in view of the different types that exist and reflected by a large array of existing legal categories (Agardy *et al.* 2003). In the Mediterranean, no less than 26 labels exist (Gabrié *et al.* 2012) and not all countries have proceeded to assign IUCN categories to their MPAs according to the international guidelines (Day *et al.* 2012) Furthermore, while an exponential number of MPAs have been established globally since the 1990s, some remain "paper parks" with no management measures in place and therefore mitigated efficiency. This fact contributes to the confusion over their role.

Another "territory" and "legal" perspective on how to define an MPA would translate as follows: a regulated area which uses environmental management over space.

[3] "A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values".

In an institutional and legal sense, the MPA can be seen as: 1) a "constituency" based on the principles of territorial division and delimitation; 2) inside which regulatory, monitoring and surveillance measures are implemented[4] (special administrative police and sets of standards); 3) by a competent, devolved or decentralized institution; 4) defined by a legal framework and run under the supervision of central administrations (directly or delegated).

Other complementary definitions exist, driven by various disciplinary influences, in particular bioecological, economic, socio-economic and even societal (Cazalet *et al.* 2012). However, the objective of this document and that of the Symposium are not to process debates around definitions and as such this will be skipped.

MPAs are now considered as a vital means of sustainably preserving and exploiting marine ecosystems that are impacted and threatened by human-induced pressures and global changes. At the international level, nations have set ambitious objectives in line with achieving the targets of the CDB (Rio+20) of 10 percent of oceans covered by representative, connected and well managed marine protected areas by 2020. In the Mediterranean, which is home to nearly 10 percent of global biodiversity (on 1 percent of the oceans' surface area) and which hosts a very high level of endemic species, this target is relayed via the Barcelona Convention. In this context, the MedPAN Network[5] encourages Mediterranean States to maintain and develop their MPA policies and conducts regular analysis to measure progress.

According to the Mediterranean MAPAMED[6] database, based on data from 2012, 677 protected sites have been created so far in the Mediterranean, distributed as follows: 1) 161 MPAs with national status[7]; 2) 9 MPAs with entirely international status; 3) 507 Natura 2000 marine sites[8]; 4) 40 MPAs with one or several international statuses, including 32 specially protected areas of Mediterranean importance (SPAMI), 5 biosphere reserves and just 2 marine world heritage sites. Lastly, 55 MPA projects are in progress. On the scale of the Mediterranean Sea, MPA spatial coverage nevertheless remains rather low and largely below the target of 10 percent effective protection. The figure below shows the percentages depending on what is taken into account or not as well as progress made since 2008. In fact, MAPAMED also takes into account the fisheries restricted areas (FRAs) declared by the GFCM to protect specific features from fisheries practices. When FRAs are taken into account on top of all other MPA labels, the spatial coverage reaches 5.26 percent. Finally, it should be underscored that most Mediterranean MPAs are mainly concentrated on the northern shores and in coastal areas.

FIGURE 1
MPA 2012 key figures

4,56%	1,08%	8,22%	2,7%	23	55
Surface sous protection légale (114 566 km²) 170 AMP; 18 965 km² 507 sites Natura 2000 en mer : 25 000 km² Sanctuaire Pélagos pour les mammifères marins en Méditerranée : 87 500 km² 8 101 km² en excluart les surfaces se recouvrant	Surface sous protection légale sans le Sanctuaire Pélagos	Surface sous protection légale dans la zone des 12 milles	Surface sous protection légale au-delà de la zone des 12 milles	AMP créées depuis 2008 dans 10 pays	AMP en projet dans 10 pays

Source: MedPAN.

[4] Exclusively targeting professional fisheries or a set of extractive or non-extractive uses.

[5] See roadmap adopted at the 2012 MPA Forum held in Antalya, Turkey: http://www.medpan.org/documents/10180/0/Feuille+de+route+pour+les+AMP+de++M%C3%A9diterran%C3%A9e/ee15ce4e-20f1-4310-8c40-d69fdb5fdc33

[6] http://www.medpan.org/mapamed

[7] Only 94 sites were identified in 2008 (Simard, UICN, 2008), i.e. the figure has nearly doubled in just 5 years.

[8] These MPAs only concern EU member states and are the result of various European directives, transposed and implemented by the States according to their national legal provisions.

MPA development is also marked by a major evolution in their expected functions. Their scope no longer relates solely to strict conservation such as "no-take" zones. Objectives guiding the creation of MPAs are now a lot more diversified. Today, MPAs are thus considered as independent tools (integrated approach) for the sustainable management of the marine environment targeting the following:

- protection of resources and habitats,
- maintenance and development of local professional fishing,
- enhancement of marine touristic activities,
- management of recreational fishing,
- coastal and catchment basin management,
- etc.

These new objectives require the participation of all stakeholders involved in MPA setup, in the framework of an adapted governance approach. MPAs are no longer just there to support public policy, and the creation process is now considered as an "ideal" objective of good governance (Cazalet *et al.* 2007). These developments lead protected site managers and small-scale fishermen to take a more active part in the governance implementation process "in and around" MPAs.

Lastly, the distinctive context of the Mediterranean and how it affects fishing and MPAs needs to be highlighted (Galletti *et al.* 2013). The Mediterranean is an enclave[9], bordered by several continental landmasses that lend it a semi-enclosed character. This particularity also has a legal status as defined by article 122 of UNCLOS. Furthermore, this status incurs compulsory cooperation in various fields (which may include the management and conservation of fish resources) between the riparian States. However legal constraints are actually weak, as they mainly operate on a political level. Tensions and blockages also exist, in particular for maritime delimitation[10], as bilateral or multilateral negotiations have not set yet all maritime frontiers between neighbouring States and in the open sea. These considerations can sometimes have a strong influence on the development of protection and of fishing management policies in the Mediterranean. This unsettled territorial situation is not abiding; it undergoes regular updates and the States' spatial claims change over time[11], in particular for economic reasons (including fishing). In principle, small-scale fishing appears less affected by delimitation issues as it is mainly concentrated in coastal areas where frontiers are fairly well-established (territorial waters), except in some archipelagic areas and in areas of latent conflict.

Following this introduction, the purpose will be to underline MPA capacity to protect biodiversity while contributing to the sustainable management and development of small-scale fisheries in the Mediterranean. Without going as far as an exhaustive country-by-country analysis, a regional panorama of current MPA relationships with the small-scale fishing sector will be showcased. Based on noteworthy experience examples, the most pertinent and efficient models will become clear, as will the viewpoints and expectations of the different stakeholders. Results presented here are intended to be didactic in order to inform exchanges, reflections and proposals put forward at the Regional Symposium.

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[9] From "*mare medi terra*", literally meaning "sea in the middle of land".

[10] Territorial sea, exclusive economic zone (EEZ), continental shelf.

[11] As witnessed by the two very recent, successive and unilateral EEZ declarations by France (Decree n° 2012-1148 of 12 October 2012) and Spain (Real Decreto 236/2013, 5 April 2013). These political decisions are not devoid of ulterior economic motives (fishing, hydrocarbons, etc) and ecological motives (canyon protection, pollution prevention), but they still come up against major previous differences in terms of calculation of the respective maritime scope and boundaries of the two States. As things stand, the two EEZs partially overlap, creating a partial "dual competence" leading to conflicts in terms of rights and authority between France and Spain. The MPAs and fisheries located in this zone are particularly affected by these new stakes.

1. NATURE AND OBJECTIVES OF MPAS IN THE MEDITERRANEAN

In this first section, the multiple, heterogeneous and changing dimensions of MPAs in the Mediterranean will be in focus with an overall description of the notions used and MPA features and main goals, with particular reference to the links with spatial planning of small-scale fisheries.

1.1 Definition, content and legal scope of MPAs

a) The multifaceted notion of MPAs

General conceptual framework

At the international level, IUCN has determined the initial generic definition of an MPA as mentioned before, as well as typologies allowing assignation of six categories of protected area (Dudley, 2008). These range from a strict nature reserve limited solely to scientific use and forbidden to the public (Ia), to nature parks in which sustainable exploitation of resources is permitted (VI). These criteria are mainly based on the type and intensity of protection efforts needed to reach the MPA's objectives. Since 2008, the concept of protected area has been simplified and is thus more comprehensive:

> "A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values".

According to the IUCN, this new definition "does ensure a clearer demarcation between conservation focused sites and those where the primary purpose is extractive uses i.e. fisheries management areas" (Dudley, 2008; op. cit. p.64). This distinction seems however fundamentally theoretical and limited to a few specific cases. In most situations, MPA zoning is intended to integrate several uses, including fishing activities, in order to ensure effective conservation or replenishment of stocks. IUCN categories I and II preclude all forms of extractive activities, particularly fishing. The IUCN refers to the "ecological draw-down on resources" seen as incompatible with biodiversity, ecosystems, and more generally environmental protection goals. Apart from category III, which relates little to marine sites, MPAs including fisheries planning and management aspects tend to belong to categories IV ("seasonal fishing bans" or sanctuaries), V ("coastal areas" aiming at "the preservation of long-term or sustainable local fishing practices or harvesting" and VI (measuring the ecological sustainability of authorized extractive activities by "appropriate metrics").

Multiple terminologies

a. National labels

Almost all MPAs in the Mediterranean are solely under the jurisdiction of the coastal States and are established according to national legal and regulatory frameworks. Almost 8 percent of territorial waters have a protection status, compared to 2.7 percent[12] for areas under jurisdiction or located in the open seas. The territorial sea is an area under full sovereignty of the coastal State (extending the national territory out at sea) which may not extend beyond 12 nautical miles (six miles for Turkey and Greece). Beyond that stretches the exclusive economic zone (EEZ) up to a distance of 200 nautical miles from the coast. The EEZ gives the State restrictively listed and exclusive rights, particularly as regards biological resource exploitation and conservation. Due to the limited size of the Mediterranean basin, such extension is complex and few States have

[12] There are two MPAs: the Pelagos Sanctuary split between France, Italy and Monaco (2.6 percent) and the Gulf of Lion Marine Nature Park, France (0.1 percent).

hitherto undertaken to establish EEZs within the 200 nautical miles limit. This lack of definition is not really conducive to the development of MPAs by coastal States beyond their territorial waters.

Among the names given to MPAs, the most frequently used terms are "nature reserve", "national park" and "nature park" (Mabile *et al.* 2005, Abdulla *et al.* 2008, Gabrié *et al.* 2012). Needless to say that, from one nation other, the use of the same term may refer to substantially different levels of protection, modes of governance and legal statuses. Twenty-six specific national terms associated with a specific MPA legal status have been recorded in the Mediterranean (Gabrié *et al.* 2012); for example: special marine reserve (Croatia), marine nature reserve, regional nature park, marine park, marine nature park, site of the Conservatoire du littoral (French coastal protection agency), marine reserve, national refuge and marine fishing reserve (Spain), area of natural interest (Catalonia, Spain), marine protected area and natural marine protected area (Italy), protected area (Monaco, Syria), natural monument (Slovenia), special environmental protected area and nature protection area (Turkey), national marine park (Albania), etc.

b. International and regional labels

Alongside State initiatives, a significant number of MPA categories and names are also established via international or regional instruments, conventions and agreements. Their legal scope is very variable; some are very restrictive, enforceable tools, while others are mere labels or part of regional planning systems for MPA development which drive cooperation and consistency of policies between Mediterranean States. Nevertheless, in most cases, these labels are complementary and apply to sites already covered by national protection measures, although there are some sites that are not recognised yet at the national level. Below is a list of such tools that exist in the Mediterranean (Gabrié *et al.*, 2012):

"Soft" tools:

- World Heritage Sites, resulting from the Paris Convention.
- Wetlands of international importance, under the Ramsar Convention.
- Biosphere reserves under the UNESCO MAB (Man and Biosphere) programme.
- SPAMIs under the Barcelona Convention – applicable to marine and coastal areas in their entirety and aiming for region-wide harmonisation. The idea consists of entering sites on the list of SPAMIs based on common identification and management criteria. SPAMIs are State-created MPAs having an efficient, durable legal protection status, while being governed and assessed according to the Protocol's general and special references (Annex I). Reflection is currently underway to establish SPAMIs within international waters. Article 6.g. of the Barcelona Convention specifies that fishing regulation or prohibition is an integral part of SPAMI protection measures. At present, 21 SPAMIs are listed, mainly in the western Mediterranean area (www.rac-spa.org). The institution in charge of the MPA aspect, called RAC/SPA (Regional Activity Centre for Specially Protected Area) was created and set up in Tunis in 1985. In addition to its MPA work, the RAC/SPA also develops action plans for certain species (turtles, cetaceans, cartilaginous fish and seals), whose interactions with fishing activities are frequently brought to light.

"Hard" tools:

- The Pelagos Sanctuary dedicated to the preservation of marine mammals (87 500km²).
- Natura 2000 sites resulting from European law and its latest directive No. 2008/56/EC of 17 June 2008. Natura 2000 works for the development of a network of

marine protected areas (MPA) in Member States' waters. The network currently includes 507 marine and coastal sites identified in the Mediterranean (it should be noted that these became national).
- Particularly sensitive sea areas (PSSA) of the International Maritime Organization (IMO) which works jointly with concerned nations to establish these with an associated protective measure to prevent, reduce, or eliminate the threat or identified vulnerability (eg. Strait of Bonifacio).
- Areas of special conservation interest (ASCI) of the 1979 Bern Convention on the Conservation of European Wildlife and Natural Habitats, areas aimed at building the Emerald network at the European scale to complement the Natura 2000 network.

Some other agreements, conventions and measures that are closely linked to the protection of the marine environment are listed below:
- RAMOGE Agreement for Mediterranean coastal waters protection (France, Monaco and Italy);
- ACCOBAMS of 24 November 1996 on the conservation of cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area, an agreement which identifies areas of special importance for cetaceans.

b) Which criteria for MPAs in the Mediterranean?

A geo-referenced database (MAPAMED) using "inclusion criteria" based on the IUCN definition and adapted to the Mediterranean context (Claudet *et al.*, 2011) has been created for the identification and recognition of MPAs in the Mediterranean. Further to the definition presented in the introduction, the MPA selection criteria are based on: 1) the nature of the site; 2) the fact that the site matches the definition of protected area and the definition of a marine protected area; 3) the goals of the MPA (IUCN category); 4) the type of protection; 5) the other criteria (management, time dimension, vertical zoning, etc.). The analysis behind the criteria uses a very broad view of the notion of MPAs, and includes both areas lagoons linked temporarily or permanently to the sea, as well as beaches used by marine species on a regular basis (such as turtles for nesting). It also includes sites that are merely "declared" but which are not officially or legally protected or which are not managed effectively. This latter point represents the recurring issue of "paper parks" and associated consequences: exaggeration of protected surface areas, confusion between the establishment of an MPA and its effective management, ineffective protection, loss of credibility of MPA policies, etc. However, by including these sites into the databases and recording data on the management aspects, it allows conducting analysis on the true number of sites that are effectively managed (and thus on the surface cover that is really managed).

The MAPAMED database is a geographic information system (GIS) jointly developed and managed by the MedPAN organisation and the RAC/SPA. It is available on: http://www.mapamed.org/.

c) The MPA as a regulatory area with restriction measures on the spatial scale

An MPA consists of "a set of legal rules" (Cazalet *et al.* 2012) or a system of standards (i.e. an array of prohibitions, limitations, procedures and control). Indeed, the MPA is a regulatory area[13].

This set of rules limits human activities within the marine realm and the associated exploitation of marine resources. This means that the very concept of freedom and rights over the commons is challenged (whether for living, working or recreational

[13] In the sense "administrative enforcement or policy": a set of general or specific rules (environment, fishing, waters, nuisance, etc.) aiming to govern and regulate the MPA by means of primarily preventive measures.

purposes). And the State ultimately adopts these rules. In most countries, environmental protection and fisheries management are governed by framework laws whereby governments can prohibit, authorise and adjust the various activities at sea, such as with "fisheries codes", "environmental codes" or other measures (including concerning repression, decision-making, management procedures, individual rights, corporate regimes, and the status of maritime property, etc.). Such laws are supplemented by a whole array of ministerial or governmental implementing documents which control end-actions.

This institutional set-up completes the process by securing a competent authority (with an organisation chart) responsible for MPA management and governance. From this perspective, government's financial interventions are obviously vital to MPA effective management by either and/or:

- setting entry fees or taxes related to particular activities (incentive and descentives),
- introducing fees for benefits from protection services and ecosystem services,
- valuing activities regarded as positive in the governance process (such as scientific research).

One of the challenges is to ensure the participative involvement of stakeholders concerned by the establishment of each set of rules/standards for ultimate good governance.

d) A look at MPAs and governance

Governance is a paradigm that stems from the disciplines of sociology and political science. But today, governance has become a federating term commonly used by policymakers, managers, researchers and stakeholders. As such, the nature governance is still rather vague, particularly on a scientific level and different disciplines thus use their own definitions. In the context of MPAs, it allows to describe the way in which MPAs function for society, combining legal rules, power driven relationships, human behaviour, institutional frameworks, market trends, user pattern, scientific data collection, etc.

According to a study conducted in 2012 (Cazalet, et al.), the positive effects of MPAs on small-scale fishing activities is one of the indicators that needs to be assessed to determine the level of good governance (as well as its effectiveness and legitimacy or "social acceptability"). Such an assessment can be carried out from two main perspectives which ought to be taken into account both.

First, from the perspective of life sciences, research has confirmed several theories on the positive effects of MPAs: reserve effect, movements of fish and connectivity, enhanced fish density and fish population growth, biomass spill over, improved quality of ecosystems, protection of food webs and keystone species, of functional diversity, of outstanding features, and of sensitive ecosystems, etc.

Secondly, from a social and economic angle, placing the focus on populations of fishermen allows to measure the benefits of MPAs on the fisheries economy and its sustainability. Links between protection and fishing are difficult to isolate given the other internal or external factors that also impact MPAs: natural and climatic variability, global change, pollution and conflicts of use.

The third fundamental aspect of MPA governance, particularly in dealing with small-scale commercial fisheries, is the daily management activities to guarantee the effectiveness of measures and the way they are conducted.

1.2 Typology of MPAs based on their objectives

a) Fisheries-focused MPAs

Some MPAs are exclusively aimed at managing professional small-scale or other fisheries (Garcia *et al.,* 2013). These types of specialised protection are based on rules specific to fisheries law and are commonly called "fisheries reserve" or "refuge", a recognised

FIGURE 2
The fishing reserve (cantonment) of Cap Roux

Source: base map: SHOM.

notion in most Mediterranean countries. The GFCM (General Fisheries Commission for the Mediterranean) has initiated work to make an inventory of these fishing reserves in order to pool analysis capacities and the results obtained on a regional scale.

In France, fisheries reserves[14] are specific legal tools for the establishment of fisheries-focused MPAs, particularly for small-scale fisheries. They are established by the Minister (with delegation to the regional directors of fisheries), and they are monitored by the authorities in cooperation with professional organisations; they are also generally monitored scientifically to assess their effects. In these reserves, restrictions are: 1) either on all forms of fishing, whatever method is used; 2) or on the tonnage or power of vessels; 3) or on the use of specific fishing gear. The most frequent is that on any form of fishing.

In the French Mediterranean, the example of the Cap Roux fisheries reserve (450 hectares of no-take area called "*cantonnement*" in French) illustrates the novel governance of a site created at the request of small-scale fishermen.

The *prud'hommie*[15] of Saint-Raphaël, which holds fishing rights over that area, was put in charge of the management of the reserve upon its establishment in 2003. It is therefore responsible for monitoring compliance with the regulations according to two key principles of the *prud'hommie*: community discipline and mutual control. The governmental authority only takes action in support of local fishermen to control recreational and submarine poaching and incursions of professional fishermen external to the *prud'hommie*.

This model's key advantages are principally the low cost of management activities (no budget or creation of any management institution) and the biomass spill over effect recorded, measured by researchers from the Nice University (Seytre *et al.,* 2008; Francour *et al.,* 2013) and confirmed by professional fishermen. In this situation, small-scale fishermen can regard an MPA as highly legitimate and efficient in helping to reinforce this professional sector on an individual or collective scale.

In addition to the fishing reserves mentioned above, the other regional initiatives for spatial fisheries planning (listed below) concern fisheries in general and not small-scale fisheries specifically.

- The 2005 ban on deep trawling (below 1 000 m depth)
- The Fisheries Restricted Areas (FRAs) designated in the open sea (beyond territorial waters) by the GFCM, over an area of 17 677km^2: 1) Gulf of Lions slopes; 2) Lophelia de Capo Santa Maria di Leuca reefs; 3) Eratosthenes seamount; 4) Cold springs of the Nile Delta.

[14] Art. L922-2 of the French Rural and Sea Fisheries Code (*Code rural et de la pêche maritime*).

[15] In the French Mediterranean, *Prud'hommies* are traditional professional institutions that represent fishermen and locally manage fisheries, particularly small-scale fisheries. Although they have not retained their full competence that was almost exclusive (under government supervision), they are still the historical foundation of artisanal fisheries in the French Mediterranean.

A draft resolution[16] is currently in progress on "the management of protected areas, including SPAMIs in the GFCM competence area". Lastly, the GFCM has agreed to create a Transversal Working Group on Marine Protected Areas, with the following terms of reference:

- "Review the state of existing MPAs in the Mediterranean and Black Sea, including assessment of the state of the ecosystem and human dimension, compliance with resolutions and functioning of the monitoring.
- Review the state of existing proposals for new Marine Protected Areas, including advances and requirements for promoting the establishment of protection figures such as FRAs or SPAMIs.
- Propose technical solutions to harmonize different criteria for the establishment of MPAs and FRAs, including on the basis of Resolution GFCM/37/2013/1.
- Identify potential new MPAs, based on ecosystem services and socio-economic analysis and by identifying the needs for a formal protection proposal. In particular, the Working Group will assess the benefits of FRAs for protection and recovery of endangered/overexploited stocks in the GFCM area.
- Evaluate current monitoring systems for MPAs and propose improvements and modifications as needed".

Closer link between fishing and MPAs is today put forward as a real political ambition on the regional scale to improve conditions of cooperation and coherence in spatial planning of Mediterranean fisheries.

Another interesting tool is artificial reefs as managed areas or within MPAs when intended to enhance fisheries. Small-scale fishermen often show unanimous interest in these restoration structures which however need to be used with great care. But in reality, "post immersion" management problems are frequent, as a number of other stakeholders such as divers also show interest and there are often conflicts of uses. Except for Japan, which has historically been leading in the topic, there is little available data about the governance of artificial reefs in the Mediterranean in an integrated framework, adapted to exclusive or non-exclusive uses (Cazalet, 2009; Cazalet *et al.,* 2010 and 2011).

b) MPAs to preserve the environment and its resources

The "traditional type" of MPA aims to produce positive bio-ecological effects for the natural environment and its resources, usually after degradation has been detected. While the body of empirical research that scientifically proves their efficiency is still not large enough (Halpern, 2003; Rice *et al.*, 2012), many examples can today be used to show the positive effects.

Among the causes of environmental degradation and loss of biodiversity, overfishing can play a significant cumulative role; yet it is rarely the only cause when small-scale coastal fisheries are concerned, at least in the Mediterranean. Other factors of degradation and biodiversity loss include removal practices (both professional and recreational), excessive visitor numbers (mooring, diving and other practices), global change, pollution, coastal development and alteration of drainage areas.

The effects of an MPA will depend on its assigned objectives which are set in response to the above listed pressures and will also be governed by its specific situation (ecosystems, demographics, socio-economic activities, etc.), and its resources, size, management methods, etc. To assess the effectiveness that MPAs aim to achieve, most research focuses on the effects of strict nature reserves and few analyse multi-use marine

[16] See the report of the thirty-seventh session, Split, Croatia, 13–17 May 2013, and Resolution GFCM/37/2013/1: https://gfcmsitestorage.blob.core.windows.net/documents/Reports/GFCM-Report-Commission-37-en.pdf; http://151.1.154.86/GfcmWebSite/docs/decisions/GFCM-Decision-RES-GFCM_37_2013_1-en.pdf

protected areas (Gascuel *et al.* in Garcia *et al.,* 2013), possibly due to measurements being more complex for the latter case. However, it is established that conservation can have knock-on economic effects on some activities, including artisanal fishing.

The importance of science is vital in MPAs governance and no doubt a critical factor for protection policy developments (Cazalet *et al.,* 2012). Scientific expertise provides justification for regulatory measures on individual and collective freedom set by policies. Also to be noted is that scientists often have privileged access to conduct research and monitoring in areas where access and all other activities are forbidden. This special access right helps further knowledge of the marine realm and allows assessment of conservation measures effects.

Even if considering economic knock-on effects of protecting marine ecosystems was conventionally not the initial goal of many "biodiversity conservation" oriented MPAs, such considerations have become much better integrated in planning and management processes. The active involvement of local fishermen in the scientific governance of MPAs is thus a major objective. Fishermen contribute significantly to observations at sea, to monitoring and evaluation in relation with extractives activities and spatial management. Small-scale fisheries have survived through centuries. This fact coupled with their capacity to adapt to their environment show how the buildup of knowledge and passing it on are essential to the daily exercise of fishing practices: knowledge of environments, species, their behavior and distributions, adaptation to change whether positive or negative (sometimes explained such as the spillover effect) or unexplained (climate change) yet immediately recognised and incorporated by fishermen in modified practices, etc. In the context of intense scientific research on MPAs, the contribution of fishermen, as eyewitnesses of the state of the environment and resources, can be very valuable for researchers and managers.

However, cooperation and mutual integration of efforts between fishermen and scientists are not always effective or systematic. In the Mediterranean, fishermen generally distrust outsiders who ask questions on fishing practices and fishermen's knowledge (sometimes secretly kept...), observations and perceptions. The multifaceted and seasonal nature of the small-scale fishing activity is complex to understand. Much attached to the versatility and relative freedom of their activity, fishermen may consider "risky" to reveal details of their work openly. Indeed, they fear that this might compromise their practices in the future, especially in case of a negative scientific assessment pointing to the negative impacts of practices and the need to strengthen regulations. This applies in particular to monitoring catches[17] and assessing fishing effort on the individual and collective scales. This situation justifies the need to establish relationships between fishermen and scientists based on trust as both parties have much interest in working together, beyond the respective suspicions on their activities. MPAs managers can here play the role of mediator, close to fishermen due to their permanent presence, and narrowing links with scientific institutions.

c) Management and protection of multi-use MPAs

While strict nature reserves and no-take zones generally ensure the most efficient protection of biodiversity, the often authoritative approach in their implementation frequently prompts contentions and opposition, namely from fishermen who are excluded from their work areas. Furthermore, the expected benefits of a strict nature reserve demand a minimum amount of time to materialise, and in the meantime the spatial exclusion is likely to engender socio-economic losses such as for fishermen

[17] Some countries impose that small-scale fishermen record daily catches and landings systematically through logbooks. The data is then recorded and processed by the fisheries management authorities for scientific monitoring.

(who are often not compensated). As a result, MPA models have increasingly favoured a more moderate approach which considers the multiple uses as well as economic and social dimensions.

This type of MPA has diversified its objectives and functions, adopting a long-term integrated vision. Management focuses increasingly on an optimal balance between protection and the on-going economic activities or their sustainable development in a delimitated space, including small-scale fishing.

This translates into MPA governance having to organise access rights between the various users and adopt a spatial planning stance. And because the marine area and its resources are traditionally considered common property by its users, governance by an MPA must manage these assets in the general interest of the populations the managing authority represents, keeping them in a satisfactory condition for future generations. The challenge remains in assigning access rights to different users so that they are perceived as least discriminatory as possible.

These access rights are usually defined by the regulations that accompany the creation of MPAs, based on the profession, origins or activities of the various groups of people. The status of fisherman is particularly emblematic of this regulatory situation. Most countries recognise a "people of the sea" status – especially that of fishermen – defined as "the legal and administrative regime applicable to individuals actually practicing the profession of fisherman". This regime is a manner of limiting access to resources to a regulated profession. It firstly comprises a list of conditions to be met in order to be covered by the special regime[18]. Ultimately, the status of fisherman grants special access rights with entitlement to use specified equipment to catch fish. For marine area managers, the status and classification of fisheries is a method of control in conservation policy implementation.

In addition, occupancy rights, particularly via concessions, are also a means of controlling exploitation of public assets[19]. A concession may be granted by the State to an individual, a group of individuals, a commercial or industrial undertaking, a public or private organization, a trade union, a cooperative, a local authority, a corporation, a village, and so on and so forth. It aims to facilitate the sustainable management of resources through the private avenue while retaining supervision responsibilities and controlled ownership of the area[20]. The granted permits are a widespread way of controlling access to MPAs in the form of concessions of areas, services, resources or regulatory powers.

The example of fishing licences is a good illustration of this method: by administrative decision, a limited number of people are authorised to fish a certain amount of resources. A concession may also encompass all or part of the government's service or enforcement activities to improve protected area governance. Systems of public

[18] Very often the composition of crews organises maritime categories defined on the basis of seniority, qualification, and specialisation in a type of fishing or navigation. This status also includes a maritime social security scheme and professional duties. In most countries the authorities have a classification by type of fishing which enables to adjust access rights in a rather arbitrary fashion: artisanal, industrial, coastal, canoe, traditional, deep-sea fishing, etc. Similarly, the organisation into specialised fisheries segments the profession to better control access to and exploitation of resources.

[19] "A concession is the contract whereby the government authorises an individual to exploit common resources, on its behalf, or to occupy public areas, or to do work or provide public services on behalf of the authorities". It is a well-documented legal form of "public-private partnerships" (Féral, 2012).

[20] Due to its characteristics, the concession system does not therefore offer the guarantees of land ownership and is most often based on temporary, unilateral, revocable authorisations, without granting the concession holders any rights in rem or to the fishing resources or areas. This legal situation naturally raises the question of the precariousness of the companies' operating rights, the question of capital structure, and of amortisation and return on investments.

facility concessions and delegation of public services also allow private resources to be involved in the administration of marine areas and fees to be levied to pay for conservation-related services: use of environmentally-friendly mooring facilities, landing stages, car parks, compulsory use of public transport to visit protected sites, retail outlets and museums adjoining protection areas, etc.

d) MPA planning and networking at regional scale

The development of maritime policies fosters the creation of international expertise networks capable of providing objective data for MPA creation and management. Governmental scientific bodies, universities, institutions, private foundations, NGOs and networks of individuals are all involved in monitoring and assessing the status of the seas and oceans, and even more so since the Rio agreements in 1992. National and international scientific networks have formed to pool their experience and databases and to partake in cooperation programmes. New university research units and programmes have been created to both increase capacity to gain knowledge on marine issues and to address a number of emerging topics. This scientific community, often an advocate for conservation issues, increasingly takes part in the administration and governance of marine areas.

The increasing scientific interest in MPAs contributes to the development of planning tools on the regional Mediterranean scale, the main ones being:

- The identification of SPAMIs (under the SPA/BD Protocol of the Barcelona Convention) by the RAC/SPA upon recommendation of the Contracting Partie, and the identification of EBSAs (ecologically or biologically significant areas, under the CBD) in conjunction with the UNEP-MAP and the RAC/SPA. This extensive work helps improve the representativeness and clarity of the system of Mediterranean MPAs (Hoyt and Notarbartolo di Sciara, 2008; UNEP MAP-RAC/SPA, 2010);
- Integrated coastal zone management (ICZM Protocol of the Barcelona Convention) which stands to "[…] promote the integrated management of the coastal zones, taking into account the protection of areas of ecological and landscape interest and the rational use of natural resources" Art. 4-3e.

At the European level, the Natura 2000 network under the EU nature and biodiversity policy drives the designation of sites by Member States under the Habitats Directive (SACs: special areas of conservation) and Birds Directive (SPAs: special protection areas). The Marine Strategy Framework Directive (MSFD – European Union) in parallel seeks to achieve "Good environmental status" (GES) by 2020, which gives marine protected areas a role in this process.

Alongside regional scientific networks, others have grown, including those involving MPA managers on the one hand and small-scale fishermen on the other. They interact increasingly with one another. For instance, scientific cooperation meshes with the network of MPA managers in the Mediterranean, represented by the MedPAN organization. With about 58 members and 32 partners from 18 Mediterranean countries (http://www.medpan.org/en/membres-et-partenaires) MedPAN encourages: 1) the exchange of experience between managers of Mediterranean MPAs and, 2) the development of management tools. Three strategic components of the 2013–2017 Network strategy are to:

- be a network for knowledge, information, anticipation and synthesis;
- reinforce the vitality of the network, interactivity between members and build their capacity for effective management of MPAs with stakeholders;
- reinforce the MedPAN network's sustainability, prominence, governance and resources.

The exchanges within MedPAN and its various programmes have contributed to strengthening the existing system of MPAs, namely with the development of management plans and prompting the creation of new sites (Bonifacio, Scandola, Port Cros, projects in Croatia, Algeria, Tunisia, Libya, etc.).

With the expansion of the MedPAN network, existing relations with small-scale fishermen are growing closer and mutually enhancing. As mentioned, small-scale fishermen are themselves getting organised in networks in response to fisheries policies, aiming to consolidate the bases of small-scale fisheries, to support sustainable management goals and maintaining the wealth and diversity of their fishing activities, issues often overlooked or even contested in their own living and working environments. Several recent subregional projects and initiatives will illustrate the case of the Mediterranean later on in this document.

1.3 MPA distribution, design and surface areas

MPA design is pivotal to reaching set management objectives. It encompasses the size and geographic location of the MPA, the possible interconnection of the various zones it comprises, and the possible interactions with areas outside its perimeter at the national and regional level, even when the latter are located far off. MPA design choices are decisive for expected benefits of the MPA.

a) The territorial basis of MPAs

Biological and ecological considerations materialise geographically to protect a whole array of habitats, species, ecosystems, unique features, etc.The following examples clearly illustrate the diversity of protected sites in the Mediterranean:

1. bays (Cabrera National Park in Spain, Al Hoceima National Park in Morocco);
2. gulfs (gulf of Castellammare fishing reserve, Italy);
3. deep-sea zones featuring canyons and seamounts: projects, studies and proposals in Catalonia, Gulf of Lion, the Ionian Sea, the Balearic Islands, Crete, the Aegean Sea, Liguria, the Nile Delta, etc. (see GFCM, reports of the 32nd and 33rd sessions, 2008/2009, Rome);
4. nursery, breeding and exportation sites (Spanish marine reserves, Zakynthos marine nature park in Greece);
5. Posidonia meadows (Côte Bleue marine park, Cap d'Agde Natura 2000 site, France) and other sheltered environments (red coral reserve and Larvotto marine reserve in Monaco);
6. emblematic and threatened species: cetaceans (Pelagos international sanctuary), groupers (Cerbère Banyuls nature reserve in France, Secche Di Tor Paterno MPA in Italy), seals, turtles (Fanar Ibn Hani, Om Al Tayour and Rass El Bassit in Syria);
7. migration corridors[21]: studies and proposals in progress for bluefin tuna (sanctuary, Monaco), for anadromous species (salmon, sturgeon) and catadromous species (European eel);
8. around non-inhabited or little anthropised islands and islets (Medes Islands marine reserve in Spain, Port-Cros National Park in France, Maddalena archipelago, Tuscany archipelago National Park and Isole Ciclopi MPA in Italy, Galite Islands nature reserve, Zembra and Zembretta National Park in Tunisia);
9. straits (international marine park between Corsica and Sardinia, France and Italy, strait of Sicily as part of MedSudMed);
10. capes (Cape Madona natural monument in Slovenia);

[21] The corridors argument is also raised in respect of marine biotopes to improve the interconnection between "patches of similar habitats or within a habitat strip" (inside and outside MPAs) and thus enable a better "spill of individuals into local fisheries" (Ramos Espla, in MedPAN 2006).

11. lagoons (Ain Gazala, El Burdi, Ain Ziyana and Farwa in Libya) and most wetlands of international importance (Ramsar sites), etc.

For example, when considering the small-scale fisheries economic sector, many cases show how its importance overrides in the decision-making process leading to the delimitation and creation of an MPA. For instance in Spain, the third largest fish producer in the Mediterranean, the fisheries economy has been a national priority, way before the environmental movement of the 1990s and the boom of MPAs. As such, it is an interesting case which illustrates functional and constructive integration between MPA and fishing No less than seven MPAs have been established along the Mediterranean coastline with the status of marine reserves "of importance for fishing"[22]. The oldest is Tabarca Island marine reserve (established about 25 years ago in 1986). The fisheries authorities are responsible for their management in close connection with the decentralised authorities (autonomous communities) and professional organisations of fishermen who are mainly artisans (*cofradias*). The reserves are delimited based on uses and "traditional" fishing sites.

b) MPA zoning

The final zoning of an MPA often results from intense negotiations with stakeholders and users which may be formal or informal and more or less based on consensus. Indeed as mentioned before, socio-economic aspects are increasingly outweighing pure scientific criteria in the creation and design of MPAs. The negotiation process leads to an array of regulations which are meant to justify the design and spatial breakdown of the MPA.

Recognition of a no-take zone is an often central feature of MPAs (along with its expected benefits, such as spill-over for local fishermen in the medium term). Beyond this zone, classic models include buffer zones and transition areas which may allow all or some extractive activities and full to partial access for non-extractive uses. Like the Spanish, French and Italians in particular show a long-standing interest in using MPAs to manage fisheries. This takes the legal form of fishing areas in France (1852 decree and 1963 by-law) and biological protection zones in Italy (1965 law and 1968 decree). Over time, this type of MPA sometimes witnesses a change of status into a multi-purpose MPA due to new types of uses gradually taking place and increasing number of users. The development of recreational, contemplative, leisure boating and mass tourism activities along the coastline has impacted perceptions on zoning. Beyond its meaning for designing MPAs as conservation tools based on scientific knowledge, zoning has become a new tool for managing conflicting access and uses, often in the framework of marine spatial planning and integrated coastal zone management.

Designing the geographic and regulatory structure of an MPA can be lengthy, complex and rather political driven. The steady growth in MPA establishment prompts fueled resistance or opposition and even conflicts on the part of stakeholders and professional fishermen in particular. As such, people and their divergences must be managed before managing the fish, hence the importance of zoning.

In addition, with the concept of participative approach for decision making or governance between the State, public services, local authorities, NGOs and all the stakeholders, purely biological aspects are of relative importance in MPA creation and management. The multiplication of functions within a single MPA can weaken expected results in that managers become confined to a role of arbiter. For these reasons, the principles of fishing reserves which are specifically designed "for" fishermen and that are agreed "with" them (using zoning to foster restocking) therefore remains a good way of paying special attention to fishing activities and the people whose livelihood relies on the exploitation of a natural wild resource. In the Mediterranean, the Spanish

[22] Resulting from a 1980 decree on "fish restocking areas".

and Italian models and, to a lesser extent, French models illustrate this case. The efficiency of existing systems must however be assessed.

c) MPA dimension

Owing to the uncertainty and controversy that still surrounds the question of optimal MPA size, specialists adopt a "pragmatic" attitude (Figure 3) and advocate a minimum surface area of 1 000 hectares, without any real maximum limit (Ramos-Esplà, in MedPAN, 2006; Tisdell *et al.*, 1989).

FIGURE 3

Relationship between spatial scale of the site-related or dependent phases of the adult and embryonic stage relative to the minimum size of MPAs

Type	Adult phase	Embryonic and/or juvenile phase	Examples	MPA size (ha)
A	fixed or territorial	direct development	Syngnathidae	<1 000
B	fixed or site dependent	planktonic larvae	Serranidae, lobsters	10^3-10^4
C	adult territory ± diffused (demersal or pelagic spp.)	direct development (egg-laying zones)	Cephalopoda	10^3-10^4
D	adult territory ± diffused (gregarious demersal spp.)	planktonic larvae	Merluccidae, Mullidae	10^4-10^5
E	large adult territory (gregarious pelagic spp.)	nursery and/or spawning areas	Thunnidae	10^5-10^6
F	large adult territory (solitary pelagic spp.)	planktonic larvae or direct development	Xiphiidae, pelagic sharks	> 10^6

Source: modified from Kenchington, 1990. Ramos-Esplà, in MedPAN, 2006.

Once again, this aspect must be correlated with zoning, particularly to determine the appropriate size of the no-take zone, from 10–20 percent (Ramos-Esplà, in MedPAN, 2006) up to 35–40 percent of the MPA total surface area and ideally of the oceans and regional seas.

Choosing between one large MPA or several small MPAs is also a subject of great debate[23]. A single MPA implies that it should be relatively autonomous, capable of achieving several aims and coherently performing a maximum number of functions, including on the land/sea interface. The largest examples include: 226 500 hectares for the Alonissos-Vories Sporades National Marine Park (Greece); 76 300 hectares for the Datça-Bozburun specially protected area (Turkey); and 53 993 hectares for the Isole Egadi MPA (Italy). The multiplication of small-scale MPAs is more in line with a networking process aiming to increase the likelihood of connectivity (Ramos-Esplà, in MedPAN, 2006) between sites and better protection against environmental factors that are difficult to predict or control, including those related to climate change.

In the Mediterranean, the predominance of small MPAs can be explained mainly by social and human reasons. Intense coastal urbanization, high tourist numbers (permanent or seasonal) and growing economic stakes don't favour major environmental constraints. Regarding fishing activities, the prior existence of fishing areas along the Mediterranean coast can be an obstacle to the establishment of an MPA. The creation of MPAs leads to a reconfiguration of the marine space liable to be seen as a factor of imbalance between neighbouring groups of fishermen, by penalizing the economy of some for the benefit of others. Furthermore, entrusting decentralised institutions with the management of marine areas applies more naturally to small MPAs as they are adjacent to the land areas over which the local authorities have jurisdiction. Such authorities prefer to have one or more small MPAs that they will effectively govern, rather than be incorporated into regional or national technocratic "superstructures", where burdensome decision procedures lead central government to make *de facto* decisions and manage with authority (Féral *et al.*, 2012 and 2013).

[23] We also refer to SLOSS controversy: *Single large or several small.*

2. NATURE AND STATUS OF SMALL-SCALE FISHERIES IN THE MEDITERRANEAN

2.1 Characteristics and status of small-scale fisheries in the Mediterranean: a spatial dimension intrinsic to professional activity

a) General considerations

Although they represent around 80 percent of active vessels, data available on this sector remain fragmented (monitoring, statistics, etc.), in particular with regards to other industrial or semi-industrial fisheries. Existing data are unspecific (Farrugio, 1991; Sacchi, 2011; Ifremer, 2008) and mainly technical (fleet, vessels, tonnage, power, etc.) and they offer little information on economic, macro-economic or sociological aspects. This may appear paradoxical, but can in fact be partially explained by the very specific structure of this fishing sector, the way it is organised and the way it functions, which is somehow hard to grasp (Polypêche project, 2013). Moreover, for several decades, public interventionism has given priority to the industrialization and economic concentration of the fishing industry, with only secondary focus on small-scale activities (Féral, 2004).

Concerning the debate of using the terms "artisanal" or "small-scale" and associated meaning, it is important to consider legal definitions regarding the sector and the interpretation which varies according to regions, countries and administrations. The FAO recognizes this lack of unanimity regarding artisanal or small-scale fishing. These two expressions differ in terms of criteria: 1) "artisan" refers mainly to the structure of the fishing business (limited capital, know-how, owner on board, etc.) whereas 2) "small-scale" introduces the notion of a geographical limit (distance, duration of trips) and technological limit (small boats). The artisan and his business have a generic meaning (in a legal and economic sense, etc.), but their definition remains ineffective and illegible in national legislation. Therefore, the term "artisanal fishing" has been generalized for practical reasons, to differentiate it from industrial fishing, yet it may refer to a wide range of realities. Small-scale fishing may appear more precise, but it is also more limiting than the "artisan" notion. Many opinions now converge on the definition of small-scale fishing according to two or three main criteria: 1) vessels are below 12 m; 2) time at sea is limited to 12 or 24 h maximum; 3) no trawling is undertaken. The definition of small-scale fishing has judicial significance in European law and, as a result, on legal systems of member States. Artisanal fishing comprises a wider approach in which boat size and techniques are not the only criteria to be part of this category. Boats of over 12 metres and trawling can be used by artisanal fishermen on a limited scope in the economic, social and legal sense. The frontiers between the two categories are however not sealed and caution should be used when sorting these fisheries.

The criteria for small-scale fisheries, and their evolution, also have a major ecological and political dimension. As a coastal activity, small-scale fishing often takes place in rich and fragile environments impacted by other activities (industrial pollution, mass tourism, coastal planning, etc.), but essential to natural cycles and biodiversity. For these reasons, it is important to ensure fisheries have a well-managed and low impact on ecosystems. Moreover, while there are renewed efforts for the development of coastal MPAs in the Mediterranean, small-scale fisheries ought to be integrated in or around these to secure the benefits that ensue from the protective measures.

b) Profile of Mediterranean small-scale fisheries

Fleets and professional activity

Fishing businesses are characterized by an individual profile with an onboard owner (boss), sometimes seconded by one or two permanent or seasonal sailors. For around 70 000 fishing vessels, there are about 200 000 small-scale fishermen in the

Mediterranean, not to mention part-time fishermen or associated jobs ashore (Oliver *et al.*, 2005, source Eurostat; Sacchi, 2008).

Mediterranean fisheries are therefore mainly small-scale and multi-specific. This type of fishing called "*petits métiers*" in France, "*artes menores*" in Spain, "*piccola pesca*" in Italy, etc., is characterized by its boat length (length < 12 m, limited tonnage and engine size[24]), a low level of specialization and the use of various catching techniques according to the season, site and sought-after species (Sacchi, 2011 and 2008). To improve fleet identification and monitoring, the General Fisheries Commission for the Mediterranean (GFCM) has drawn up the following classification (Figure 4) using a boat/gear length or technique used ratio. It is to be noted that some polyvalent boats can also be observed in the 12 m – 18 m category and this trend even seems to increase in various Mediterranean regions.

FIGURE 4
Recommendation GFCM/33/2009/3 (Annex 1) Implementation of the GFCM Task 1 Statistical Matrix repealing Resolution GFCM/31/2007/1

SEGMENT TABLE				
Groups	**<6 metres**	**6-12 metres**	**12-24 metres**	**More than 24 metres**
1. Polyvalent small-scale vessels without engine	A			
2. Polyvalent small-scale vessels with engine	B	C		
3. Trawlers		D	E	F
4. Purse seiners		G		H
5. Long liners			I	
6. Pelagic trawlers			J	
7. Tuna seiners				K
8. Dredgers		L		
9. Polyvalent vessels				M

The polyvalent nature of the small-scale fisheries boats can take several forms and cover various skills. Fourty-five types of techniques have been recorded in the Mediterranean – for example: net, encircling net, creel, fyke net, line, longline, basket, dredging, shore fishing, diving etc. While some fishermen may be exclusively driftnetters and considered as "specialized", they actually use several netting techniques (trammel, gillnet, combined net, drift net, etc.) with different mesh size, targeting different species. This polyvalent character can therefore equally refer to the diversity of fish or techniques. Uncertainties inherent to all professional fishing activities encourage small-scale fishermen to maintain a diversity of techniques and avoid entirely depending on a single species such as with industrial fishing. The main advantage[25] of polyvalence is that it allows great flexibility and daily adaptation to natural conditions, species present and even market demand.

The opportunism of small-scale fishermen is not therefore void of a commercial and economic strategy. Species with high added value are the first target (bass, gilthead bream, sole, whiting, murex, red mullet, striped sea bream, spiny lobster, bonito, etc.) as they maximize the results of efforts. Nevertheless, many other species of lesser commercial value, or species caught off-chance, are also captured and sold, sometimes at very low prices (mullet, Mediterranean bream, bogue, mackerel, etc.). One of the main

[24] Small-scale fishing uses little fuel and generally benefits from tax-free professional prices, but the regular increases in energy costs are now impacting this category and contributing to the progressive rise in their overheads.

[25] This advantage becomes a disadvantage when weather conditions (wind, swell, temperatures, etc.) restrict or prevent all fishing activities. From this point of view, small-scale fishing boats are more sensitive to natural conditions than larger units and may be subject to long periods of idleness.

difficulties for fishermen is to manage a basket of species of varying economic interest every day. Another is to manage, throughout the year, imbalances caused by variations in species abundance, in particular between those with high value and those of lower interest. As such, times of good catches alternate with slack periods or even shortages. Variations in abundance have a substantial effect on prices and on the capacity to respond to local demand, especially in terms of wholesale and retail wholesale (auction, merchants, cooperatives, etc.). For private small-scale companies with limited volumes, problems relating to irregular prices can be particularly penalizing.

At a commercial level, "small-scale production mostly targets nearby markets and fresh, varied produce sold directly to consumers. Some may, however, contribute to the export market in a significant manner (eel and octopus fisheries, etc.)" (Sacchi, 2011). The question of the economic performance (product marketing/ promotion) of small-scale fisheries is particularly essential in that it offers a very varied supply (nearly 100 demersal species and many pelagic species – Sacchi, 2011). However, consumers are generally unfamiliar with many of these species which are therefore difficult to promote beyond local markets and direct sales. Similarly, the importance of marketing can also be taken into account upstream within the spatial management of individual fishing effort. This aspect often seems to be set aside. Averaging selling prices should be encouraged as this is likely to reduce the fishing pressure; as the saying goes "fishing less, but sell better". MPAs appear important due to role they can play in promoting products from their site (labeling, traceability, infrastructure, etc.) by providing added value. This encourages self-regulated efforts by fishermen and thus contributes to a sustainable use of the marine environment.

The territorial basis of small-scale fisheries

Small-scale fishing fleets operate in coastal areas, within the limits of a very narrow continental shelf and mostly fish for demersal species, small pelagic species and some highly migratory species. It should be noted that lagoons are also exploited and that some fish and shellfish farms are sometimes associated with small-scale fisheries.

The territorial basis is a common trait of all types of polyvalent coastal fisheries. Polyvalence has developed in response to the need to work efficiently and flexibly in a restricted and non-expandable area. While the Mediterranean has a rich biodiversity, it has a small biomass. Fish species are numerous, but the stocks are shared and lack abundance. As such, polyvalence is an optimized balance between fishing and biodiversity. This type of fishery is considered the most sustainable as it has the least ecological impact on resources and environments (theoretically better distributed at least in theory). Adaptation has led fishermen to gain extensive empiric and vernacular knowledge of natural environments and fish behaviour patterns. This has resulted in fishing calendars showing spatial characteristics and seasons.

Moreover, vessels below 12 metres are generally limited to territorial waters (12 nautical miles and often below 5 nautical miles) for legal and/or material reasons, although some units occasionally operate in more distant and deeper waters (red tuna and highly migratory species by small-scale long-liners). In many Mediterranean countries, bottom and pelagic trawling is banned along the coast, although this is not always respected, monitored and sanctioned by the administration. But in fact, trawling does not belong to the notion of territory as it is far more mobile and covers far greater distances than small-scale fishing. Conflicts between small-scale fisheries (passive *métiers*) and trawlers are frequent (equipment removal, habitat destruction, competition over particular species, etc.) and justify a spatial and effective distribution of access to these different fisheries. In this respect, the instigation of an MPA can help guarantee small-scale fishing in coastal areas and its enforceability with regards to other non-compatible practises.

Coastal areas are also increasingly coveted for other purposes, mainly recreational, such as yachting, scuba diving and snorkelling, spearfishing, power sports, jet skiing, recreational fishing, etc. This reduces the scope of action of small-scale fisheries in particular in areas near the shore and during summer. In turn, this tends to aggravate conflicts of interest between fishermen themselves and with other marine environment stakeholders. The spatial regulation of coastal activities according to categories of interests and which respects the principles for the use of maritime areas (public) is becoming increasingly difficult to implement in an efficient and consensual manner. This is even more obvious in the case of biodiversity and marine ecosystems protection. Numerous initiatives, including conservation projects (MPAs) and restoration projects (artificial reefs) regularly modify the spatial reference coastal fishermen work with in terms of constraints (prohibited or limited zones) and benefits (fishing reserves and biomass production sites). These protective/management measures raise many questions and prospects for cooperation between small-scale fisheries and MPAs. The situation and strategies of small-scale fishermen in the framework of these integrated policies as well as their expectations (economic dependency to natural renewable resources) must be taken into account and incorporated in the management systems, especially in terms of sustainability.

Organisation and representativity

From a historic and sociological viewpoint, the original organisation of small-scale fisheries is based on the communitisation of the spatial limits of a territory (fishing area) and required knowledge for using it (Féral, 2004). The instigation of community discipline rules makes the practical application of sharing possible by guaranteeing a balanced share-out of the wealth (access and use). From the 1960s onwards, the legal, institutional and economic evolution of the fishing industry rapidly modified these traditional, autonomous management patterns. Currently, community structures and the spatial reference still exist on the scale of ports, fishermen's villages and some specific institutions (*prud'hommies*, *cofradias*, cooperation, consortium, etc.). However, the dynamics of these models tend to weaken with the breakdown of fishing communities. This is further reinforced by the more general crisis affecting the profession and its attractiveness. In addition, the professional fishing industry is often very bureaucratic and technocratic on an EU and member State level, hence incurring increasingly heavy and costly constraints (capture monitoring, catches, safety, controls, equipment, etc.) on individual, family-run and self-directed businesses.

Small-scale fisheries have the advantage of bringing together the largest number of vessels and fishermen, but their multifaceted character leads to many problems, as previously mentioned:

- A scattering of the activities and practices due to multiple *métiers*;
- The individualistic and opportunistic strategies of professional fishermen;
- A strong territorial identity on a port and village scale with a daily scope of action that restricts fishing practices and their objectives to "one's own living space".

These factors render the profession quite isolated and, despite being widespread throughout the Mediterranean, it lacks solidarity and a suitable organisation to defend its rights and economic interests. For specialized fishing semi-industrial and industrial units representation is secured via structures which group category-based interests (unions, producer organisations, owners, cooperatives, federations, etc.),

whereas small-scale fisheries greatly lag behind on a regional and national scale[26]. Few small-scale fisheries are involved in professional instances with a representative and participative vocation as regards decision-making, regulations and the elaboration of fishing policies. However, long-term representation is vital for gaining credibility with regards to public authorities, being listened to and heard, and for influencing the discussions that lead to decisions and regulatory measures. This fact is poorly covered in existing research and could be the subject of comparative analyses of Mediterranean States.

FIGURE 5
Comparative approach of the characteristics of industrial and small-scale fishing on a global scale

FISHERY / BENEFITS	LARGE SCALE	SMALL SCALE
Subsidies	$$$$$ 25-27 billion	$ 5-7 billion
Number of fishers employed	about 1/2 million	over 12 million
Annual catch for human consumption	about 30 million t	same: about 30 million t
Annual catch reduced to fishmeal and oils	35 million t	Almost none
Annual fuel oil consumption	about 37 million t	about 5 million t
Catch per tonne of fuel consumed	= 1-2 t	= 4-8 t
Fish and other sealife descarded at sea	8-20 million tonnes	very little

Source: Guidetti, 2012, from Piante, 2012.

The issue of traditional fisheries

The so-called "traditional" fisheries which take place in various places in the Mediterranean are sometimes listed in the small-scale fishing category. Although they are considered part of a historic and cultural legacy[27], traditional fisheries are a

[26] In particular in the EU context, where the progressive transfer of state skills to European institutions (Commission, Council, Parliament) has contributed to shifting decision centres to a supranational level. The common fisheries policy is symptomatic of this technocratic centralization process which is often poorly understood and perceived by fishermen. Small-scale fishing stakeholders also refer to a feeling of inaccessibility and even cutting off (physical, political and social) with regards to power and decision circles. Lobbyist and professional setups must now incorporate these increasingly complex components which prevail over the definition, adoption and implementation of standards.

[27] Examples include tuna nets (traps or *madragues*), which are very widespread in the Mediterranean and have been used since Greek times to catch tuna, and the use of fixed nets still found in Sicily (Italy) and called "*tonara*" in Spain and "*almadraba*" in the Maghreb region.

regulated commercial and professional activity in most cases. There is a lack of clear-cut definition in national legislations[28] and because many small-scale fishing techniques have a traditional origin, it is often hard to distinguish between them. In fact, the main qualifying criteria are fishermen using traditional techniques/equipment who claim special protection for these via the application of special legal regimes. What stands out most is the highly local or regional character of this type of fishing, used "here and nowhere else". Secondly, traditional fishing takes place at a community level, driven by the traditions and know-how of a clearly-defined group of fishermen. Lastly, these fisheries are often seasonal, hence reinforcing their inherent geographical dimension. When negative effects are scientifically-proven (poor selectivity, over-exploitation of stocks or impacts on the natural environment, traditional fisheries may be restricted or banned by the States and their organisations (e.g. European Union). In this case, the "traditional fisheries" status is not enough to protect the technique and guarantee it an ad hoc regime. A number of practices for which no historic, cultural or heritage legitimacy[29] could be proven have therefore been under scrutiny.

c) A regional-scale structuring process for small-scale fisheries

A favourable political and legal climate for small-scale fisheries

Small-scale fisheries are increasingly becoming the focus of significant and positive political attention. The Mediterranean fishing crisis is affecting the whole industry[30] (Sacchi, 2011), and even if industrial and semi-industrial activities are mentioned more often due to their impacts, small-scale fisheries have not been spared either, as shown by the decreasing number of working fishermen. In the case of industrial and semi-industrial practices, the decline of these fisheries underlines the fragile nature of ultra-specialized activities whose profitability relies on mass catches using power-dependent techniques[31]. The opinions and conclusions of the Scientific Advisory Committee (SAC) of the GFCM, presented at the thirty-fifth annual session of the GFCM (documents GFCM:XXXV/2011/4 and GFCM:XXXV/2011/Inf.5) reiterate the following:

> "According to the Subcommittee on Stock Assessment (SCSA), the majority (91 percent) of the demersal stocks and part (18 percent) of the pelagic stocks assessed were considered as fully or overexploited, with catches comprising mainly youngsters" (FAO, 2012)[32].

[28] The term is often employed in developing countries to describe subsistence fishing undertaken by coastal communities according to customary procedures and laws. However, this concept is too restrictive to be applied to the Mediterranean, with the exception of certain fisheries in the southern Mediterranean (Morocco, Algeria, Tunisia, Libya, Egypt).

[29] For example, there was a Mediterranean uproar over *thonaille* fishing (drift net for tuna and other pelagic species) blamed for being non-selective and causing too much by-catch (namely of dolphins) and over the *gangui* (small-scale trawler) used in coastal habitats (posidonia beds). These practices have progressively lost their special regime and are now banned – or, in the latter case, subject to strict regulatory measures.

[30] Data reveal a global decreasing trend in the number of catches and working units, but this is not homogeneous across the Mediterranean. Trends in the eastern Mediterranean are fairly different from those in the western Mediterranean, including with regards to small-scale fishing (Sacchi, 2011). On a national scale, public policy sometimes has totally different orientations; the European States in the northern Mediterranean have implemented policies to reduce capacity (paid fleet decommissioning and aids to stop boat construction), improve selectivity and protect areas/resources, whereas other countries are committed to public and private support for the development of the fishing industry (Turkey, Cyprus, Malta, Albania, Algeria, etc.).

[31] The huge increase in production costs (fuel prices), in particular for trawlers, has been the main factor of weakening, coupled with the rarefaction of resources.

[32] Report available at: http://151.1.154.86/GfcmWebSite/docs/Reports/GFCM35f.pdf

Around fifty priority species are currently being monitored and supervised more closely by GFCM SAC. In addition to highly migratory fish, the following species account for the majority of Mediterranean production: hake, red mullet, sole, shrimp, sardine, sardinelle, anchovy, sprat and scallop.

And while the industrialization of fishing launched in the 1950s–1960s has up to now been encouraged by national and European bodies on a political, structural and financial level, the current decline in fish re-balances the focus onto small-scale fishing catches[33] in some Mediterranean regions. This can be seen as an indicator of the better sustainability of the small-scale fisheries sector, its technical adaptability (polyvalence, selectivity) to natural environments (lagoon, coastal and marine) and its structuring role in the coastal economy. The changes in the fishing industry appear to favour the evolution process on a political and legal level.

The European Union

The reform of the Common Fisheries Policy (CFP), implemented by the European instances, contains concrete orientations in favour of the small-scale sector and its sustainable development. To summarize: 1) member States are encouraged to consider preferential or exclusive access for small-scale fishermen along the coast, underlining the selectivity and low impact of the techniques employed; 2) fishing opportunities will not only be allocated according to seniority but also on the basis of environmental and social criteria, e.g. the impact of fishing on the environment, or the creation of local economic benefits. Beyond this favourable legal content, many questions remain as to how these provisions will be implemented from 2014 onwards. Similarly, the issue of public support/financing has not been decided yet and serious questions remain regarding the *in fine* criteria for aid and participation that will actually assist small-scale fishing[34].

These European inclinations confirm the need to consider adequacy of spatial and temporal factors for small-scale fisheries and recognition of its strong environmental and socio-economic dimension. However, it remains to define clearly which fishing sector is concerned and instigate regulatory measures relating to the possible transfer fishing activities to the coast. This latter point is fundamental in that promoting the coastal area is likely to reinforce imbalances and disturbances if the proposed measures do not guarantee the management of the carrying capacity and factors of production in Mediterranean coastal environments.

From the fisheries perspective, European legislation[35] favours an approach based on "fishery reconstruction plans", the "improvement of the state of conservation of ecosystems" and the "establishment of areas and/or periods of fishing bans or limitations, including for the protection of spawning and nursery zones" (art. 4.g.ii) in order to contribute to the reinforcement of stocks and stabilization of captures. At

[33] Even if situations vary according to the country, trawlers still account for a vast majority of catches. Their unloading and wholesale networks (auctions, wholesalers) facilitate statistical monitoring by competent organisations.

[34] The European Parliament has voted the future text relating to the European Maritime and Fisheries Fund (EMFF) on 22 October 2013. Small-scale fisheries representatives had already expressed their concern with regards to the attenuation of small-scale fishing criteria, allowing a larger number of boats to benefit from the aids granted to this sector. The main risk would be a failure to take into account the time spent at sea (24h maximum) in order to enter into the small-scale fishing category and benefit from the associated subsidies. Finally, the vote will maintain the existing distinction in favor of small-scale fisheries, which may access certain forms of public subsidies due to the sustainability of this segment and a better integration of environmental practices.

[35] Council Regulation (EC) n°2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy, amended by Council Regulation (EC) n°865/2007 of 10 July 2007. Regulations have a direct effect, i.e. they must be automatically applied by member States, as opposed to more flexible directives that require adaptation for integration in national law (law, decree, by-law, etc.).

the financial level, the European Fisheries Fund (EFF, to become European Maritime and Fisheries Fund, EMFF) focuses on supporting (Priority axis 2) the development of Natura 2000 marine areas (art. 30.2.d). The integration of environmental concerns in the fishing management policy has become a priority.

From the environmental perspective, the Directive of 17 June 2008[36] mobilizes States "to achieve or maintain a good ecological status of the marine environment by 2020 at the latest" (art. 1). The MSFD mentions in many sections recourse to MPAs in the form of Natura 2000 or other sites qualified as "marine protected areas" to achieve ecosystem rehabilitation and restoration (sections 5, 6, 7 and 21) and confirms the usefulness of spatial protection measures (art. 13.4), such as closed areas (point 39), in re-establishing the "integrity, structure and functioning of ecosystems and, if necessary, protecting hatching, nursery and rearing zones". The EU underlines the fact that the Strategy is based on the commitments made at the Johannesburg Summit for the constitution of a representative global network of MPAs by 2012 (point 18). A progress report on MPAs should be published by the European Commission (executive body) in 2014.

Lastly, although these various provisions only concern EU member States, the weight and influence of the European system in the Mediterranean context should not be underestimated. The EU remains a predominant stakeholder and leader at a political, economic and environmental level, in particular with regards to its action in the fields of the fishing industry and marine environment governance. The European case illustrates policies on a subregional level but many other initiatives exist in the Mediterranean and should be analyzed. Policy integration of fisheries and coastal/ marine environmental policy vary across the Mediterranean especially in the south where better coordination and subregional coherence could be sought.

The General Fisheries Commission for the Mediterranean (GFCM)

At the regional level, the main asset of GFCM is its macroscopic approach to a semi-closed sea and to the management and conservation of shared stocks. Moreover, its mandate targets the management of living marine resources within its area of application without prior distinction between types of fisheries. The progressive strengthening of its powers[37] has allowed this institution to increase its legitimacy and scope of action. The new GFCM Agreement reiterates its main functions in terms of conservation and rational use of resources.

The legal impact of the measures adopted by the GFCM can be viewed as moderate (Beer-Gabel *et al.*, 2003). The elaboration of recommendations follows a precise process, detailed in the relevant provisions of the Agreement for the establishment of the General Fisheries Commission for the Mediterranean ("GFCM Agreement"). The adoption of a text requires a two-thirds majority of votes before it is enforced on Contracting Parties. However, a member can object to the notification of these recommendations expressly by specified deadlines (art. 13.3) which gives the right to not being under the obligation to give effect to the recommendation. The GFCM is not a supranational instance; it is an interstate organisation in which each State is considered in an identical way and protected in their sovereign functions as recognized

[36] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (the "Marine Strategy Framework Directive").

[37] Reforms undertaken in 1997 and 2003 (Venice Conference) mainly related to: 1) the integration of the European Union and Japan; 2) the election of an Executive Secretary by the Commission Contracting Parties; 3) the allocation of a dedicated head office; 4) gaining functional semi-autonomy from the FAO and the transfer of financial contributions to the member States in force since 2004 (independent budget); 5) special measures to counter illegal, unreported and unregulated fishing, including a whitelist for vessels of over 15 m authorized to fish in zones governed by the GFCM.

by international law and the United Nations Convention on the Law of the Sea (UNCLOS). However, this must further be considered in terms of the special context of regional relationships, obligations born out of the ratification of treaties[38] and the special status of a semi-closed sea. Therefore, the will to reach a consensus, and even unanimity, instigates the notion of shared will, mutual recognition, regional coherence and respect of one's obligations.

Regional Fisheries management organizations (RFMO) initiatives only make sense when the States take the necessary measures to achieve their objectives and individually respect their common commitments. Their efficiency relies on members acting in compliance with the spirit and content of the texts. Upstream, members must guarantee a certain degree of reciprocity as, downstream, there is no way of enforcing a sanction on a State that refuses to apply a binding provision. The role of the compliance committees takes this reciprocity into account in its assessments of efforts to implement recommendations. These are made public (to the other States and civil society) in order to highlight who is "playing along" and who is not. From this viewpoint, the compliance committees can be dissuasive and encourage the State to respect the law if it does not want to be pointed at for defying regional interests and its own commitments.

Although the right to sit at the Commission is given to Contracting Parties, the GFCM remains open to non-governmental institutions that represent the interests of civil society in relation to the mandate of the organization. These observers have no legal competence, aside from being given the right to make observations in order to inform the Contracting Parties, warn them about certain situations and/or encourage them to react accordingly. Although this participation in decision-making is limited, it provides two important benefits:

- it allows to balance the process in favor of the democratic participation of civil society; and
- it provides enhanced exchanges between policy makers, their administrations and some state representatives, on both the economics and environmental fronts.

GFCM focus on small-scale fishing was recently initiated by the *FAO International Guidelines on Securing Sustainable, Small-Scale Fisheries* published in 2012[39] (GFCM, 2013), which established a clear link between marine protected areas defined as "all marine geographical areas benefiting from greater protection than the surrounding waters to conserve biodiversity or manage fisheries development". These guidelines reiterate the importance of associating small-scale fishing communities with MPA design, planning, delimitation and management processes (see the section on governance).

The Euro-Mediterranean platform for small-scale fishing: MedArtNet[40]

Created in February 2011 (www.medartnet.org), this platform brings together small-scale fishing representatives from four Mediterranean EU member countries (Spain, France, Italy and Greece) and two non EU countries (Morocco and Algeria).With a common vision and objective, the founding members intend to sustainably secure their activity by giving professional fishermen back a predominant role in the elaboration, implementation and monitoring of fish resource management measures in coastal areas.

[38] The *pacta sunt servanda* rule obliges signatory States to implement treaties in an objective manner and with goodwill (article 26 of the Vienna Convention on the law of treaties, 23 May 1969).

[39] ftp://ftp.fao.org/FI/document/ssf/SSF_guidelines/ZeroDraftSSFGuidelines_may2012_fr.pdf

[40] We will not go into details on this as Session 5 of the Symposium is specifically dedicated to these issues; MedArtNet will be partially leading the symposium. We can also identify some emerging initiatives in the area of North Africa (Libya, Tunisia, Algeria, Morocco and Mauritania): See the results of the Subregional Workshop for strengthening professional organizations of artisanal fisheries in the countries of North Africa, Bizerte, Tunisia, 24–26 September 2013.

This organization highlights various characteristics and expectations:

- the full dependency of these communities (jobs and lifestyle) on local fishing areas and fish stocks;
- the capacity to assume responsibilities with regards to areas/resources ("guardians" of resources), to guarantee the activity is in a good shape and sustainable, to favour a local approach to management and adapt/finetune regulations, including reinforcing constraints;
- the commitment to sustainability and taking part in initiatives with MPAs and co-managed fisheries. The use of selective and polyvalent gears that respect marine ecosystems and especially habitats (no trawling) and fish sizes;
- the artisanal character of the profession: owners onboard, time at sea less than 24 hours, limited-size of boats (low energy consumption), etc.;
- the will to uphold the economic, social and demographic dynamism of fishing communities and coastal communities in general, weakened by the transformation of coastal areas, multiplication of anthropic pressures and global changes and their effects on the natural marine environment;
- the inadequate representativeness of this sector despite it forming a majority: nearly 80 percent of the European fleet and up to 65 percent of full time sea jobs in some countries.

For the above reasons, several priority claims have been addressed to EU representatives in the context of the Common Fisheries Policy (CFP) reform to: 1) guarantee preferential or priority access to professionals practising sustainable fishing that is integrated in their environment (economic, social and environmental performance); 2) put an end to certain destructive fishing practices in particular in Mediterranean coastal areas (protect biodiversity and habitats) ; 3) guarantee/restore the health of seas and oceans, and 4) recognize/preserve fish resources as a public good that cannot be owned privately.

Regarding the concept of a public space and common heritage under high human-induced pressures, the platform considers that public authority should not systematically apply the principle of commercial deregulation, open competition and economic concentration to the marine environment and its resources. Professional fishing relies on the exploitation of a renewable wild resource. This specificity means States and the EU have special responsibilities in terms of the implementation of effective policies for managing fishing efforts and long term integration. The allocation of quotas (where necessary) and rights of access must reward sustainable fishing methods that preserve the balance of ecosystems, especially in coastal areas. Managing fishing capacities must favour a transition towards fisheries that have a lower impact thus not solely taking into account the number of working vessels (size and engine power). Fishing capacity is also determined by the fishing means (equipment and performance) of each unit. As such, reducing the number of boats does not necessarily mean that fishing is reduced. For example, where boat destruction policies are applied (using public subsidies), it often leads to fleet renewal (also subsidised) whereby the boats are in smaller numbers but more efficient, modern and predatory than their predecessors.

MedArtNet's concerns with regards to the future CFP relate to the risk of a harsh reduction policy in fishing capacity mainly targeting the largest number, i.e. small-scale fishermen, despite the fact that they obviously represent very low individual fishing capacities (ratio between the number of vessels/volumes landed). A fishing community can only survive if it has an adequate number of professional players and boats. Fewer boats invariably mean fewer fishermen and hence weaker fisheries. The stakes of the future CFP and its financial instruments therefore consist in maintaining this dynamism and even reinforcing it to restore and develop coastal communities by encouraging young fishermen to set up there.

To maintain and restore the health of the marine environment, European fishery management must focus on the local dimension and return the small-scale sector to its rightful place by:

- taking different geographic realities into account; gaining inspiration from the experience and knowledge of the relevant fisheries considering the fishermen as a source of information on the environment, resources and practices;
- enhancing local know-how, in cooperation with scientists and fishermen;
- developing concerted management systems to allow the various players to jointly define rules for the sustainable management of areas/resources and other activities taking place in the small-scale fishing area;
- reinforcing research on the state of fisheries reserves and measures to rebuild species and their habitats.

The creation of marine reserves is one of the possible tools for the protection/management of the environment with regards to fishing practices and other human activities which MedArtNet supports. Like other conservation and management methods, it requires consulting the various stakeholders in an appropriate manner and consideration of the needs of small-scale fishermen. Failing this, MPAs are often perceived as an additional, non-compensated spatial constraint, at least in the short to medium term. Fishermen are not always convinced of the positive effects of MPAs as they first consider the economic consequences of the losses (territory and restrictions) incurred by the creation of an MPA before looking ahead to its long-term benefits[41].

Generally speaking, MedArtNet improves the legibility and representativeness of small-scale fisheries in the Mediterranean and should, as far as possible, continue to develop throughout the Mediterranean basin. This type of initiative can also be found on a very local level and in the shape of national platforms. Such is the case with the French Mediterranean fishermen (http://www.plateforme-petite-peche.fr/) and a similar momentum is under way in Morocco. The evolution of federative approaches and their capacity to extend and favour the buy-in of other fishermen or groups of fishermen, and the results obtained, will be decisive for the future of small-scale fishing.

3. MPA EFFECTS ON SMALL-SCALE FISHING IN THE MEDITERANEAN

The effects of MPAs on small-scale fishing in the Mediterranean are presented in this section. Methods used for bioecological and bioeconomic analyses (mathematical calculations, modelling, indicators, etc.) are then discussed. Some examples and field assessments are provided to illustrate effects of MPAs on small-scale fishing.

According to the FAO (2011), the main positive effects of MPAs (services rendered by marine ecosystems) with regards to fishermen are as follows (Boncoeur *et al.* in Garcia *et al.,* 2013):

- "control of mortality induced by fishing sedentary species in a context of information rarity and/or difficulties in controlling the activity using "classic" methods;
- assistance in managing multi-specific fisheries;
- reduction in accessory catches (undesirable secondary catches);
- protection of habitats and biodiversity;
- protection against uncertainty (shock-absorption in case of random shock);

[41] This reaction may be worsened by institutional (ministries) and administrative compartmentalization between fishing and the environment (fishing attached to agriculture or transport and MPA to ecology/the environment), even more in southern countries. This may maintain upstream suspicion and administrative competition and jeopardize the downstream buy-in of fishing communities and their representatives.

- delegation of responsibilities and management tasks to local fishing communities in a co-management perspective;
- protection of cultural practices and traditional rights of use;
- protection and development of the livelihood of local fishermen;
- solving conflicts of use."

To these, the following could be added:
- potential and direct advantages for small-scale fishing firm sales (effects on prices and economic optimization of products) linked to larger catches (in case of biomass export), and/or catch size;
- added value of the MPA image and the prospect of alternative, complementary or compensatory activities generated by its creation.

3.1 MPA biological effects

What effects of MPAs can we measure on resources exploited by fisheries in general and by small-scale fishing in particular? These effects are the subject of many monitoring campaigns, studies, analyses and assessments. The biological/ecological results of MPA policies are very different from one site to the next and varies according to the size of the site, its level of protection, its status and management objectives and measures adopted, etc. According to Halpern (2003) and Rice (2012), the number of empirical studies proving the efficiency of MPAs nonetheless remains fairly limited.

a) Recalling the effects of small-scale fishing on ecosystems and species of conservation concern

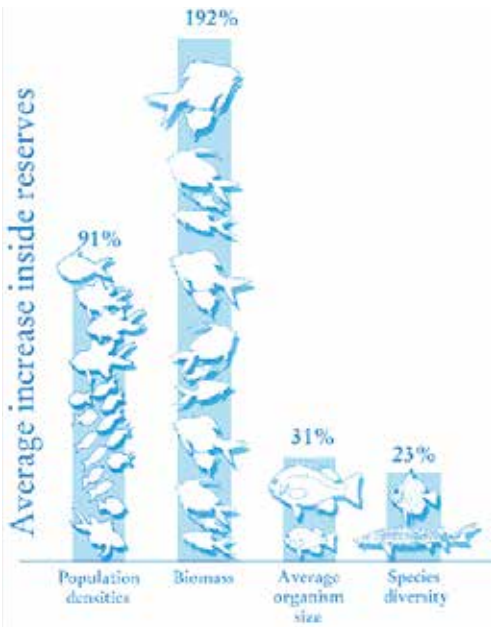
Determining the impacts of small-scale fisheries on ecosystems and species of conservation concern is important for setting protection measures as well as for thereafter assessing the MPA effect on small-scale fisheries. However, this question is better known for industrial or semi-industrial sectors than for small-scale fisheries for which it is difficult to ascertain globally. The assessment of the impacts of small-scale fisheries should consider the heterogeneity of gears and target species and factors such as the season of the year and characteristics of the area exploited (depth, bottom type) (Tudela, 2004). The impacts are also made harder to isolate in the coastal zone where growing anthropic pressures other than fishing multiply factors of mortality and deterioration. Finally, the most suited is likely to conduct analysis on a case-by-case basis.

While the previous section points to the severe state of Mediterranean fish stocks and highlights that small-scale fishing is not the main cause of the over-exploitation or deterioration of habitats related to fishing practices (because 80 to 90 percent of catches come from the destructive industrial or semi-industrial trawling), small-scale fishing is not devoid of excessive behaviour and negative effects on ecosystems. Overfishing can affect all professional sectors and the absence of regulations, weakness of enforcement, lack of compliance and poor management of fishing effort can very rapidly incur imbalances and stock collapse. In terms of other effects, generally speaking, the more selective a gear is the less impact it will cause, which explains restrictions on trawling, beach seines and some trained nets, for example. Possibly one of the greatest impacts comes from the massive use of fixed nets or other fixed gear which leads to ghost fishing by abandoned or discarded gears, a problem for ecosystems and food-webs (Tudela, 2004).

With regards to impacts of artisanal fisheries on species of conservation concern, the following are the most affected: turtles and the loggerhead (*Caretta caretta*) in particular, monk seals and chondrichthyans populations (shark, ray and chimaera) (mainly from trawling).

The polyvalent character of gears in small-scale fisheries is key to the livelihood of artisanal fishermen and as such needs to be maintained while ensuring the fragile and rich environment suffers least impacts. Small-scale fisheries management cannot therefore be restricted to just highly selective gear and to a single species or groups of species. Multidisciplinary management only makes sense if it is part of a spatial, ecosystemic framework, taking into account territorial fishing activities and their possible interactions with neighbouring environments and species. Moreover, "the impacts of fishing not only concern targeted species but the structure and productivity of ecosystems as a whole" (Gascuel *et al.,* 2013). For the above reasons, the effects of small-scale fishing on exploited populations and/or habitats must be examined by means of local, empirical studies, also considering external elements likely to further influence the state of environment and its resources. In return, the biological effects of MPAs on the biomass targeted by small-scale fishing as a whole in the Mediterranean coastal context will obviously also be vaguer and harder to measure than the effects of certain specific conservation efforts targeting a symbolic species[42].

FIGURE 6
Average increases in densities, biomass and organism size and species diversity inside reserves



Source: study based on 69 reserves. Courtesy of FAO, 2011.

b) Effects of no-take zones

Effects within the boundaries of no-take zones

Most of the effects described in the scientific literature relate "mainly to the biomass, density, diversity and size of species" (Gascuel *et al*., 2013). The method is generally based on the establishment of a "zero" state[43] together with "in-out" comparative analyses. The "zero" reference enables the expected result of an MPA management objective to be determined and gradually held up against reality in the field and the observed, progressive effects of protective measures.

Other effects are also highlighted in terms of population resilience. No-takes contribute to rebalancing the age structure of populations

[42] Two examples:
- In the Mediterranean, from the 1980s onwards, several successive moratoriums for the protection of the Mediterranean dusky grouper (*Epinephelus marginatus*), as well as other emblematic species, put an end to mainly recreational fishing and fishing competions (underwater hunting, angling). The results from monitoring inside and outside MPAs have been spectacular and relatively rapid (activity reports of the Groupe d'étude du mérou (Grouper Study Group): http://www.gemlemerou.org/cms).
- From mid-2000 onwards, the industrial overfishing of red tuna *(Thunnus thynnus)*, which had been uncontrolled for many years, led to the implementation of drastic measures to reduce fishing efforts and progressively eliminate illegal, unreported and unregulated fishing (IUU). Two key measures adopted by the member States of the International Commission for Conservation of Atlantic Tunas (ICCAT) enabled a fairly rapid and scientifically proven replenishment of Mediterranean stocks. As a result (and despite the lack of a scientific basis), French Mediterranean small-scale fishermen are partially blaming the significant rise in the biomass of young red tuna along the Gulf of Lyon coast (confirmed by Ifremer, Fromentin, 2012) for the negative consequences on the abundance of foraging species stocks targeted by small-scale fishing.

[43] This scientific "state of the art" is normally carried out when the reserve is created (before it produces the expected effects), although not systematically. Therefore, many MPAs suffer from a lack of initial references in terms of a "zero" state and cannot measure the effect of their management measures.

(Berkeley *et al.,* 2004, Gell & Roberts, 2002), which can be particularly beneficial for slow-growing species. Therefore:

> "The rise in the proportion of old individuals helps raise the reproductive potential of protected populations: large fish are more fertile and produce more eggs over a longer spawning period" (Gascuel *et al.*, 2013).

Genetic diversity has also been enhanced in many no-take zones compared to fished areas:

> "A study on five Mediterranean reserves (Tarbaca, Cabo de Palos, Cerbère-Banyuls, Elbe and Giglo marine reserves) analyzed the effects of protection on the genetic structure of populations of white seabream (Diplodus sargus), targeted by local fisheries. The results showed that on average, gene frequency was significantly higher in reserves than in fishing zones" (Pérez-Ruzafa *et al.*, 2006).

The presence of a reserve is also of interest to migratory species, which travel through the MPA during their lifecycle. Moreover, a model developed in the Mediterranean by Apostolaki *et al.* (2002) for hake, demonstrates that "reserves contribute to preserving stocks (increased yield and resilience)" if the MPA includes spawning and/or nursery zones.

In addition to their direct effects on the protection of species and groups of species, reserves also improve the protection and quality of the natural environment. No-take zones help maintain/restore habitat diversity and their continuous and sustainable protection against destructive practices (fishing and other).

Sala *et al.* (2013) synthetize the biological effects of MPAs and their implications for fisheries, with verified examples of benefits throughout the world, including in the Mediterranean. From a review of peer-reviewed studies of 124 marine reserves in 29 countries, they found that, on average, marine reserves led to an increase of 21 percent in the number of species, 28 percent in the size of organisms, 166 percent in density (number of individuals per unit area), and a remarkable 446 percent in biomass, compared to unprotected areas nearby. However, the increase in biomass of predatory fish can be greater than the above averages.

It should be noted however that in some cases, some effects that are considered as positive may be accompanied by other negative, opposite or unexpected effects, hence confirming the high variability of MPA responses (Lester *et al*., 2009).

Outside no-take zones

These effects are less systematic, rather random and difficult to foresee, and thus harder to pinpoint. The best-known effect is spillover: when population density inside the MPA reaches a certain level and where various processes trigger fish propagation outside the zone (Planes *et al.,* 2006). This has obvious positive consequences for the fisheries operating in the vicinity of the no-take zone. Many reasons explain this process: the rise in spatial competitiveness (food, shelter reproduction), migratory periods of certain species, etc. However, a study conducted in the Mediterranean revealed the limited spatial scope of this phenomenon, whereby fish biomass declined in a linear trend based on the distance from the reserve. On average, this effect was no longer detectable beyond 500 metres away from the no-take area (Harmelin-Vivien *et al.,* 2008). Another study in the Port-Cros national park (France) showed that exports from the no-take zone are limited (potentially 100 metric tons/year for this 13 km²

reserve) and may not have a significant effect on the neighbouring area (Gascuel *et al.,* 2013 quoting Valls *et al.,* 2012).

Another study on catches in six marine protected areas in the Mediterranean (including no-take zones) conducted over eight years (Cerbère-Banyuls, Carry-le-Rouet, Medes, Cabrera, Tabarca and Cabo de Palos) has highlighted a rise in fishing efforts and production at the boundaries of these reserves, across all fishing techniques practised by local small-scale fishing fleets (Goñi *et al.,* 2008). The effects are detectable still out at 700 m away from the no-take and up to 2 500 m and dwindles with distance.

Spillover is of particular interest in terms of biomass of adult individuals of commercial value for fishermen. In some cases, it can lead to a rise in catches by professional fisheries (total catches and catch per unit of effort – Francour *et al.,* 2013) and non-professional fisheries alike. This direct benefit is key to promoting the positive effects of MPAs.

The rise in catches due to biomass export therefore benefits fishermen working in close proximity to MPAs. This deadweight effect can mean the edges of protected sites become excessively attractive, leading to a rise in fishing pressure in areas close to no-take zones and perhaps eventually limit their positive effects *(*Mora *et al., 2006).* In this respect, considering the use of buffer zones to regulate activities and adequately manage anthropic pressures (fishing and others) is important.

Spillover can also lead to egg and larval export, but this has little direct or immediate effect on small-scale fisheries. However, medium and long-term effects (recruitment and yield) are obvious on a scientific level (Hart, 2006), even if stakeholders with daily requirements in terms of catches and profitability are little-convinced, especially when the constraints and losses incurred by the reserve are extensive.

The EU funded BIOMEX project (Assessment of biomass export from marine protected areas and its impacts on fisheries in the western Mediterranean Sea) has analysed MPA capacity to spur the biomass export of: 1) adult fish, by measuring and comparing abundance gradients inside and outside the MPA; 2) fish eggs and larvae (similar technique), to assess the pelagic potential produced by the MPA, and 3) adult fish contributing directly to commercial fishing activities (Planes, 2005). The latter objective was calculated by means of experimental fisheries, monitoring professional fishermen and analyzing the spatial distribution of fishing efforts according to the MPA (zoning, regulation). The project was led on 6 case studies in the north-western Mediterranean: France (Carry le Rouet and Cerbère Banyuls) and Spain (Medes, Tabarca, Cabo de Palos, Cabrera). The summarized restitution of the results obtained showed a decreasingly intense fishing effort according to distance from the MPA boundaries (regular drop in catches per unit of effort and surface unit). The global export of the biomass and its positive effects were confirmed, although high variations remained in terms of species and their distribution. Lastly, biomass export beyond the limits of the MPA was mostly expressed over short distances (around 1 km). The economic benefits are presented in the appropriate section below.

The EMPAFISH project (European Marine Protected Areas as tools for fisheries management and conservation) (2005–2008), followed by BIOMEX, aimed to look at certain questions more in depth and put forward ways of assessing MPAs as components of public policies (fishing and conservation). EMPAFISH included 20 case studies, 16 of which were in the Mediterranean[44]. The basic idea was to assess MPA effects on ecosystems, fishing and other economic activities. This project then allow operational indicators of MPA impact to be refined and drawn up in order to

[44] Spain (Cabo de Palos, Tabarca, San Antonio, Serra Genanta e Islotes de Benidorm, Anti-trawling zones, Columbretes and Medes), France (Cerbère Banyuls, Bouches de Bonifacio and Côte Bleue), Italy (Tuscany Archipelago, Ustica, Sinis Mal di Ventre and Golfo di Castellamare trawl ban area) and Malta (Zone de Conservation de la Pêche and RDUM Majjiesa/RAS IR-RAHEB MPA).

create functional, adaptable and weighable models (bioeconomic) according to MPA contexts and locations. The modelling phase is discussed in the appropriate section below. Further to the final results, concrete proposals were put forward in the form of guidelines and assessment tools: optimal MPA size and zoning configuration, central role of no-take areas (percentage), distance and MPA interconnectivity.

From the 16 Mediterranean EMPAFISH case studies, the main conclusions that were drawn are that establishing an MPA is very likely to reverse the population and ecosystem impacts of fisheries on coastal areas. The reasons are that: (i) abundance and/or biomass of target species increases within MPAs compared to unprotected sites; (ii) more "natural" population structure of these commercially harvested populations recover, with a bigger proportion of larger/older individuals; (iii) fecundity is increased; (iv) local fishery yields is enhanced due to biomass exportation to surrounding non protected areas; and (v) shifts in fish assemblage structure occur, mainly by increasing the dominance of large predator species. The fishery effect of these MPAs is discussed at length. Naturally, measures to control other pressures that can ensue from these results need to be adopted. A number of other observations and lessons learnt from this analysis and that have positive implications for small-scale fisheries are also presented in this study.

c) Effects of multi-use MPAs

As mentioned previously, the biological/ecological effects of this type of MPA are much less known and studied. They are also much less obvious because the area is ecologically protected but also managed with a view to economic sustainability, where regulations prevail over bans. The challenges of sustainable development are very visible in this type of MPA: how can protection and development be reconciled while allowing everyone to contribute positively to their respective expectations?

These MPAs essentially aim to enhance the use of areas/resources to avoid excesses (prevention/precaution) and maintain an "acceptable" and sustainable balance in a negotiated and evolutionary framework (Cazalet *et al.*, 2013).

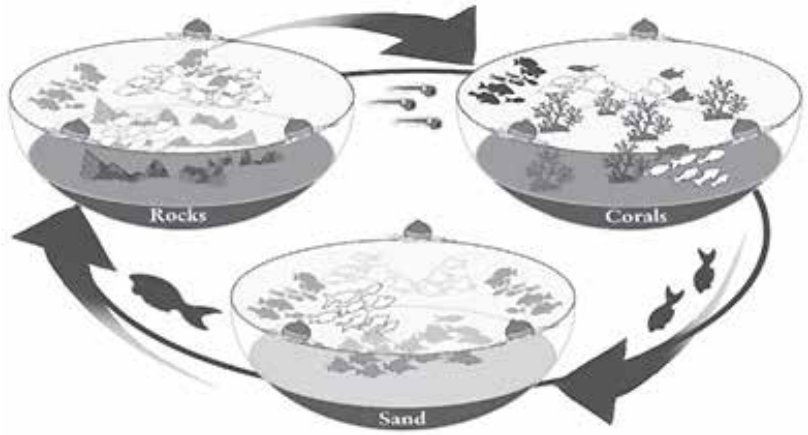
These MPAs are structured around a zoning system, which intends to provide ranked levels of protection and use-management according to the vocation of each zone. With regards to fishing, this model tends to favour activities with a lesser impact on the environment and resources, hence spurring an interest in, and even encouraging, respectful, integrated practices giving access to the MPA. For example, legal provisions may include advantages or waivers in favour of traditional fishing activities (commercial or non-commercial) practiced by local populations, also involving a heritage or folklore aspect. From this point of view, the MPA can contribute to maintaining certain practices or techniques that tend to die out or be challenged by the predominant activities – in particular recreational – of multi-use MPAs. This model is of definite interest with regards to the variety of small-scale fishing practices encountered in the Mediterranean.

d) Coherence and network protection

The MPA network notion is widely referred to in public policies and has the following key objectives:

- Reinforce horizontal coherence and cooperation between the various categories of MPA and the multitude of legal statuses in force;
- Ensure better vertical legibility of MPA policies on a local, national and international level. The idea is to encourage the coordination of protective measures in order to establish representative networks in various regions throughout the globe;
- Favour MPA manager, expert and scientist networking. The benefits of networking are also expressed in terms of knowledge and sharing of experiences on the use of small-scale fishing in the MPA.

FIGURE 7
Protecting the various stages of the lifecycle via the MPA network



Source: Courtesy FAO 2011.

But the network idea also has a real scientific dimension, highlighting the potential reach of MPAs with regards to the outside world, as well as in terms of mutual ties. The IUCN defines them as:

> "A collection of MPAs or reserves operating in cooperation and synergy on a variety of spatial scales and with a range of protection levels designed to achieve objectives that cannot be achieved by a single reserve" (IUCN-WCPA, 2008).

The idea of ecological connectivity highlights the complexity of the spatial interactions between environments and their resources. Knowledge of these interactions (ecological functions) and their evolution helps improve MPA complementarity and the capacity of their stakeholders (decision-makers, managers and fishermen) to adapt as much as possible.

The network is a way of optimizing connections, as long as:

> "The average distance between the various areas is compatible with the biological functions they are supposed to fulfil. [...] For example, the study conducted by Abdulla et al. (2008) shows that the distances separating Mediterranean MPAs is too large to guarantee the larval connectivity of most species present in the reserves; this inter-MPA distance is up to 55±6 km (n = 93, excluding Pelagos Sanctuary) and 62 percent of MPAs are located over 20 km from the nearest MPA. This 20 km distance is considered too high for the larval dispersion of most non-sessile species or for efficient fish export. Conversely, 92 percent of MPAs are situated less than 150 km from at least one another MPA, hence assuring the functional connectivity of highly migratory species with long-living larvae suitable for transport over such distances" (Gascuel *et al., 2013*).

The perfection of the MPA networks to the benefit of small-scale fishing could become more of a focus for the relevant authorities. Recommended distances would be 20 to 150 km between MPA sites (Abdulla *et al.,* 2008; Halpern, 2003; Palumbi, 2003 and Cowen *et al.,* 2006).

A balanced distribution of MPAs would reinforce the benefits of protection, but it should also allow a better distribution of constraints between the various groups of fishermen involved in the network. Economic and political dimensions therefore tend to predominate over scientific considerations in terms of setting up and implementing MPA networks.

3.2 Socio-economic effects of MPAs

The BIOMEX project while looking at MPA capacity to impulse biomass export also looked at the economic aspects linked to the MPA (Planes, 2005). It concludes that the economic value of the catch will also be higher because of the presence of more valuable species and of larger size individuals. Several perception analyses also look into the subject such as Himes (2003) in the Gulf of Castellammare fishery reserve and the Egadi Islands marine reserve in Sicily, Italy relating to socio-cultural impacts. Although this study relates more to the level of integration of fishermen into the management, it provides an insight into some of the perceived effects by small-scale fishermen. Whitmarsh *et al.* (2003) looked at the same case of the trawl ban in Castellamare, using a combination of methods and also investigating fishermen's reactions to such regulations. Another case of interest is that of Gökova bay MPA and how fishermen's reactions have changed over time while their socio-economic benefits eventually increase praise to the establishment of some no-take zones (Ünal *et al.*, 2013; Kizilkaya *et al.*, 2013). Cost-benefit analysis is presented in the following sections.

a) Principles of MPA cost-benefit analysis and expected results for small-scale fisheries

The essential theoretical foundations of cost-benefit analysis (CBA) define benefits as increases in human well-being (utility) and costs as reductions in human wellbeing (OECD, 2006a). The basis of technique compares the monetary value of benefits with the monetary value of costs in order to evaluate and prioritize issues. A more sophisticated approach of CBA attempts to put a financial value on intangible costs and benefits (e.g. the cost of environmental damage or the benefit of quicker and easier travel to work) through measuring WTP ("willingness to pay" for an environmental gain) and WTA ("willingness to accept" compensation for an environmental loss).

On an economic level, MPAs comprise an "investment of society in the preservation of its natural capital" (Boncoeur *et al.* in Garcia *et al.*, 2013). This investment is reflected in the establishment of a protection perimeter, coupled with various measures intended to maintain the capital "in a good state" (a satisfactory level of conservation) and even improve it (improvement of natural conservation conditions). Beyond purely "conservationist" targets (non-use), the investment can have additional, complementary aims linked to sustainable use (commercial or non-commercial), including commercial fishing in or around the MPA. In the long run, every investment must produce results than can be assessed in terms of costs-benefits and seek an optimal balance between MPA operational efficiency and its social acceptability (equity or legitimacy) through a fair distribution of its positive and negative effects.

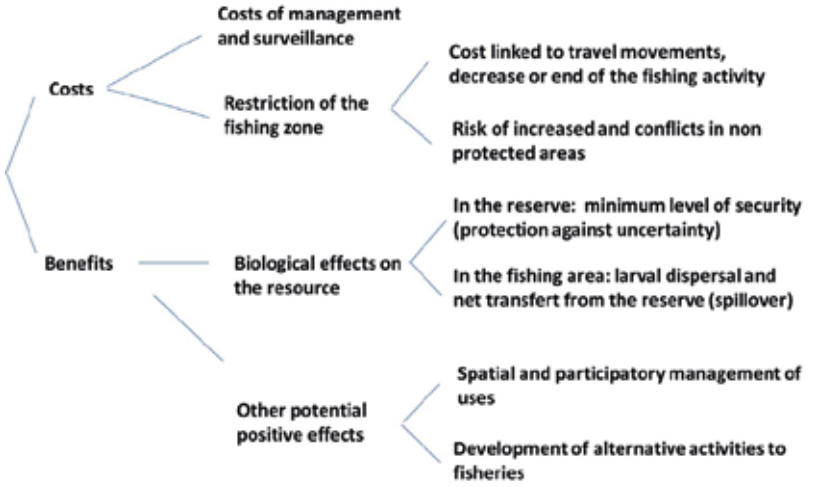
MPA costs are characterized by the regulatory constraints associated with its existence, including technical and spatial bans over time, limitations, authorizations, loss of working territory, costs relating to MPA monitoring and supervision, smaller catches (at least initially), activity transfer to/concentration in unprotected adjacent areas, etc. The results obtained according to the categories of fishermen targeted by these measures should also be weighed (Boncoeur *et al.* in Garcia *et al.*, 2013). Indeed, protection policies (or fishing reserves) can, voluntarily or not, favour certain types of fishing (multi-specific, passive gear, selectivity) to the detriment of other sectors (trawling, specialized fisheries, industry, etc.) and so the costs will not be the same for all.

A number of studies have used the CBA to assess the effects of Mediterranean MPAs on different groups of stakeholders (Becker *et al.*, 2006; Pearce *et al.*, 2006). In relation to small-scale fisheries, the following costs and benefits have been identified while pointing to which case the CBA can be used (Alban *et al.,* 2006):

> "Assessing costs and benefits of the MPA for fishers mainly relies on the following considerations:
>
> - The prohibition of fishing in the no-take part of the MPA reduces catch, ceteris paribus, in the short term. This is the negative effect of the MPA for fishers. The economic importance of this drawback varies according to the degree of dependency of fishers on the zone affected by the prohibition.
> - On the other hand, by protecting a part of fish stocks against fishing mortality, the fishing ban favours an increase in biomass in the no-take part of the MPA, which is likely to induce a net transfer from the no-take zone to the fishing zone (spillover effect), thereby increasing the catch per unit of effort (CPUE) in this zone. This favourable effect of the MPA depends on two types of factors: biological parameters of the targeted stocks (recruitment, natural mortality, space mobility), and the level of fishing mortality (hence of fishing effort) in the zone left open to fishing. This factor is critical when assessing the economic performance of the MPA: if the fishing zone is under open access, the increase in CPUE will be followed by an increase in effort, and this process will normally go on until the rent resulting from the spillover effect is totally dissipated (Hannesson, 1998). If the increase in fishing effort can be prevented (e.g. by a system of limited entry licenses in the fishing zone), the rent dissipation will not happen, and the MPA may improve the situation of the fishery, both in economic and in biological terms, even though this fishery suffers from some overcapacity (Holland and Brazee, 1996; Guénette and Pitcher, 1999; Boncoeur *et al*., 2002).
> - The existence of a zone where fish resources are protected from fishing mortality may also be considered as an application of the precautionary principle to fisheries management (Lauck *et al.*, 1998), limiting the risk of accidental collapse of the fishery by the constitution of a "buffer stock", or safe minimum biomass level (Anderson, 2002).
> - Benefits of the MPA for fishers will be maximized if the location of the no-take zone is such that it protects a critical zone for the stock renewal. On the other hand, these benefits may be jeopardized by the opportunistic development of predators (Boncoeur *et al.* 2002)".

Figure 8 summarizes expected costs and benefits (Boncoeur *et al.* in Garcia *et al.*, 2013).

FIGURE 8
Expected costs and benefits of MPAs from a fishery development viewpoint



Source: Boncoeur et al. in Garcia *et al.*, 2013.

Using the RAC/SPA recommendations (Beck *et al.* 2006), guidance from OECD (Pearce *et al.* 2006) and from the French GEF (Clement *et al.* 2010), the Plan Bleu (Mangos *et al.* 2013) undertook a CBA of five sites (already protected or in the making) in the Mediterranean to which they added some prospective scenarios: in the Kuriat Islands (Tunisia), Kas Kekova (Turkey), Cap de Creus (Spain), Zakynthos (Greece) and Mont Chenoua Kouall coves (Algeria). The results are shown in Figure 9. In general, it shows that the benefits for fishing are higher than benefits of tourism and recreational fishing.

FIGURE 9
Hypothesis for the prospective quantitative analysis of the Kuriat Islands, Cap de Creus and Kas Kekova sites

	Business-as-usual scenario	Increasing-protection scenario	Decreasing-protection scenario
		ARTISANAL FISHING	
Kuriat Islands Tunisia	Average annual variation of 4% over the period 1999-2009. Rising benefits of 3% per year until 2020 because of the economic crisis. Then slow down with an increase of 2% per year due to environmental degradation resulting from non compliance of fishing behavior.	Rising benefits of 3% per year until 2020 and then accelerated with 4% per year since the fisheries shall more abundant and accessible.	Rising benefits of 4% per year until 2020 because fishing rules are removed. Then slow down to 2% per year due to the degradation of fish stocks and ecosystems ranifient resources.
PNCC Spain	Catches linked to local population growth and benefits derived from the average local price assumed to be stable over the period.	Catches linked to local population growth and considering also an an increase in fishing efficiency of 3% per year.	Increase in catches of 4% per year until 2014, then decline to environmental degradation, accompanied by the release of some fishermen (-10% of catches per year until 2021, then -5% per year until 2024, and -3% per year until 2028 and stagnation).
Kas Kekova Turkey	Number of fishermen, catch volumes and revenues remain stable, at the same level as 2011 (no retrospective data).	Fishing management plan: gradual 30% decline in catches between 2012 and 2020. After 2012, 10% increase in catches and 3 additional fishermen each year up to a limit of 52 fishermen.	1% increase in catches per year for the first 10 years, followed by a 4% decrease per year and 1 fisherman stopping his activities each year

Source: Mangos *et al.* 2013.

b) Bioeconomic modelling for assessing MPA costs and benefits for small-scale fisheries

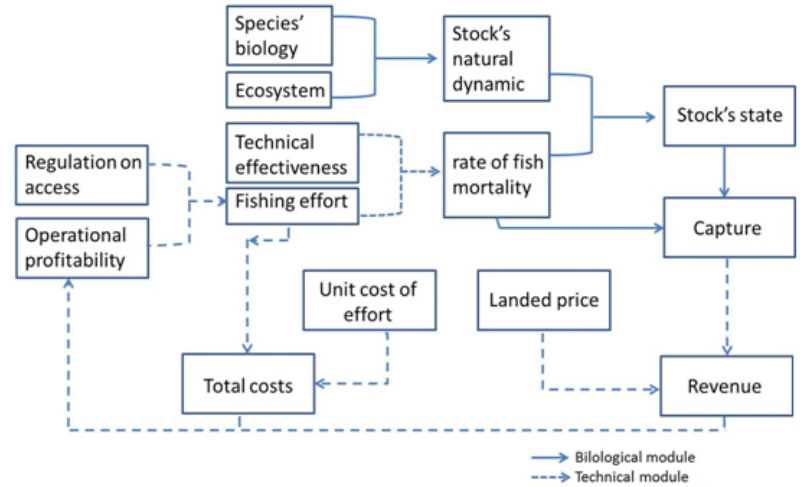
Bioeconomic modelling has long been used as a tool in managing fisheries for determining the sustainable levels of catch and effort and the exploitation path to achieve those equilibrium levels. The concept stems from Gordon (1954), and Schaefer's (1954) static models of a single species commercial fishery used to describe and compare equilibrium solutions. These models were made more dynamic in the 1950s and then

1980s to allow multi-species analysis and to model transitions and exploitation paths (Larkin *et al.*, 2011). The FAO provides technical guidance on how to use these tools for fisheries management, mainly looking at BEAM 5 and the Ecopath with Ecosim approach (Seijo *et al.*, 1998).

Several types of models exist and Prellezo *et al.* (2009) have reviewed all those used in EU waters, some extended to the whole Mediterranean (such as BEMMFISH, BIRDMOD, MEFISTO, FORTRAN MOSES and FLR (EFIMAS) and TEMAS toolboxes). Some are used in the context of MPAs and while Grafton *et al.* (2004) reviewed these, some specific examples are provided below for the Mediterranean and for small-scale fisheries.

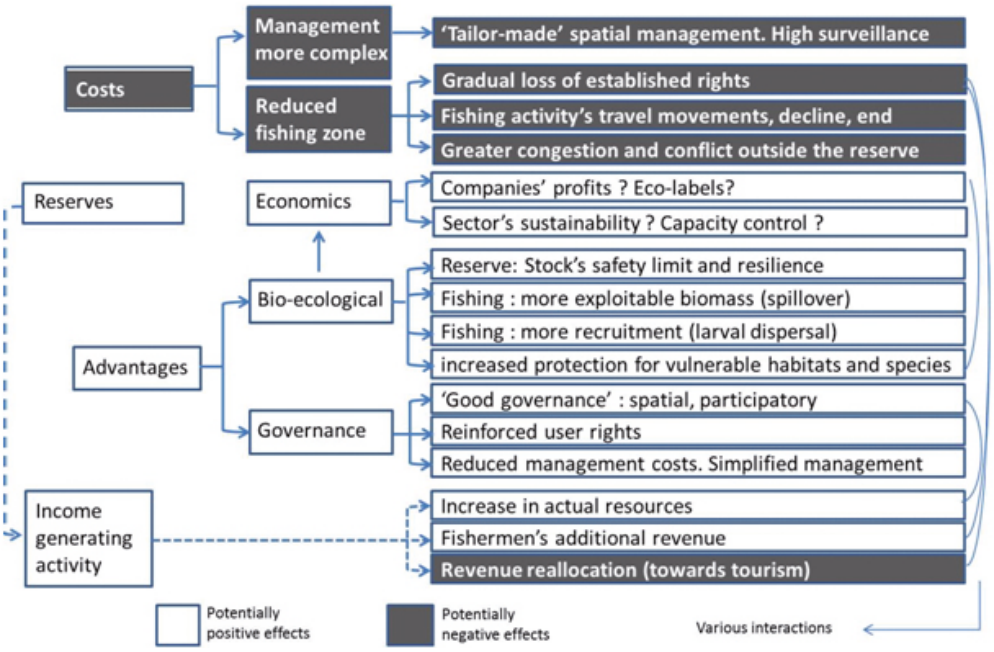
Bioeconomic modeling aims to represent "*biological and economic interactions in a simplified and formalized manner*" and rests upon three interdependent modules: biological, technical (human activity) and economic costs/benefits as shown in the Figures 10 and 11 (Boncoeur *et al.* in Garcia *et al.*, 2013).

FIGURE 10
Schematic view of a fishery bioeconomic model



Source: Boncoeur *et al.* in Garcia *et al.*, 2013.

FIGURE 11
Potential bioecological and socio-economic effects of MPAs reserves



Negative effects are shown in black. Positive effects are shown in grey. Economic benefits are indirect and a result of biological benefits. Benefits, if any, have retrospective positive or negative effects indicated by the arrows to the far right of the figure (Adapted from Boncoeur *et al.* in Garcia *et al.*, 2013).

The BEAMPA model (Bioeconomic Analysis of Marine Protected Areas) typically allows testing the result of management measures on extractive (commercial or recreational fishing) and non-extractive (ecotourism) activities in MPAs. Tested in the Medes Islands MPA (Spain), a multi-use site example where small-scale-fisheries co-habit with recreational activites (Maynou, 2008, Merino *et al.*, 2009), it provides useful results. Figure 12 summarizes its features and results.

FIGURE 12

BEAMPA model (BioEconomic Analysis of Marine Protected Areas)

Rapid characterization	Bioeconomic simulation model, dynamic, spatially explicit, multi-specific and multi-activity (fishing and recreational non-extractive activities). BEAMPA is not an ecosystemic model: no trophic relationships between species.
Spatialization	Grid of adjacent cells, characterized by three permanent attributes (see ex. below).
Spatio-temporal dynamics	Partially-structured model in terms of age (juveniles / adults); exogenous recruitment. Redistribution of adult biomass between adjacent cells at the end of each period (if habitat suitable), on the basis of a density-dependent algorithm. Spatial redistribution of fishing efforts at the end of each period from a combination of 2 parameters: "tradition" (tendency to maintain existing location of fishing effort) and profitability (effort redistribution between adjacent cells on the basis of the differences in profitability observed at the end of each period). Evolution of frequentation due to touristic activities: according to ecosystem quality, represented by the biomass of various emblematic species.
Main output variables	For each period and each cell: biomass per species, fishing effort per fleet, catches per species and fleet, benefits per fleet, frequentation for recreational purposes, benefits of recreational service providers.
Feasible scenarios	BEAMPA enables hypotheses to be tested on the spatio-temporal mobility of stocks and fishing efforts, the impact of protective measures on activities and MPA configuration.
Use in ACA framework	Comparison of a scenario 0 (no protection) and scenario 1 (protection of a given type in a given spatial configuration). Benefits taken into account: revenue from fishing and recreational activities. Costs taken into account: MPA management costs.
Application to the Medes islands MPA (Spain)	Fishing reserve (93 ha), buffer zone with special fishing restrictions (418 ha), external zone subject to common law regulations (4989 ha); 6 fish stocks and two small-scale fishing fleets; 2 recreational uses (diving and glass-bottomed boats); grid: 28 ´ 10 cells of 25ha each.
Main results of the tested scenarios	The benefits for fishing provided by the existing configuration are difficult to detect. Benefits from fishing far from covering the institutional costs of protection; benefits for ecotourism show a positive score sheet. Doubling the size of the MPA will only have moderate effects on fishing but will considerably increase institutional protection costs. Zoning is recommended to separate the various activities.

Source: Maynou, 2008, from Boncoeur *et al.,* in Garcia *et al.,* 2013.

EMPAFISH (2005–2008) followed BIOMEX to create functional, adaptable and weighable models (bioeconomic) according to MPA contexts and locations. The methodologies employed were based on the analysis of the protective regimes applied to MPAs, together with field surveys and observations to assess MPA performance with regards to the environment and fisheries. The project was completed in February 2008, but the final results continued thereafter and concrete proposals were put forward in the form of guidelines and assessment tools: optimal MPA size and zoning configuration, central role of no-take areas (percentage), distance and MPA interconnectivity.

In view of their "European" character, these projects were both conducted mainly in the western and central areas of the Mediterranean. Naturally, we cannot detail the multiple national initiatives led by the Mediterranean States here. However, in

addition to political enthusiasm for marine environmental protection, they reflect great scientific, legal and institutional dynamism with regards to MPAs, the analysis of their governance and the effects they incur on general uses and on fisheries in particular[45].

Other bioeconomic models with MPA linkages exist such as the the BEMCOM (Bioeconomic model to evaluate the consequences of marine protected areas) which aims at answering the question "what's best?" by looking at the economic effects of introducing an MPA for fisheries (Hoff *et al.,* 2013). Others such as the random utility model RUM (Holland *et al.* 1999) could be applied to MPAs.

c) Indicators to plan MPA management and assess its effectiveness

Indicators used for assessing MPA management effectiveness in relation to small-scale fisheries take into account small-scale fisheries, both in terms of their relation to the resources and their socio-economic well-being.

The use of indicators enables the development of informed measuring instruments for assessing the performance[46] of MPAs with regards to fisheries and monitoring the effects produced. With regards to socio-economic aspects, the IUCN puts forward the following graduated classification Figures 13 and 14, ranging from the determination of goals and objectives to the list of selected indicators and methods for collecting the corresponding data (Boncoeur *et al.* in Garcia *et al.,* 2013).

Some even more specific tools tailored to MPA management specifically in the Mediterranean offer even finer prospects at integrating small-scale fisheries into assessments of MPA effectiveness Tempesta *et al.,* 2013).

[47] As an example and in reference to France only, we can mention the following ongoing research projects involving Mediterranean MPAs :

- GAIUS (MPA governance for the sustainable management of biodiversity and coastal uses), ANR (National Research Agency) programme, 3 years (2008–2010). 3 case studies: Cerbère Banyuls, Bouches de Bonifacio and Côte Bleue.
- PAMPA (Indicators of MPA performance for the management of coastal ecosystems, resources and their uses), LITEAU III programme by MEEDDAT (Department of Ecology, Energy, Sustainable Development and Spatial Planning), 3 years (2008–2010). 4 case studies: 3 identical to GAIUS, plus the Cap Roux fishing zone.
- AMPHORE (MCAs and Fisheries Management through Optimisation of Resources and Ecosystems), ANR programme, 4 years (2008–2011). Case study: Bouches de Bonifacio.
- LINDA (Limits of negative interaction between dolphins and human activities), LIFE (Financial Instrument for the Environment) European Programme, 5 years (2003–2007). Applied to the Corsican coast, it aims to reduce conflicts between dolphins and fishermen thanks in particular, to the existing MPA network (nature reserves Natura 2000 sites).
- GRAMP (Governance of large MPAs), LITEAU III programme by MEEDDAT, 3 years (2009–2011). Analysis of the Study Mission for the creation of a marine nature reserve on the Vermillion coast (preparatory phase of a Franco-Spanish transborder project) set up by the French MPA Agency.

[46] This is not limited to socioeconomic aspects; it also integrates MPA bioecological results and management modes (governance indicators) (Pomeroy *et al*.,2006).

FIGURE 13

Socio-economic goals and objectives of MPAs

Goals	Objectives	
1 Improve or maintain food safety	1A	Nutritional requirements of coastal residents satisfied or improved
	1B	Rise in the availability of local seafood intended for local consumption
2 Improve or maintain subsistence means	2A	Improve the economic status and relative wealth of coastal residents and/or resource users
	2B	Stabilize or diversify professional structures and household incomes by reducing dependency on marine resources
	2C	Enhance local access to markets and capital
	2D	Improve the health of coastal residents and/or resource users
3 Improve or maintain non-monetary benefits to society	3A	Improve or maintain visual aspect
	3B	Improve or maintain value of existence
	3C	Improve or maintain value of the wild natural environment
	3D	Improve or maintain leisure opportunities
	3E	Improve or maintain cultural value
	3F	Improve or maintain values of environmental services
4 Fair distribution of MPA benefits	4A	Fair distribution of monetary benefits by and between coastal communities
	4B	Fair distribution of non-monetary benefits by and between coastal communities
	4C	Improve equity within social structures and between social groups
5 Maximize compatibility between management and local culture	5A	Prevent or minimize negative effects on traditional practices and relationships, or on social systems
	5B	Protect cultural characteristics or historic sites and monuments associated with coastal resources
6 Promote awareness and knowledge of the environment	6A	Promote respect and/or understanding of local knowledge
	6B	Improve public understanding regarding environmental and social "sustainability"
	6C	Increase the public's scientific knowledge
	6D	Improve scientific knowledge thanks to research and monitoring efforts

Source: Pomeroy *et al.*, 2006; Courtesy of IUCN.

FIGURE 14

Socio-economic indicators of MPA performance

N°	Name	Additional description	Type	Data collection
S1	Local patterns of use of marine resources	Manner in which populations use coastal and marine resources and impact their state	Factual	Existing data (statistics, reports, etc.), semi-structured interviews, observations
S2	Local values and beliefs regarding marine resources		Perceived	Survey on local populations
S3	Level of understanding of human impact on resources		Perceived	Survey on local populations
S4	Perceptions of seafood availability	Opinion of local consumers on the availability of foodstuffs from fishing	Perceived	Survey on local populations
S5	Perceptions of the abundance of local catches	Opinion of fishermen on the abundance of local resources (main target species)	Perceived	Survey on local fishermen
S6	Perceptions of non-commercial values (use and non-use)		Perceived	Survey on local populations
S7	Material lifestyle of local populations	Housing characteristics	Factual	Survey on local populations
S8	Quality of human health	Nutrition, access to health services, child mortality	Factual	Statistic data, observations, survey on key informants
S9	Distribution of household incomes per source		Factual	Survey on local populations
S10	Structure of household activities	Distribution of productive activities in the community (per age, sex and social group)	Factual	Statistical data, survey on local populations
S11	Community infrastructures and shops	Hospitals, schools, sanitation systems, shops, etc.	Factual	Statistical data, observations, survey on key informants
S12	Market number and type	Seafood market from MPAs and vicinity	Factual	Statistical data, observations, survey on key informants, fishermen and shopkeepers
S13	Stakeholder knowledge of natural history	Non-scientific knowledge of local populations on the natural environment and impact of human activities	Perceived	Survey on local populations
S14	Publication of official knowledge in local communities	Degree of information of local populations with regards to scientific knowledge on the natural environment and impact of human activities	Perceived	Survey on local populations
S15	Proportion of members of stakeholder groups holding positions of responsibility	Positions of responsibility related to MPA management	Factual	Administrative data, survey on key informants
S16	Change in the state of ancestral and historic sites and monuments		Factual	Historic data, observation, survey on key informants

Source: Pomeroy *et al.*, 2006; Courtesy of IUCN.

3.3. Regional fisheries research programmes assessing the integration with MPAs

Technical and scientific cooperation in the field of small-scale fisheries dedicating significant importance to the role of MPAs in fisheries management has been incepted under the aegis of the FAO while relating directly to GFCM objectives.

a) CopeMed project

Launched in 1996, the CopeMed project (advice, technical support and establishment of cooperation networks to facilitate coordination to support fisheries management in the western and central Mediterranean) brings together eight countries from the western and central Mediterranean (Morocco, Tunisia, Algeria, Spain, France, Italy, Libya and Malta). The work of the CopeMed network, which covers around seven existing MPAs includes a component referred to as "MPAs as a management tool for Mediterranean fisheries". It unfolds over several phases. The project partners re-assert the role of MPAs in reducing fishing-related mortality, rebuilding the demographic structure of exploited species, protecting spawning/nursery zones, raising the reproductive biomass, maintaining genetic diversity and reducing conflicts between fishermen (Ramos-Esplà *et al.,* 2004, FAO-CopeMed, 2004). The exhaustive and comparative analysis of various protection models in force in the relevant States has enabled results comparison and inspiration to be gained from successes, together with fine-tuning of the spatial approach, size optimization and functions destined for MPA zoning (conservation, logistics and development) and improved monitoring and supervision efficiency, taking into consideration the obvious time lag between site protection and benefits to fishermen (around three to five years), etc.

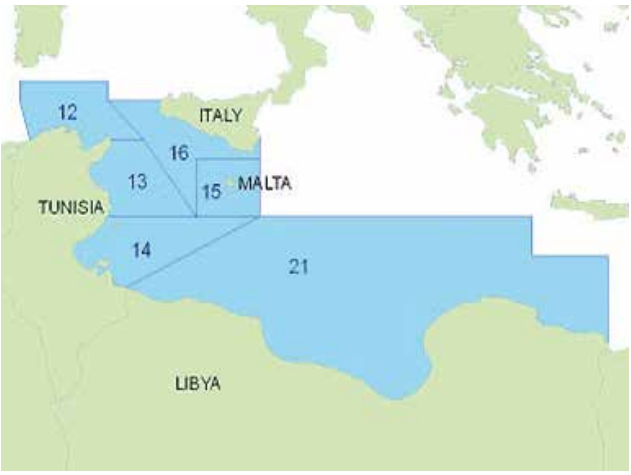
b) AdriaMed project

Launched in 1999, the AdriaMed project (scientific cooperation to support responsible fisheries in the Adriatic Sea) brings together Albania, Croatia, Italy, Slovenia and Montenegro. The geographic particularity of the Adriatic means that all of its commercial fish stocks are shared. For this reason, the bordering States decided to instigate a multilateral co-management approach to fishing activities. Specialist working groups were set up to assess the state of stocks (demersal and pelagic), the impact of the various catching techniques used, fishing capacity (operational units) and legal, sociological and trade aspects. The Adriatic is a closed-in sea, predisposed to inter-State conflicts with regards to the demarcation of marine areas under jurisdiction. The various demands and unilateral declarations (on the pretext of fishing management and environmental protection) are not properly enforceable with regards to neighbouring riparian States. Although several MPAs exist in the Adriatic (Miramare, Tremiti Islands and Torre Guaceto for Italy) or are in the project stage, these areas are not explicitly mentioned in the work conducted by AdriaMed. However, the predominance of the guiding principles of the FAO Code of Conduct (mentioned earlier) reiterates the need for the spatial regulation of fishing practices and the identification and protection of strategic areas to preserve resources and the sustainability of fishing activities.

c) MedSudMed project

Launched in early 2000, the MedSudMed project (assessment and monitoring of the fishery resources and the ecosystems in the Straits of Sicily) focuses on the Mediterranean's largest fishing zone (Figure 15), with particular attention to demersal species and small pelagic species.

FIGURE 15
MedSudMed geographical scope



12 – Northern Tunisia

13 – Gulf of Hammamet

14 – Gulf of Gabès

15 – Malta Island

16 – South of Sicily

21 – Libya

The role of MPAs in fishing development is one of the topics common to the involved countries (Italy, Tunisia, Malta and Libya). In 2003, a large-scale scientific consultation (MedSudMed, 2007) allowed numerous specialists to unveil and compare the experiments led or scheduled by the MedSudMed States and throughout the Mediterranean, in particular with regards to the CopeMed project (Spain). The results of this initiative highlighted the following points: 1) the importance of preliminary studies and targets allocated to MPAs on a scientific and biological level (habitats and species); 2) the efficiency of MPAs in reducing overfishing and illegal coastal fishing; 3) recourse to artificial reefs to reinforce the physical protection of certain areas (trawlers, seines); 4) consideration of the social and cultural acceptability of MPAs and the economic effects of protection processes; 5) the pertinence of the legal framework and regulations.

Lastly, in the same spirit, the EastMed[47], ArtFiMed[48] projects need to be underscored. The first two became entirely operational in 2009. EastMed aims is to support and improve the capacity of national fishery departments, to increase their scientific and technical information base for fisheries management and to develop coordinated and participative fisheries management plans in the Eastern Mediterranean subregion (EastMed, 2014). As for ArtfiMed which involves Morocco and Tunisia, it follows on from CopeMed II and targets artisanal fisheries in particular, livelihood and socio-economic development. Many assessments have been conducted on specific fisheries in that region[49].

4. INTEGRATION OF SMALL-SCALE FISHERIES IN MPA GOVERNANCE: FROM PARTICIPATION TO CO-MANAGEMENT

Assessing and confirming the positive impacts of MPAs on small-scale fisheries as seen in the previous sections can help demonstrate good governance of the marine environment, its efficiency, legitimacy, and the fishermen's positive perception. Such evaluation can be conducted focusing on observations/evaluations (including fishermen participation) of the interconnected biological/ecological and socio-economic effects of MPAs on fisheries. However, the dynamic linkages between MPAs and small-scale fisheries (synergies and conflicts) remain a complex and contextual issue that is

[47] Scientific and institutional cooperation to support responsible fisheries in the eastern Mediterranean.
[48] Sustainable development of Mediterranean artisanal fisheries in Morocco and Tunisia.
[49] http://www.faoartfimed.org/fr/publications.html.

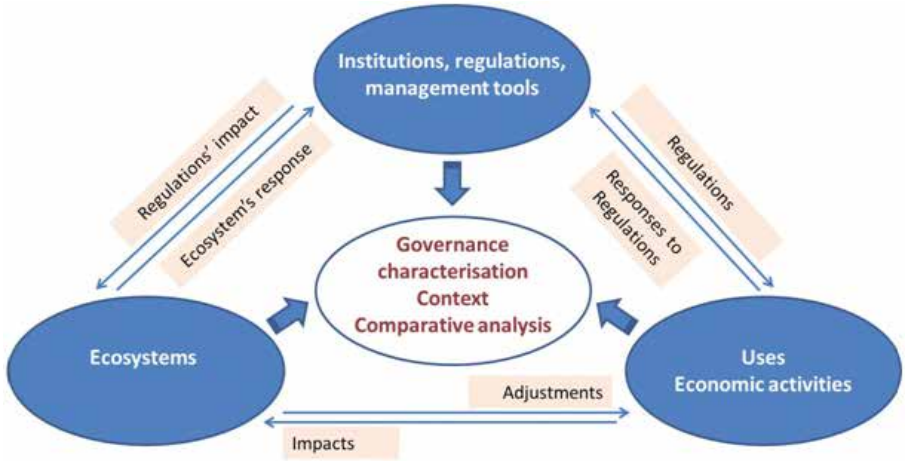
addressed in this third section. The functioning of MPAs and management therefore need to be analysed with regards to small-scale fisheries: Which relevant types of governance can be identified? What are MPA abilities to integrate the challenges of fishing economy and the actors' specific expectations? From this perspective, it is the search for synergies between MPAs and fisheries that needs to be prompted, a challenge that often goes beyond the mere framework of professional fisheries, especially in multi-use MPAs and in Mediterranean coastal contexts.

4.1. Conceptual framework and meaning of MPA and fisheries governance

a) Definitions and general action framework

The term governance can have different meanings according to the discipline, but all converge. For a legal expert, governance of an MPA is first defined through the institutional and legal framework set by the States to ensure the conservation of all or part of the marine biodiversity. Other social standards and legal institutions are included in this framework according to the principles and conditions adopted by the governments (Féral, 2011; Cazalet *et al.*, 2012). Thus, governance of an MPA can be regarded as a "societal whole" which includes legal rules, power relations, behaviours, scientific data, the institutional framework, the market, the users, different professional activities (such as small-scale fisheries). In short, governance relates to complex and ever changing systems (e.g. see Figure 16 on the multi-disciplinary and comparative approach of the governance of MPAs).

FIGURE 16
Multi-disciplinary and integrated approach of GAIUS project



Source: Cazalet *et al.*, 2008.

Garcia *et al.* (2013) remind us that:

> (one of the) "major characteristics of modern fishery governance and MPA management is acknowledging the uncertainty resulting from the great complexity of the socio-ecological systems involved and the possible consequences in terms of: spatiotemporal differences between actions and responses; system sensitivity to external inputs; amplification or absorption of system responses to stimuli; interconnection between space and time scales; self-organization and endogenous change capacity; difficulty in spreading experiences; non-linearity and ambiguity in cause-and-effect relationships; low impact reversibility; different actors' perceptions; and inevitable reduction of prediction and control capacities".

Fisheries governance and MPA governance have long been ignoring one another, and were sometimes even conflicting, but their complementarity has started to be considered along with a search for synergies in integrating small-scale fisheries in MPA policies.

This link was internationally embodied during the World Summit on Sustainable Development (WSSD) (Johannesburg, South Africa, September 2002), with many relevant planning actions for fisheries and MPAs (Source: WSSD Report, Johannesburg, South Africa, 26 August – 4 September 2002):

- Encourage the application by 2010 of the ecosystem-based approach, (Para 30 d);
- Promote integrated, multidisciplinary and multi-sectorial management (Para 30 e);
- Strengthen cooperation and coordination between the relevant regional organizations (Para 30 f);
- Maintain or restore fish stocks to levels that can produce the maximum sustainable yield not later than 2015 (Para 31 a);
- Develop and facilitate the use of the ecosystem-based approach, the elimination of destructive fishing practices, the establishment of marine protected areas including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods, proper coastal land use and watershed planning and the integration of marine and coastal areas management into key sectors (Para 32 c);
- Promote coherent and coordinated approaches to institutional frameworks for sustainable development (Para 162 a);
- Strengthen governmental institutions promoting transparency, accountability and fair administrative and judicial institutions (Para 163);
- Promote public participation, including through measures that provide access to information regarding legislation, regulations, activities, policies and programmes. Foster full public participation in sustainable development policy formulation and implementation (Para 164);
- Further promote the establishment or enhancement of sustainable development councils and/or coordination structures at the national level, including at the local level. In that context, multi-stakeholder participation should be promoted.

b) Evolution of governance in MPAs and fisheries – a viewpoint

Broadly speaking, the governance of fisheries has evolved alongside that of MPAs. Initial methods were based on a strict conservationist approach (artificial preservation of spaces/emblematic species) or single-species approach (management per stocks or groups of stocks exploited by industrial fleets). In both cases, governance was rather authoritative, centralised and reductive in its objectives. Progressively, governance of both MPAs and fisheries shifted from a paternalistic, commanding, controlling and penalising approach (top-down approach) towards a mix of top-down and bottom-up approaches, giving a more important role to actors and other non-governmental stakeholders in decision-making processes. Therefore, for ideological and practical reasons, they turned into more dynamic and participatory systems of governance (Figure 17). This change strongly contributed to the mutual understanding between fishing and environmental governance, especially for the CBD requirements (art. 11), the implementation of the ecosystem-based approach and the precautionary principle.

The most radical methods remain somehow effective in some cases:

- in emergency situations or imminent/proven danger (for the environment or the resource), when the need for action driven by a strong will and appropriate means prevails over the negotiation time and languid consensus;
- when sites are naturally isolated or when there is low social and economic relevance of a fishery.

FIGURE 17
Development of the MPA dominant paradigm

Topic	As it was: protected areas were ...	As it is becoming: protected areas are ...
Objectives	Set aside for conservation Established mainly for spectacular wildlife and scenic protection Managed mainly for visitors and tourists Valued as wilderness About protection	Run also with social and economic objectives Often set up for scientific, economic and cultural reasons Managed with more consideration for local people more in mind Valued for the cultural importance of the so-called "wilderness" Also about restoration and rehabilitation
Governance	Run by central government	Run by many partners and involve an array of stakeholders
Local people	Planned and managed against people Managed without regard to local opinions	Run with, for, and in some cases by local people Managed to meet the needs of local people
Wider context	Developed separately Managed as 'islands'	Planned as part of national, regional and international systems Developed as 'networks' (strictly protected areas, buffered and linked by green corridors)
Perceptions	Viewed primarily as a national asset Viewed only as a national concern	Viewed also as a community asset Viewed also as an international concern
Management techniques	Managed reactively within a short timescale Managed in a technocratic way	Managed adaptively in a long-term perspective Managed with political considerations
Finance	Paid for by taxpayer	Paid for from many sources
Management skills	Managed by scientists and natural resource experts	Managed by multi-skilled individuals drawing on local knowledge

Source: Phillips, 2003 ; Thomas & Middleton, 2003

However, limits soon appear, in most cases and contexts.

When the unilateral rules set are not accepted socially and economically, even when ecologically justified, it will inevitably lead to conflicts between actors and decision-makers and/or non-compliance with the rules. In such cases, there is no point in chasing out fishermen or attempting to close the borders of the MPA, since – unless "bringing out the big guns" – such actions are doomed to failure. There are numerous examples of this kind of systems and their equally counterproductive consequences for the ecosystems and the populations (Weigel *et al.*, 2007). *In fine:*

> "joint planning of MPAs and fisheries management in a region or ecosystem, to reduce their respective negative impacts and optimise synergies, is an attractive and necessary perspective. The alternative consisting in operating separately has already showed its limits" (Garcia *et al.*, 2013).

Therefore, participatory governance appears an obligation which requires continuous development, reassessments and adaptation, since it is made of a complex strategy of behaviour and the organization and implementation of management and decision-making processes. The role of NGOs (facilitator and/or host) and MPA managers' networks is of utmost importance in this shift towards new forms of governance. From this point of view, the implementation of "good" governance however seems hard to determine beyond ideology and theory (see following section). Some consider it a form of protest – in a broad sense – against the State apparatus and its centralized administrations (locally transposable) in view of the will to rebalance the implementation of public policies and decision-making powers (Féral, 2007). Governance takes us back to the dialectics between the State and civil society, the interactions between public and private sectors, and the complex integration of all the often-conflicting interests of the stakeholders: how is the power exercised, following which paradigms, what responsibilities for which results?

Characterizing the different forms of governance has been the subject of numerous analyses and attempts at schematic representations. Figure 18 illustrates the different typologies where:

- State-owned MPAs are the classic centralised and bureaucratic model of State or certain local authorities having significant marine skills;
- Participatory MPAs correspond for instance to the French model of "Marine Natural Park" where a forum of users and local representatives (including professional fishers) is responsible for management. The expression "Sea Parliament" is therefore often used to describe its functioning. The State (and its representatives) voluntarily appears as a minority, while keeping its regulatory and executive functions in consensus-based decisions;
- Traditional MPAs' represent localised models, often strengthened by geographic seclusion and/or prevailing and recognized traditional village structure. This model does not seem, in principle, representative in the Mediterranean (or it is at least in decline), except for a few coastal and fishers' communities likely to claim such an organization that is really effective.

FIGURE 18

Proposal of MPA management models

State-owned MPA	Participatory MPA	Traditional MPA
Centralisation	Co-management	Decentralisation
Technocratic	Participatory	Traditional
Urban	Urban, peri-urban	Rural, villagers
Recreational	Mixed	Food-producing
Unilateral	Power relationships	Common consent
Expensive	Expensive	Cheap
Professional	Corporate, by categories	Voluntary, disciplinary
Science	Negotiation	Experience
Vertical Organization	Forum	Horizontal organization
Bureaucratic	Conflicts, dialectics	Community-based
Extravert	Introvert	Extravert
STATE LEGITIMACY	SOCIETY LEGITIMACY	INDIGENOUS LEGITIMACY

Source: Féral, 2011; Cazalet, 2012.

According to an integration gradient of the societal model to the state model, a range of mixed applications appears, combining interferences and items of the three models. As for the societal model managed locally (where management is entrusted to professionals (traditional fishers) or private institutions (NGOs, associations, unions) in collaboration with local populations) and which can be compared to indigenous models, duality remains and is expressed around:

- either cooperation, sharing, synergies and complementarity;
- or tension, confrontation and competition.

It is to be noted that tension could be attenuated by having these models strengthening each other to create "good governance". These different models will be illustrated with Mediterranean case studies further in this document.

c) MPA good governance and challenges for co-management with small-scale fisheries

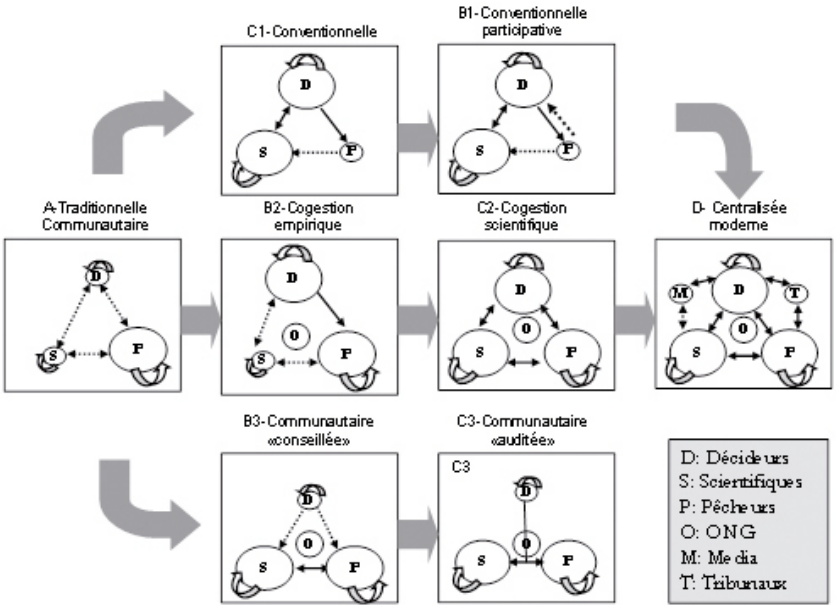
Participatory management or co-management can be defined (Pomeroy & Riviera-Guieb, 2006) as a partnership arrangement between the community of local resource users (fishers), government, other stakeholders (boat owners, fish traders, boat builders, business people, etc.) and external agents (non-governmental organizations, academic and research institutions), to share the responsibility and authority for the management of the fishery. Through consultations and negotiations, the partners develop a formal agreement on their respective roles, responsibilities and rights in management, i.e.

the shared power they negotiated. Such "agreements" can be of different types and determine levels of transfer or delegation of very different competences and powers[50].

The challenge of an agreement is to ensure that each stakeholder benefits from it in the exercise of his rights and in complying with its obligations. The aim being that no party feel strongly or unjustifiably disadvantaged against the other party(ies). "Good governance" aims at promoting constructive interactions between the components of the State, the private economy sphere, and the civil society. Thus, "co-management is not a formula, a model strategy, but an adaptive process which changes, grows and develops over time. It involves democratisation of processes, social emancipation of the actors, decentralisation, sharing of powers and social learning". (Viswanathan *et al., 2003).* In short, the principles of co-management are those of "good governance". This concept has been much in use although sometimes also misused where the involvement of actors has been sought by the authorities only to have them better comply with centralised and preconceived decisions. This is the case in many traditional fisheries

FIGURE 19

Relationships between decision-makers (D), fishermen (F), scientists (S), NGOs (N), courts (C) and media (M) in the different types of fisheries governance



[50] Although the following typology cannot always be transposed to any legal and administrative framework, the following terminology can be used as a guide:

- Decentralisation: when there is a transfer of authority and/or responsibility relative to management (competence) from the centralised higher authority (State, Ministry of fisheries) to an institution of local administration level (region or commune) with a certain level of autonomy (institutional, legal, fiscal, etc.) and legitimacy (electoral) or to the private sector.
- Deconcentration: involves a transfer of management responsibilities from the ministry headquarters or any agency responsible for the management of its own staff within a peripheral administrative area (e.g. prefecture, commune) where the employees are agents from the central authority. The decentralised action requires peripheral administration and is generally framed by guidelines set by the headquarters. It is a variant of the delegation, since the State is still – remotely - in power.
- Delegation: involves a transfer of certain functions of the central government to a semi-autonomous or paragovernmental organisation. The delegated functions cover: the selection of management measures, registration of rights, local conflict resolution, full planning responsibility and implementation of specific protected area or fishery management. The State hands over the supervision of the operations, but remains in control.
- Devolution: decision-making authority allocated to local governance, which – within the established limits (geographic areas, type of resources) – can decide and enforce decisions. The State reserves the right to intervene in the last resort if the basic objectives or the rules in force are not complied with.

and MPAs. Furthermore, the level of integration of fisheries into MPA governance also depends on the different chronological phases of MPA implementation: planning, creation, regulation, monitoring, surveillance and conflict resolution.

The relative size of the circles represents the relative importance of the roles. If we extended the fishermen group to the group of actors in general, the diagram could easily be applied to multi-use MPAs (Garcia *et al.*, 2010).

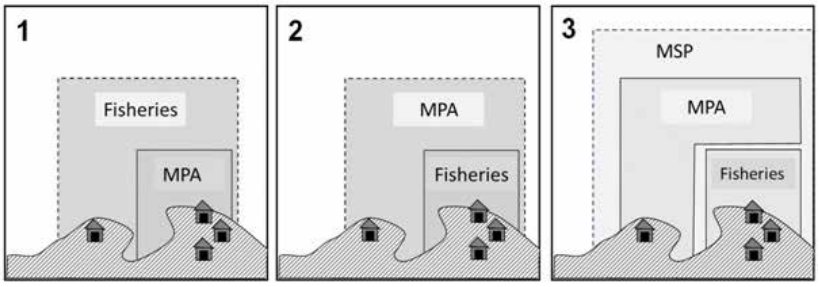
The ideal of balanced co-management however remains counterbalanced by many uncertainties resulting from the complexity of fisheries phenomena, marine ecosystems and human responses (Charles, 2001; Garcia, 2009 from Garcia *et al.*, 2013):

- "Delayed responses: which can appear long after the first implementation of management measures (e.g. when responses depend on the age of fish or the actors);
- Teleconnections: the effects of measures can occur far from their application point, including in another country (e.g. due to migrations, currents, or through the food chain);
- System sensitivity to external factors: environmental, social or economic factors at the global, regional and/or local scale;
- Feedback loops that adjust (amplify or absorb, accelerate or slow down) the system responses;
- Strong interconnections between the different time and space scales that must, as far as possible, be considered simultaneously. Conclusions made at a certain scale (e.g. local) cannot necessarily be extrapolated to another scale (e.g. national or regional) and the role of the State in the search for consistency between the scales is of utmost importance;
- Self-organisation capacity which allows the system to react unpredictably (e.g. the ecosystem does not react as expected; fishermen find an unexpected way to counter a measure, or an unexpected solution to their problem);
- Loss of universality. Protocols cannot necessarily be transferred from a region or a community to another, even if managers always search for successful transferable protocols (often gathered in good practices catalogues);
- Non-linearity of phenomena: impacts are not just proportional to the measures taken. Saturation, acceleration and threshold phenomena may occur.
- Ambiguous relations: one action may lead to several types of responses and one problem observed may have various origins; so one issue can actually have different solutions.
- Irreversibility of impacts: unlike what is assumed with conventional management, the phenomena observed (e.g. impacts of fishing activities or conservation measures) cannot necessarily be reversed.
- Actors may have different perceptions, and they may change over time;
- Reduced prediction and control capacities. All the above elements lower the governance capacity to accurately predict the impacts of the measures taken, and therefore to entirely control possible events".

Figure 20 illustrates the different arrangements of integration between fisheries and MPAs, adding the MSP component to the picture.

To illustrate these challenges and how they translate in practice, a peculiar case is the Côte Bleue marine park (France).

FIGURE 20
Types of interactions between MPAs and fisheries



1: MPA integrated in fishery management. 2: Fishery integrated in MPA management. 3: Fishery and MPA integrated in Maritime Spatial Planning (Garcia *et al.* 2013).

The settled governance of this park is an innovative initiative, *sui generis* within the meaning of law, but perfectly integrated in the local environment and accepted by the users and actors, especially the small-scale fishermen. The presence and efficiency of an MPA do not necessarily involve being part of legal categories expressly provided by law. Indeed, the status of "marine park" does not exist under the French law. This designation has been used by the local organization (a union), which initiated the creation of the MPA in the 1980s. The legal basis is a combination of various statuses (fishing regulated areas, marine culture concessions for the installation of artificial reefs, etc.) that have developed to progressively form the "marine park" entity. Today, a single concession has simplified the MPA legal framework, without changing the functioning principles based on the cooperation between local authorities and professional fishermen within a joint association. Acceptance of this MPA in the official categories of the Environmental Code has progressively been normalized under the European Marine Natura 2000 Network (European Habitats Directive) – where the marine park manager is an operator.

Another example to illustrate the good governance of fishing reserves or regulated areas (fishery-oriented MPAs) is the Cap Roux MPA (France) where the management has been delegated to a professional institution (the St Raphaël fishermen organization).

d) Perspectives of small-scale fisheries self-management (spatial-based)

From there, the concept can be taken one step further to that of self-management of a given space. This idea has already been mentioned in this work, especially in the processes of small-scale fisheries integration in local, daily and decentralised MPA management (not only fishery-oriented MPAs). Consideration should be given to the ways of supporting or reactivating spatial management capacities ("fishery regions" inherent to traditional fisheries), directly by the fishermen themselves – according to the community-based models (existing or once existing) (Féral, 2004; Cazalet *et al.,* 2011). Some historical models that progressively disappeared seem to gain a renewed interest, especially with the European institutions and the Common Fisheries Policy reform process. Besides, the current context of institutional and socio-economic crisis must not be overlooked since it reduces the daily presence and *in situ* intervention capacity of public authorities (human, logistical and financial resources for fisheries and MPAs). This will lead to changes in the governance of maritime spaces and it can help reach new forms of local appropriation and decentralised management. The maritime public space has always been traditionally over-managed, with a growing trend to multiply

regulatory constraints (protection, fishing, etc.), but with a decreasing *in situ* support. Bureaucratic and technocratic management are still used, but they are centralised and less field-related.

The will to promote coastal small-scale fisheries specificities (sustainability, selectivity, environmental integration, etc.) should be expressed through better recognition of spatialized access rights and according to decentralised management criteria, adapted to local fishing conditions. The possibility to strengthen sustainable fishing livelihood raises the question of dynamism among fishers' communities, their sufficient number and their capacity to dedicate a space for protection and fishing effort management (collective discipline). This also raises the issues of legitimacy and compatibility with existing rules and practices (uses) in the same marine coastal spaces (risk of conflicts, protests). Finally, it shouldn't appear incompatible to promote better conditions of access and use for professional categories having a particular and exclusive dependence to the natural environment and whose role remains essential in terms of food supply.

In terms of "models" (types of concessions, delegations, etc.), and coming back to self-governance of fishing reserves and regulated areas, the perspective consists in stronger governance, with a true management autonomy and appropriation for the benefit of the fishermen groups likely to achieve it. Some of these models already exist *de facto* in the daily practice of some fishers' communities, but they are not well enough known or considered, especially by the decision-making and centralised management authorities.

e) Summary of arguments for integrating the management of MPAs and fisheries

The figure below is a synoptic overview of the main arguments put forward in the literature, by the supporters of introducing MPAs in fisheries management and their opponents (Garcia *et al.*, 2013).

Bidirectional arrows indicate that the argument is used on both sides, without controversy. The text in italics indicates comments made by the authors in this chapter. Grey cells indicate conditional or total consensus. The table idea comes from Jones (2007). Data come from: Agardy *et al.*, 2003; CEFAS, 2005; Fonteneau, 2001 and 2007; Game, 2009 and 2009a; Garcia, 2009; Jones, 2007; Kaiser, 2005; Kaplan *et al.*, 2010; Norse, 2005; Weigel *et al.*, 2007 and 2011 (all in Garcia *et al.*, 2013)

Arguments of pro-MPAs		Arguments of pro-management
MPAs are a universal solution for fisheries management	→	MPAs are only one of the potential fisheries management instruments *Correct answer for Reserve-MPAs but multi-use MPAs are integrated spatial management frameworks*
MPA objectives and fisheries management objectives are different but MPAs can help fisheries	←→	MPA objectives and fisheries management objectives are different. MPAs are not designed to help manage fish stocks
MPAs are crucial means for ecosystem reconstruction	→	yes, provided that they are properly managed
Natural shelters were eradicated by development Trawling is destructive and needs to be prohibited on large surface areas	→	NO: trawlers only affect a few percent of the surface areas available *(correct only for the impacts to the seabed)* Creation of MPAs will encourage them to damage other habitats elsewhere
	←	MPA socio-economic consequences are largely ignored
Some fishing capacity monitoring systems (ITQ) also tend to exclude traditional users	←	MPAs tend to exclude traditional users, removing or complicating their livelihood
But multi-use MPAs attempt to secure the traditional fishers' rights	←	Reserve-MPAs lead to displacement of fishermen, increasing personal dangers, transferring stabilized impacts, concentrating overfishing
	←	MPAs cause ecological, operational and socio-economic issues
Only MPAs can reduce certain impacts on living habitats and biodiversity	→	Approval

Arguments of pro-MPAs		Arguments of pro-management
Approval	←→	Less mobile sedentary species should better benefit from MPAs
Pelagic MPAs are necessary, especially in open and high seas	←→	Yes, but difficult to plan (boundaries, position, seasonal dynamics, extreme dimensions or networks)
	←	Adverse effects of fishers' displacement are immediately perceived. Positive effects of their exclusion will take years to be observable.
[…]		
The size of MPAs has little impact on their performance. However, many works indicate that small MPAs are less efficient in terms of conservation	→	Only in tropical coral reefs. In temperate areas. The size of MPAs should be adapted to the life cycle geography. *Small protected areas should be sufficient to meet socio-economic objectives (Claudet et al. 2011)*
Fisheries will benefit from spillover effects and larval dispersal. There are examples in tropical reefs and temperate seas.	→	That is what the models indicate, especially for less mobile species, but actual effects are rarely demonstrated in the wildlife. *However, it is logical, probable and confirmed in some cases. Always hard to demonstrate without ambiguity. Effects worn off by the "attractive" effect of the reserves, especially when the prevailing effort is not controlled.*
Such arguments are supported by some facts and contradicted by others. There are unquestionable examples of spillover effects.	←	The growth of protected stocks will slow down the recruitment and productivity (and surplus production), reducing or even cancelling the spillover effect. *Unless the emigration rate is high, but in this case, the protection provided by the MPA will be lower.*
Failed fisheries management processes are due to the search by the actors (fishermen and politics) for short-term benefits	←→	But establishing rights will rectify this problem aligning the objectives of both the sector and the society
Failed management is due to decision-makers' non-compliance with scientific recommendations	→	Frequently, but the reasons for this behaviour (compromise, clientelism) will also affect the MPA.
Extensive areas should be closed (10-65 percent, average 32 percent) (for species strongly related to their habitat)	→	For cod, closing 25 percent of the North Sea would have an insubstantial impact. *An inacceptable part of the region would need to be closed.* Extensive transboundary MPAs (transnational) will generate significant management problems. For very mobile species, the effects of MPAs are worn off by many factors and the surface areas to be excluded would be too important (ongoing debate). The patchwork of MPAs would be hard to manage. *It is a typical argument for single-species management, not ecosystem-based management.*
The stock decline is such that conventional management will not help recover them (ITQ)	→	There is sufficient evidence that a proper effort regulation can lead to biomass recovery.
MPAs and effort control must be combined to achieve sustainable use.	←→	It is true for fisheries, but hard, with sometimes adverse effects on the ecosystem (more rejections).
Fisheries management (often) fails.	→	Yes, but the failures are mainly due to politics, and the same compromises would affect the implementation and management of MPAs.
It is possible in multi-use MPAs and acceptable even in Reserve-MPAs, if they are decided for and with the fishers	←	Individual quotas (or community quotas) and TURF are successful in modern fisheries management.
MPAs should be implemented collaboratively, but some argue that exclusion can first be imposed and that approval will come later with the results).	←→	Allocating fishing rights (and the resulting exclusion) is necessarily a collaborative and compensatory process. Efficiency depends on the quality and the equity of the initial allocation.
This could occur, for the same reasons in integrated spatial management where economics' forces are involved.	←	The highly participatory and multi-sectorial approach of multi-use MPAs sometimes leads to progressive partial exclusion of fisheries actors (e.g. for the benefit of tourism).
The lack of data for the evaluation of many MPAs is a problem.	←	Configuration and implementation of MPAs require greater multidisciplinary scientific support (socio-economic aspects).
Managing Reserve-MPAs is easier (only access control). SSN and coastal radars make it easier.	→	*Common failure of Reserve-MPAs indicate that this control alone is not sufficient, unless it is increased to impossible financial levels or with the active support from the impacted communities.*
MPAs can help control fishing pressure.	→	Not when the whole capacity is not reduced simultaneously
MPAs are a "guarantee" against scientific mistakes and errors in fisheries management.	→	Not always. Dissatisfactions also lead to further deviant behaviours (fraud, falsifying data).

Arguments of pro-MPAs		Arguments of pro-management
MPAs help solve conflicts between users (with zoning).	→	Creation of MPAs can also generate conflicts, inside and outside their borders.
MPAs help reduce by-catch and catch release.	→	Yes, but in the same way that fishing reserves and other RSTs
Information needs are lower: only regarding representativity of MPAs and their connectivity within the networks.	→	*But total omission of information on social and economic impacts due to exclusion and pressure dynamics (demography, globalisation). Bio-ecologists' tunnel vision*
Opinion being generalised	←	It is absurd to consider Reserve-MPAs as a sole instrument for fisheries management; it is a loss of precious time and energy.
MPAs and conventional management are complementary despite their respective drawbacks.	←→	Yes, but their role is not to improve the stocks and their integration in fisheries must be tested.
The conventional precautionary approach does not help address the side effects on habitats and biodiversity.	→	This aspect probably requires the introduction of MPAs.
The managers and actors' trust in fishery science is limited.	←→	The fisheries managers and fishers' trust in MPA science is even lower, given the radical and unilateral message from MPA supporters.
Conclusions: MPAs are a key solution MPAs need less ideology and more science	←→	Conclusions: Rights systems are a major solution component. In temperate systems, MPAs are a symptom of poor management, but not a solution. If MPAs are needed, uncertainties must be recognized, tests must be carried out and they must be included in appropriate regulation contexts.

4.2. Examples of the successful integration of MPAs and small-scale fisheries management in the Mediterranean

The case studies presented below are some of the best documented of the Mediterranean and the data were made available by the MedPAN Secretariat.

a) The marine extension to the Taza national park (Algeria)

The offshore extension of the national park of Taza (Algeria, MedPAN South project, led by WWF Mediterranean Programme) has generated an intense work of communication and exchange between experts, members, partners and small-scale fisheries stakeholders. The local public and fishermen were made aware of the concept of marine protected area and its benefits (social, economic and environmental) applicable to the extension of the park of Taza into the marine environment. The objectives for local small-scale fisheries have been established to ensure:

- the continuity of local fisheries in a sustainable development process;
- the introduction of new alternative activities to generate income.

This recent initiative illustrates the participatory nature of its design and its implementation, without prejudging the final outcome and the expected effects to be produced in relation to the small-scale fishing sector.

b) Natural reserves of Bonifacio and Scandola (Corsica, France)

These two MPAs in Corsica (France) have a significant and successful experience in associating management between small-scale fisheries and MPA. The results of scientific and socio-economic monitoring highlight the positive effects of protective measures for local professional fishermen. On the basis of a negotiated process of co-construction of the MPA legal framework, supplemented by a daily and dissuasive presence of sworn officers, they offer interesting perspectives in terms of potential contribution of MPAs to maintain small local fishing activities. The findings of Scandola (which is a no-take area) lead the managers to consider that the practice of small-scale fisheries can develop in harmony with the principles of sustainable management of fisheries resources and that it can benefit from the reserve effect. Managers are sometimes asked to undertake specific actions in the interest of professional fishermen and work directly with them. In Bonifacio for example (which was set up praise to fishermen, the MPA managers were with fishermen on the lobsters and sea urchins issues.

c) Côte bleue marine park (France)

This decentralized example of creation process and management, displays a very high degree of integration of small-scale fisheries. From its inception, the MPA has always expressed the will to support this professional category. The results are quite successful and are soon to be published. In addition, the MPA managers have more recently started to investigate the volumes of catches made by recreational fisheries. In some areas of the MPA, the percentage of biomass taken by recreational fishers is identical to that produced by professional fishermen (Charbonnel *et al.,* 2013a and 2013b). This kind of data is very important as it confirms a number of perceived trends, often difficult to measure and demonstrate. It is clear that in many places, small-scale fisheries are increasingly forced to "share" their workspace and catch volumes with recreational fishing. However, the level of regulation of non-professional fisheries is minimal or nonexistent in terms of control/monitoring, including within MPAs. When the biomass caught is identical between professionals and non-professionals, it points to the need to set up fair regulation measures for both. This issue is dear to fishermen and a recurrent topic of discussion in meetings which are recently bringing together professional fishermen and representatives of Mediterranean MPAs to find common solutions and identify the way forward. An example is that of the Carovigno meeting (Piante, 2012) organized in Italy (17–18 March 2012) which brought together MPA managers and Mediterranean artisanal fishermen around two ideas:

- Promoting sustainable fisheries in and outside Mediterranean MPAs;
- Support the artisanal (small-scale) fisheries in the Mediterranean.

This workshop allowed identifying some key case studies with concrete initiatives in order to present findings and clear guidelines for policy makers.

d) Torre Guaceto MPA (Italy)

Located in the south of Italy on the Adriatic Sea, the marine reserve of Torre Guaceto provides a dynamic example of adaptive co-management. At the start though, difficulties were encountered with the effective implementation of the management plan in the 2000s with fishermen objecting to the strict enforcement of the MPA. After an initial refusal on the part of fishermen, mutual efforts, dialogue and their involvement in the management of the MPA have improved to legitimize the presence of the reserve in the heart of a historic fishing area for fishermen in this region. According to the statements of the fishermen themselves, the loss (or strong access restrictions) of a workspace of more than 2000 hectares now seems largely offset by the spillover effect: "In 2001, survey/control of the reserve has been applied, we thought we were stolen a piece of sea and during four years, we poached. After, we were able to discuss and collaborate. Today, we catch four times more than 10 years ago".

e) Networks of fishing reserves in Spanish Mediterranean

The table below describes the general characteristics of the Spanish MPAs (seven of which are in the Mediterranean) established under fisheries reserves status (Revenga *et al*, 2012).

For example, according to the authors (Revenga *et al., 2012*), the evaluation of the effect of the Columbrete Islands reserve after 20 years of protection shows that:

- 11 percent of the annual catch is exported as net biomass of the marine reserve;
- The density of lobsters and egg production is 5 to 20 times higher in the marine reserve than outside;
- Regional lobster egg production has increased – multiplied by 6.

FIGURE 22
Network (surface, category) of 10 fishing reserves established along the Mediterranean coast and the Canary islands

Reserva	R Full (ha) Category I. UICN	Remaining (ha) Category VI. UICN	Total (ha)
Isla de Alboran	695	955	1 650
Cabo de Gata-Nijar	1 665	2 988	4 653
Cabo de Palos- Islas Hormigas	267	1 664	1 931
Cala Ratjada-Levante de Mallorca	2 000	9 285	11 285
Islas Columbretes	3 112	2 381	5 493
Isla Graciosa	1 076	69 363	70 439
Masia Blanca	457		457
Isla de La Palma	837	2 618	3 455
Punta de La Restinga-Mar de Las Calmas	237	943	1 180
Isla De Tabarca	78	1 676	1 754
Total	**10 424**	**91 873**	**102 297**
%	**10.2**	**89.8**	**100**

Source: Revenga *et al.*, 2012.

5. PROMOTING SMALL-SCALE FISHERIES AND THEIR RECONVERSION POTENTIAL IN AND AROUND MPAS

5.1. Introduction

In line with MPA positive effects on small-scale fisheries, it is important to consider the possible additional auxiliary benefits. How far can we go in integrating the objectives between fisheries and MPAs?

The features of fisheries economics (dynamism, stability or disintegration) are key to understanding the expectations and needs of fishermen groups and the perspectives of MPA contributions to coastal small-scale fisheries. It is obvious that situations are wide ranging and as such, the principles presented below only provide some orientations, illustrated with examples when appropriate. When looking at "reconversion", it can refer to a career change which involves giving up the main original activity, such as small-scale fisheries, and replacing it by another activity. While such radical change is sometimes inevitable, other solutions can be envisaged first and will be discussed below. Indeed, "losing" small-scale fishermen upon implementing fisheries or environmental policies can be considered a failure[51]. Often used in the context of reconversion are the concepts of "alternative livelihood and income-generating activity". In any case, the consequences of such alternatives will need to be anticipated and evaluated. For instance, reconversion for the benefit of diversification around MPA tourism attractiveness can worsen the managers' constraints, jeopardizing the site protection (Cazalet, 2008).

5.2. Compensations

Negative impacts of MPAs on fisheries (real or perceived) mentioned earlier are sometimes put forward by the fishermen to protest against MPA projects. Such reactions can encourage the managers to adopt compensatory measures to make up for the consequences – especially on the short term – of the implementation of a protected area where extraction activity is prohibited.

[51] As the plans for withdrawal of fishing vessels (regulation of overcapacity and/or individual and collective fishing effort), which compensate fishermen for the voluntary destruction of their fishing vessel, with permanent or temporary prohibition to exercise any fishery-related professional activity.

a) Artificial reefs as means to compensate

Artificial reefs are often considered excellent "fish-producing" tools by small-scale fishermen as they can help support the sustainability of activities. Used by some MPAs to displace fishing pressure to areas of lesser biodiversity importance and provide alternatives for fishermen, their installation should however be very carefully researched and planned. Indeed, they are not a transversal panacea and can also cause adverse effects.

Without getting into the debate on bio-ecological evaluation of the reef effects, only the fishers' expectations and opinions are considered here. Artificial reefs have been used for thousands years by some civilisations, sometimes in extraordinary proportions, without any scientific justifications or considerations. In Japan for example, they cover 12 percent of the continental shelf, and technical/scientific support is not a criterion for their legitimate installation. Rather, positive perception of artificial reefs is an assumption, an observation that is not questioned, and it is on that basis that it is supported and enhanced in order to improve efficiency (Cazalet *et al.,* 2009). However, beyond looking at installing artificial reefs, monitoring should focus on all the post-installation aspects.

Furthermore, the financial and economic stakes behind reef installation projects (e.g. modules *versus* wrecks) are significant and can substantially influence political decisions and reef installation choices. Having said that, the high cost of introducing artificial structures in the natural marine environment is more than often not compared to the lower cost of working towards human co-management of the resources in a given space.

In any case, when MPAs consider the installation of "compensatory reefs" within or around their borders, beyond the environmental impacts, they also need to carefully consider which elements must prevail and whom the reefs are for: professional or multi-use fisheries? What features should they have (volume, design, composition)? How deep should they be (distribution of uses, conflict prevention)? How should they be managed (conventions, management plans, etc.)? What control and monitoring need to be set up?

b) Accompanying measures

To make up for spatial and regulatory constraints, other compensatory approaches can also be implemented to support small-scale fishers in their daily work. Such initiatives are not supposed to be funded by the MPA, but the MPA can lead the process (file set-up, grant application, partnerships, etc.). Through involvement and leadership, the MPA strengthens its legitimacy towards fishermen extending its functions to direct or indirect support to small-scale fishing economy. Some examples can be highlighted:

- Professional infrastructures and collective services: fish storage and processing means, on-site ice-making, improvement of harbour conditions (docking/landing), storage of material, product promotion (selling stands), etc.;
- Support to modernization (e.g. improving engine energetic performance or modernising the fishing fleets) in return for more environment-friendly practices (gear selectivity, limited fishing effort, etc.);
- Direct financial support: quite uncommon, "since it is expensive and generally does not encourage the beneficiaries to modify their behaviour towards a sustainable use of resources" (Garcia *et al.,* 2013). Occasional and limited contributions in return for services rendered to MPAs can however be considered: compensation, fishers' remuneration, e.g. during scientific fishing activities, transport of researchers/scientific divers, larval fish catch, rental/manufacturing of catching gear for scientific purposes, etc.;
- Direct employment within the MPA management: semi-reconversion into the surveillance paid staff.

5.3. Diversification – conversion

The FAO (2011) takes into account the MPA capacity to generate revenue and employment diversification for the relevant fisheries. Numerous measures (tourism, agriculture, aquaculture, crafts, etc.) can generate an additional activity (diversification) or even a complete reconversion for the fisherman and/or his family. In the tourism sector, "fishing tourism" or ''pesca-tourism" is possibly the one reaching fishermen most directly. It consists in professional fishermen taking tourists on board for them to witness and take part in a traditional activity (Bellia, 2010), or develop sport fishing or ecotourism. The development of this type of diversification has been specifically requested by the fishermen in the MPA of the national park of Taza in Algeria during the consultation process conducted in 2012 (Piante, 2012). Conversion into nature guides is also an option, with fishermen for example leading cetacean watch activities.

5.4. Promotion of and communication on fisheries products

Another form of support is when the MPA helps promote and communicate on the small-scale fishing products and practices by:

- Supporting the implementation of labels. Although the concept of "label" is very broad, serious initiatives (i.e. with legal backing) on maritime products are rather uncommon. The most famous label, MSC[52] (Marine Stewardship Council), is still not used in the Mediterranean. MSC covers the stocks and/or fisheries sustainability considering their impact on the environment and the management mechanisms implemented to ensure sustainable use of resources. This type of approach inevitably leads to a "label" effect on the product image (or the fishery image) and on the market. The labelling process however remains expensive especially for small-scale fisheries: 10 000 to 20 000 euros, plus the application file fees, as well as a post-labelling fee of about 0.5 percent of the product value. The rather classic awarding criteria yet seem to favour the stock condition. It must be assessed and considered as sustainable, whatever the technique used (selectivity? impact on habitats?) or the economic structure of the fishery (industrial, artisanal, jobs generated, etc.);
- Strengthening and diversification of trading channels: direct sale, rather short circuits/channels, inland regions, etc.;
- Setting up partnerships (quality charter), especially for the communication process towards the general public. The diversity and resources of small-scale fishery products are often little known beyond the local fishery villages. This Mediterranean specificity can sometimes hinder the promotion of discredited products[53] (wariness, preconceptions), which actually have interesting qualities and could be granted a better added value.

6. CONCLUSION

Conclusions focus on the principles and orientations for the optimal and sustainable integration of small-scale fisheries within MPAs. The aim is also to integrate these to the general framework of the First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea and its main objectives[54]. The convergence between MPAs and small-scale fisheries is also rooted in other regional

[52] Currently includes 215 certified fisheries, i.e. about 8–10 percent of worldwide catch.

[53] Other older and sometimes infamous examples, such as the cod, indicate how much the perception and economic value of the product can change over time, and not only because of its scarcity.

[54] 1) Foster and renew political commitment towards small-scale fisheries; 2) Agree upon a possible roadmap for the gradual implementation of tasks in support to the sustainable development of small-scale fisheries; 3) Discuss the set-up of a regional cooperation project on small-scale fisheries; 4) Lay the foundation of a platform where stakeholders could be directly involved and participate in the management of small-scale fisheries.

initiatives which can help support this integration, such as reflected in the Antalya Declaration[55] and the 2012 Mediterranean MPA Roadmap (Montbrison *et al.*, 2012).

6.1. Towards a win-win strategy between MPAs and small-scale fisheries

The objectives of small-scale fisheries and MPA management intersect on many aspects: territorial management, sustainable fishery resources and practices, search for balanced and "acceptable" governance between conservation of ecosystems and extractive activities. In any case, establishing spatial-based standards and implementing them through an institutional structure determine levels of constraints and the organisation of use/access rights according to the objectives, especially those established to ensure adequate conservation of spaces and resources. But this general framework is not sufficient as many other parameters add to the complexity of small-scale fisheries good governance in or around the MPAs: 1) the unstable ever changing nature of marine ecosystems and the natural interactions they encompass, including global change effects; 2) the multiple uses and human pressures other than fishing activities, especially in coastal areas.

Besides, although the features and challenges are often shared, the priorities remain different, sometimes even contradictory and conflicting. MPAs give priority to the wildlife, its non-market dimension and its protection against practices likely to harm it. Whereas small-scale fisheries aim for daily – or at least regular – accessibility to a working area, profitability of the enterprises (mainly individual), their renewal and the constant demographic strength of professional communities. *In fine*, a successful win-win strategy would provide ideal integration and enhance synergies between small-scale fisheries and MPAs, as expressed in the strategic objectives 2 and 3 of the Antalya Declaration:

- **Strategic objective 2**: Achieve an effective, efficient and sustainable management and good governance in Mediterranean MPAs;
- **Strategic objective 3**: Develop a territorially and sectorially integrated governance of Mediterranean MPAs while promoting the sharing of environmental and socio-economic benefits.

6.2. What do small-scale fishermen expect from MPAs?

Avoid worsening regulatory and spatial constraints regarding access to and use of fishery resources. Such constraints tend to increase and become stronger in coastal areas due to the diversification of uses, activities and regulatory frameworks established. Despite their specific difficulties[56], small-scale fisheries are gradually losing their political, economic and social importance, increasingly becoming minorities, even controversial activities. With a view to compensating and supporting the sustainability of these "integrated" practices, MPAs can determine priority objectives more likely to maintain small-scale fisheries as historical, heritage-based and structuring activities within the protected territories and surrounding areas.

Improve the quality/resilience of natural environments acting similarly and complementarily on other causes of damage to the marine environment (e.g.: on pollution or tourism pressures) and fish mortality. Overfishing is not the only reason for the crisis in the sector and the deterioration of coastal ecosystems. Although they are little known, the environmental challenges related to global change, their (positive or negative) consequences on the environments, the resources and the economy,

[55] Adopted further to the Forum of MPAs in the Mediterranean, organized in Antalya, Turkey, 25–28 November 2012, to commit "*to achieve by 2020, a connected, ecologically representative, effectively managed and monitored network of Marine Protected Areas*". Declaration based on Aichi Target 11 of the Strategic Plan for Biodiversity 2011–2020.

[56] Decreasing resources and attractiveness of the profession, increasing installation and functioning costs, etc.

encourage the public authorities to be cautious. The precautionary approach leads to considering fisheries management in this general context of uncertainty around marine ecosystems. Coastal fisheries are also affected by water pollution, sediments from watersheds, estuaries, habitats deterioration, contamination with heavy metals, hydrocarbons and other industrial and domestic chemical compounds. All these harmful effects are well known and measurable, and the risks threatening the quality of fishery products are real and proven, with potential consequences on human health. The capacity of MPAs to effectively improve the marine/coastal environment quality indicators on the long term remains a crucial component of their support to small-scale fisheries.

Develop tools to improve the productivity of the marine environment. Artificial reefs as means of compensation are particularly appreciated by small-scale fishermen. Extensive natural enlargement initiatives are also likely to support small-scale practices. Such planning measures which are not systematically included in MPA policies could be increasingly considered when appropriate to complement protection measures.

Maintain the versatility of fishing units. Small-scale fishing is characterized by a great adaptability in terms of techniques used, target species, seasons and fishing areas. Such flexibility is territorialized (daily scope) and needs to be best articulated with spatial protection measures. Besides, regulatory and time-space management of fishing effort needs to include the complexity related to versatility, for which regulation cannot be limited to specialized or single-species approaches. Indeed, the will to compartmentalize the regulations (per species or technique) may "rigidify" daily practices and highly hinder small-scale fishers adjusting capacities. MPA design, size, regulation and governance must help preserve the fisheries features.

Encourage diversified small-scale fishing activities. The MPAs must help enlarge the range of economic activities directly or indirectly linked with small-scale fisheries. We have seen various tools in details, from simple additional activity to pure and simple reconversion. From this point of view, diversification must be considered as a mean to help maintain small-scale fisheries and the related number of professionals.

Promote the sustainability of practices and the quality of small-scale fishery products. This is a concrete and practical dimension of the collaboration and support of MPAs to the small-scale economy. MPA actors are often requested to promote and circulate the actions and results of the protection measures. In return, the MPA must help promote good practices and provide a substantial added value to the efforts undertaken by small-scale fisheries: 1) Promoting selectivity, sustainability, environmental integration; 2) Contributing to the promotion of products in or around the MPA (labelling, traceability, etc.)

Encourage conservation of the coastal area (3/5 miles) in favour of small-scale fishing (priority area for access and use). Small-scale fishermen do not have technical, material and regulatory capacities to practice their art beyond coastal areas and territorial waters. However, other more remote and "de-territorialized" (un-spatialized) practices/techniques (industrial and semi-industrial) can access such areas more or less intensively (legally or illegally), using sometimes non-selective or even destructive techniques for the habitats (bottom trawling). Such situations are very common in the whole Mediterranean basin, they affect the environment and they can lead very quickly to overexploitation of resources and to conflicts between professional sectors. Therefore, coastal MPAs can contribute to: 1) ensuring use and access priorities to small-scale professional structures that depend exclusively on the resources; 2) defining accurate and adapted criteria for small-scale fisheries; 3) locally supporting measures that promote small-scale fisheries (funding, renewal, installation, etc.). Finally, the recurring problem of "paper MPAs" remains a major weakness in the governance of coastal areas.

Improve planning/decision-making mechanisms in terms of fisheries and MPAs. The ecosystem-based approach tends to better coordinate the environmental and economic challenges of the marine environment. In some regional (European Union) and national contexts, the legal and political framework establishes the conditions for a better synergy between small-scale fisheries, their environmental integration and the MPAs: definition of criteria and economic and environmental indicators, granting of use and access rights, shared governance, sectorial support to the branch, etc.

Establish measures and sufficient means for limiting/monitoring catch effort of non-professional fishing practices (booming activities). The latter remains lightly regulated or unregulated and poorly controlled in many Mediterranean countries, it sometimes creates a real sense of "differential treatment" penalizing for small-scale fishermen. This should be especially considered in contexts where these practices have become very intense, having a significant impact on the environment and resources, comparable or even higher than professional fishing.

Ensure systematic involvement of professional representatives within the MPA design, development, creation and implementation processes. The complex aspects of co-management need to find an ideal expression ground within MPAs. Small-scale fisheries must remain a major referent for maritime practices and receive special attention from managers and decision-makers, even though they sometimes tend to lose influence, representativity and their historical position in the coastal context.

6.3. What are the MPA managers' expectations?

Enhance communication between fishermen, managers and scientists. To varying extents, small-scale fishermen maintain more or less close and constructive relationships with MPA managers and scientists. Disagreements (on objectives, content, methods, consequences, risks, etc.) may sometimes hinder dialogue. Fishermen may feel like they serve the interests of – sometimes too obscure and technical – scientific disciplines, without any operational feedback or tangible benefits. MPA contribution to science is significant, and so is the related financial investment. Scientists (fundamental and applied research) often bear the consequences of the conflicts between fishermen and decision-makers. Sometimes used as a shield by the decision-makers, when unpopular regulations need to be backed up by expert scientific advice; or scape-goated by the fishermen who consider they supported measures (restrictions, prohibitions) without neither considering economic requirements nor consulting field professionals. In the end, using the scientists as a tool is all the more detrimental given that they have quite little influence on the decision-making processes.

MPA managers are in the best position to optimize the links between fishermen and scientists. They can act as an ideal intermediary to define and direct scientific protocols considering the fishers' expectations. This can involve two joint approaches: 1) keep in mind the versatility of small-scale fisheries and their effect on management objectives; 2) complete the prevailing bio-ecological approach with research in social sciences on the organization of fisheries and fishermen communities, the institutional and legal analysis, the actors' strategies, the territorial challenges, the economic context, the role of the market, etc. Progress has clearly been made on that matter, but it needs to be consolidated in terms of research and managers' training.

Identify or build referent groups. Involving the actors is one of the governance's core concerns. This commendable undertaking implies one prerequisite: what is meant by "actors"? It does not involve providing the list and distribution of the actors in a MPA, but a simple quantitative evaluation/follow-up work can provide such information. For the governance, it is necessary to determine groups of actors likely to be represented and to adequately represent the MPA users. Whether it is about professional fishermen, recreational fishermen, recreational boaters or other users, a minimum of organisation is required to ensure everyone's participation. Professional

fishing organizations (committees, consortiums, *cofradias*, *prud'hommies*, fishermen organizations, associations, federations, etc.) have always taken part in public decision-making, this is nothing new, including in MPAs, but such participation is not necessarily systematic or satisfactory in all the Mediterranean countries. As seen earlier, personal and split strategies are likely to lead to area-use conflicts. This needs to be discussed individually with fishermen to understand their position and hear their proposals, but this is still not sufficient. As an institution, the MPA should be able to hold a dialogue with identified, structured and, where possible, institutionalized focal points. Beyond the decision-making process and its legitimacy, this parameter is also necessary to receive the MPA regulation, disseminate it "internally", and support its efficiency and enforcement within the group's own functioning system (using self-monitoring and/or disciplinary rules).

Some of the main expectations of MPA managers towards small-scale fisheries, on the basis of the two main orientations above, can therefore be summarised as follows:

- Acknowledgement of the need for some regulatory measures over space or in time to enhance marine natural productivity, resilience, the quality of the ecosystems and reduce the mortality of marine resources (ie. on threats that can directly be addressed through MPA management measures);
- Agreement on the joint management of the resources based on knowledge, sustainability principles and transparent constructive discussions (including with enforcement and surveillance);
- When the need for no-take zones is demonstrated, active involvement in joint brainstorm sessions to best establish accompanying measures;
- Initiation of discussions and proposals to value the diversity of fishing units, the diversification of fishing activities and the quality of products (including labels);
- Contribution to building structured groups of fishermen, at the local, national and regional levels;
- Concrete and equitable recommendations towards the management of conflicting uses such as tourism (e.g. diving) and recreational fisheries;
- Flagship the concept of responsible small-scale fisheries in various fora;
- Promotion of MPAs as a positive tool to jointly manage the living resources and the habitats they depend upon.

ACKNOWLEDGEMENTS

The author wishes to express his sincere thanks to the people who have supported and guided this work:

- Marie Romani of MedPAN organization for her continued support, understanding and active contribution to the development of a complex document, both synthetic and multidisciplinary;
- Chloë Webster of MedPAN organization for her support, added insight and editing of the document;
- Nicola Ferri of GFCM for his enthusiasm and confidence, as well as Lena Westlund and Jessica Sanders of FAO;
- Dr Serge Michel Garcia for his work and encyclopedic knowledge freshly updated on MPAs and fishing.

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FULL PAPERS

The Tonnarella of Camogli, an example of sustainable fisheries in the Portofino marine protected area

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The *tonnarella* of Camogli is a small static tuna trap used since the seventeenth century to catch migratory pelagic fish along the Western coast of the Portofino Promontory (Ligurian Sea, north-western Mediterranean). Since 1999, this fishing device has been set within the MPA boundaries (Cattaneo-Vietti and Bava, 2009).

The Portofino MPA was established on 26 April 1999. Its management consortium includes the municipalities of Camogli, Portofino, and Santa Margherita Ligure.

The establishment of this MPA is regulated by two Italian laws: the *Legislation regarding the defense of the sea* (n. 979 of 31 December 1982) and the *Outline Law on protected areas* (n. 394 of 6 December 1991).

The aim of Portofino MPA is twofold: i) promote the conservation of the marine ecosystem (very high in this area) along with its biodiversity and biological resources and ii) support and enhance the local economic activities, provided that these are compatible with the importance of the naturalistic aspects and of the landscape in the area. Since 2005 Portofino MPA has been recognised as a specially protected area of Mediterranean interest (SPAMI) and it has been included as a site for the water column monitoring in the Long-term ecological research (L-TER) Network.

The coastal area of Portofino is characterised by a significant fishery local community but also high tourism activities. Nowadays, the main activity of the residents is tourism, but both in Camogli and Santa Margherita Ligure, the professional fishermen community is still very active although quite small. Due to the differences in both economic sectors of the area, i.e. fisheries and tourism, it has been difficult from the MPA management point of view to avoid a conflict between these two sectors.

The fishing sector is typically characterised by small-scale fleets using different gear throughout the year such as fixed net, surrounding net, purse seine net and long line. Moreover, there are two fishing systems: "*mugginara*" and "*tonnarella*" which are very traditional and typical of the Portofino Promontory.

The *Tonnarella* of Camogli is a small tuna trap including also by a barrage net. This barrage, locally called "*pedale*", is 340m long and is set perpendicular to the coastline, near the locality of Punta Chiappa (Ligurian Sea), whereas the two rectangular collecting chambers (including the "death chamber", locally called "*lea*") are approximately 100 m long each. The mesh size of the barrage is 60 cm, whereas that of the collecting net is 40 cm. The "death chamber" net has a mesh size of 1 cm.

The trap is located according to a particular disposition and the current flow in the area. Its location is the result of many years of fishermen' experience. Currently,

the *tonnarella* of Camogli is placed in the centre of a complex oceanographic system. Indeed, the Portofino Promontory lies within the Ligurian current that moves from east to west as part of the general cyclonic circulation of the Mediterranean Sea (Astraldi and Manzella, 1983; Astraldi and Gasparini, 1986; Gasparini *et al*., 1999). The very narrow continental shelf, together with the Portofino Promontory itself extending into the sea for more than 4 kilometres with a roughly quadrangular shape, produces a "tunnel effect" of the coastal current that significantly increases the hydrodynamics of the area and causes a well defined clockwise gyre in front of the town of Camogli (Doglioli *et al*., 2004). The pelagic fish schools follow this small littoral clockwise gyre, turn around, bypass Recco and Camogli and return towards Punta Chiappa. As the barrage net intercepts its route, the fish follows the net, arrive in the collecting chamber and move inside the "death chamber" due to the current flux.

The entire net, excluding the "death chamber" is handmade every year using coconut ropes. Usually during the month of February, some fishermen are involved in the manufacturing of the net in a laboratory located next to S.Fruttuoso Abbey for 15 days/year.

The only net side made in nylon is the "death chamber".

Every year since the seventeenth century, from April to September, fishermen haul the net three times per day: before dawn, in the late morning and in the afternoon.

In the past, fishing activity took place more than 3 times a day and all fishermen living along the coast from Camogli to S. Fruttuoso bay where involved in the *tonnarella* fishing activities. Nowadays, the situation has changed. A great part of the crew is made up of temporary employees also coming from abroad just for the fishing season.

Data on catches and species composition of the *tonnarella* are daily recorded in a logbook by the fishermen of Cooperativa Pescatori Camogli, providing Portofino MPA with a record of the daily catches which also results in data analysis carried out in collaboration with the University of Genoa.

The opportunity of investigating the relationships between the quality and quantity of catches of the Tonnarella, as well as the specific climatological and environmental variables, made the Tonnarella a key tool to assess potential structural changes in the pelagic fish composition along the Ligurian western coast and, possibly, in the entire north-western Mediterranean.

The analysis of the *tonnarella* total yields (t/year), from 1950 to 2012, shows that the annual yields have changed significantly over time.

Catches from *tonnarella* of Camogli include approximately 30 species of fish with 15 different species comprising the majority of the yield.

Changes in species composition were evident within the multi-year data set. Certain species have been periodically substituted by others, some species have completely disappeared, and other species, such as the amberjack *Seriola dumerili*, have appeared only in recent years (Relini, 2001; Orsi Relini *et al*., 2010).

So the Tonnarella of Camogli can be defined as a laboratory of biodiversity which represents a unique reality in the Mediterranean Sea.

The Cooperativa Pescatori Camogli works in a difficult context because of the high average age of the fishermen, their hard job and the difficulty to find young people interested in traditional fishing activity. Since the date of its institution, the MPA has been engaged in building a relationship with Camogli fishermen, promoting collaboration and reciprocal cultural growth.

As consequence of this positive collaboration, the MPA management consortium has decided to support sustainable fishing activities integrated with the environment and in support of the cultural importance of fishing to the local community.

All this was made in order to raise young people's interest in traditional fishery and to integrate fishermen income.

In this context, in 2010, three marine biologists created a cultural association, called "Ziguele" supported by Portofino MPA, to promote guided tours in the *tonnarella* of Camogli and the fishing museum of Punta Chiappa, in cooperation with the Cooperativa Pescatori Camogli.

The aim of this cultural association is to promote the maritime culture and the small-scale fisheries tradition in the Mediterranean Sea, with particular regards to the sustainable fisheries.

Some data of the Ziguele touristic season report small numbers in the first year of activity (1850 people totally transported in 2010) but an increase in the following years (2 300 people totally transported in 2012).

The Ziguele association is also engaged in raising awareness about the sustainable consumption of fishing resources, sustainable use of the marine resources and the local bioeconomy of Camogli.

Since 2011, Ziguele has started to improve its range of activities, specially organizing guided tours addressed to schools in cooperation with local ferryboats.

Because of the long tradition of fishing and salting of anchovies, some tasting of the local products have been also organized along with educational workshops at the fishery museum of Punta Chiappa.

In this scenario, other future ideas could be developed such as the creation of a fish processing activity (ex. mackerel in oil).

This can be a slow process but all these activities might represent a new way of carrying on fishing and promote the local coastal community activities. Indeed, tradition can be kept alive only if it is properly displayed and tourists can understand and share its social impact.

The Tonnarella is an example of integrating fishing activity, environment monitoring and the sharing of sustainable management goals within a MPA.

ACKNOWLEDGEMENTS

The authors are indebted to the Cooperativa Pescatori di Camogli, and president Mr Simone Gambazza in particular, for their continuous support during field work.

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Three-year experience with small-scale fishers and no-take zones in Gökova SEPA (eastern Mediterranean), Turkey

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ABSTRACT

Part of Gökova Bay including both marine and land areas was defined and declared a special environmental protection area (SEPA) in 1988 by Decree no. 88/13019 of the Cabinet of Ministers (dated 12 June 1988) (Aktaş *et al.*, 2011). The marine area of the SEPA has been established as a marine protected area (MPA). Since the designation of these areas in 2010, enforcement has been the weakest link in the management of the recently-established network of no-take zones (NTZs) in the MPA of Gökova. It has been known that, with low enforcement, MPA produce very little benefit. In addition, the involvement of local stakeholders is the crucial point for compliance and effective enforcement. The location of the NTZs in Gökova provides an excellent opportunity to protect many threatened and key species of the Mediterranean (such as *Monachus monachus, Posidonia oceanica, Epinephelus marginatus, Carcharhinus plumbeus, Caretta caretta, Chelonia mydas*, etc.) and encourages ecological connectivity between these protected areas. By joining forces with the Mediterranean Conservation Society (MCS), project partners and local communities will aim to improve enforcement and other conservation regulations in NTZs in order to strengthen marine ecosystem resilience and to facilitate the recovery of fish stocks in the MPA of Gökova.

Mutual respect, transparency, genuine dialogue and support from local fishing communities allow taking the next steps towards restoring and strengthening marine ecosystems. In 2012, the Mediterranean Conservation Society (MCS) designed a community marine guard training and a NTZ patrolling scheme to improve the effectiveness of protected areas as well as cooperation of coast guards and other relevant stakeholders. Marine guard training modules were developed to provide theoretical knowledge and practical training for effective NTZ enforcement. The local fishermen trainees gained knowledge on topics ranging from protected area patrolling techniques and boat safety to marine biodiversity monitoring and public awareness-raising strategies. A community of marine guard units was fully equipped to deliver effective enforcement and monitoring in NTZs. Dialogue with the government has already been initiated to establish the mandate and process to ensure legitimacy to surveillance and patrolling activities. Financing strategies to support long-term enforcement and operation of NTZs are being explored to find the most appropriate solutions for the local situation.

MCS raised conservation awareness and widened the understanding of local fishing community members, the general public and government to enhance compliance and facilitate enforcement in the MPA. MCS has designed and set up NTZ information boards in all areas and built NTZ border poles to further raise awareness of the MPAs.

Moreover, marine rangers deliver brochures to visitors coming by boat and anchoring in NTZs areas.

At the end of the third year, the monitoring of NTZs and surrounding areas showed a substantial increase in fish biomass as well as in the local fishery cooperative records related to revenues. These are clear signs of pay outs of NTZs. According to the accounting statistics of the Akyaka Fishery Cooperative, the revenues of cooperative members have increased by 53 percent. Fish monitoring in the MPA has shown increase up to 27 percent of fish population and a 19 percent increase of *Epinephelus marginatus* population *(EKAD, 2013)*. In a recent comprehensive conservation meeting in the area, fishermen expressed their opinions about NTZs; although they all agreed about the positive benefits of the NTZs as long as proper enforcement is ensured, they also asked to change the borders of two NTZs because they had very limited fishing areas, especially in the winter season. This successful example of NTZ management could be easily replicated in other areas of the eastern Mediterranean.

INTRODUCTION

Gökova is a MPA and one of Turkey's 305 listed key biodiversity areas (designed within the criterias of Natura 2000 sites) (Eken *et al.,* 2006). The area is located on the southern Mediterranean coast of Turkey within the Mediterranean basin global biodiversity hotspot and WWF Global 200 Ecoregion (Olson & Dinerstein, 2002). This is why NTZ and proper management in the Gökova MPA are important. Human pressure, especially overfishing, is the major stressor on Mediterranean reefs and underwater habitats. Combining effect of climate change and invasive species threats would be a force multiplier stressor on the marine ecosystems of the eastern Mediterranean. As overfishing is a common issue in the entire Mediterranean sea, total fish biomass would be the most important indicator of the health of fish populations (Garcia-Rubies & Zabala, 1990, Guidetti & Sala, 2007, Harmelin-Vivien *et al.*, 2008, Ünal & Franquesa, 2010).

Fishing is one of the major employment sectors in the Gökova MPA. However, local fishing resources are in serious decline and fishing communities are suffering from a loss of income (Ünal & Franquesa, 2010) while marine species and habitats suffer from human induced pressures such as unsustainable and illegal fishing, low capacity to manage MPAs, and at times the lack of basic understanding on the importance of the healthy marine ecosystem. A recent study on the structure of Mediterranean ecosystems clearly demonstrates that the Gökova MPA is at the bottom of the list as far as fish biomass is concerned among all research sites along the Mediterranean coast (Garcia-Charton *et al.*, 2004, Ünal & Franquesa, 2010).

The establishment of the Gökova MPA NTZs in 2010 came two years after such study and we have some clear baseline data among the marine ecosystems. Although we do not know the pristine state of the historical Mediterranean reefs, NTZ MPAs in the Mediterranean proved that fish biomass increases with decreasing fishing pressure (Garcia-Rubies & Zabala, 1990, Guidetti & Sala, 2007, Harmelin-Vivien *et al.*, 2008)

The network of NTZs in the Gökova MPA was built upon hope and with the support of local fishermen and fisherwomen who decided not to give up and to carry on their fishing tradition. However, two years after their official establishment, illegal fishing was still common, mainly because of a lack of effective management and enforcement within the NTZ network. This caused discontent within law-abiding local fisher communities, who had agreed to give up some favored fishing grounds to safeguard fish stocks. The hope of a positive change was starting to fade away.

In a new and urgent project, we aim to engage the fishing community, as a key stakeholder, to conserve marine biodiversity, improve NTZ enforcement and communicate, in their own language, about the benefits of these NTZs as well as accelerate the change of behavior among the most active sea users. This study provides

the key steps towards community-centered marine conservation in the Gökova MPA, Turkey. More broadly, we provide a framework and methodology for establishing community based enforcement strategies and related cooperation among other stakeholders including government institutions.

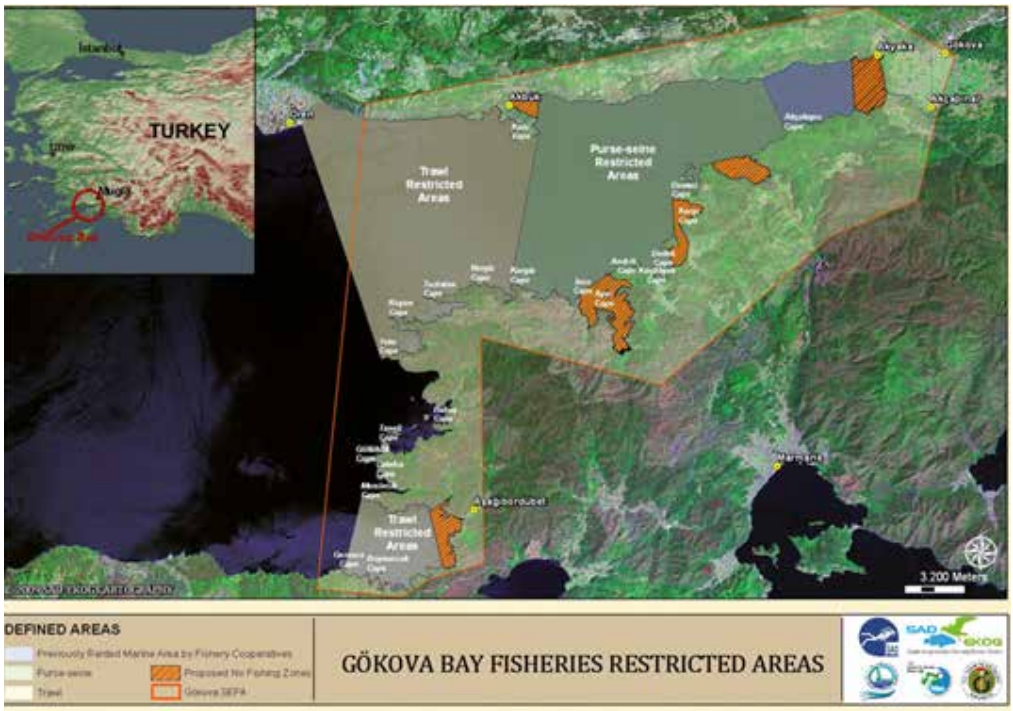
MATERIAL AND METHOD

Enforcement and management gaps

The provincial department of the Directorate General of Fisheries and Aquaculture – Ministry of Food, Agriculture and Livestock, the Coast Guards, the Gendarmerie and local administrators are responsible for implementing the legislation, controls and conservation measures at the sites. The main official government body responsible for enforcement in this area is the Coast Guard, located in Ören / Muğla. The Coast Guard in the Gökova MPA has many other priority duties such as preventing illegal immigrants from reaching the Greek islands and controlling the safety of the heavy boat traffic in the summer season. Their responsibility area is quite large and they could hardly find time for the enforcement of NTZs, especially those that are located far from their base. Besides, the engine sound of the big Coast Guard boat could easily be heard by illegal fishermen who could immediately haul the gear and leave the NTZs. Moreover, the fuel costs for a Coast Guard boat coming to NTZs is much higher than any kind of fine they would assign. Although the Coast Guard team is doing its best, it is not sufficient to mitigate illegal fishing activity threats. In a couple of cases, community members reported illegal activity, however the Coast Guard boat was far and engaged with other duties and could not give timely response to the report.

The second enforcement body is the provincial department of the Directorate General of Fisheries and Aquaculture – Ministry of Food, Agriculture and Livestock in Akyaka. Unfortunately, they do not have enough capacity to conduct marine patrol activities due to a lack of experienced staff and of a proper boat. No enforcement strategy exists and no patrolling activity is planned.

FIGURE 1
Gökova MPA No Take Zones



Source: Kıraç & Veryeri, 2010.

Another gap in the management of the NTZs was public awareness. There were no sign boards or any public information about the NTZs regulations on the sites. Only the local fishing community was aware of these protected areas and fishermen were even sometimes hesitating whether these were located inside the NTZ or not since there were no markers or buoys at the borders of the NTZs. Many traditional fishermen do not use GPS nor any other navigation equipment.

During the summer season, hundreds of private and charter boats visit the area and anchor in NTZs. Obviously, none of them is aware of the NTZ status of this area and the majority of infringements are due to tourists coming by boat.

After some comments made by the Coast Guard, shore-based recreational fishing (angling) was permitted in two of these areas (Akyaka and Boncuk) as announced in the Official Gazette n. 28388 (dated 18 August 2012).

Community-based conservation model

The Mediterranean Conservation Society (MCS) improved compliance and enforcement in NTZs in the Gökova MPA through a community marine guard patrol programme. MCS designed a community marine guard training as well as a NFZ patrolling scheme to improve the effectiveness of protected areas. A wide range of national and international experts, successful examples from around the world and local knowledge were used to create a practical but effective programme that has been tested since the beginning of 2013. Marine guard training modules were developed to provide theoretical knowledge and practical training for effective NFZ enforcement. Trainee candidates were first selected by local fishery cooperatives with experienced fishermen having the best knowledge of the area and of the illegal activities involved. Trainees gained knowledge on topics ranging from protected area patrolling techniques and boat safety to marine biodiversity monitoring and public awareness raising strategies. A community marine guard unit was fully equipped to deliver effective enforcement and monitoring in NFZs (Figure 2). Dialogue with the government has already been initiated to establish the mandate and process to ensure legitimacy to surveillance and patrol activities. Although community rangers cannot impose a fine for an illegal activity, they record any incident with a camera and immediately report it to the Coast Guard; then, the Coast Guard legally completes the lawsuit using the pictures and video recordings

FIGURE 2
Community marine rangers patrolling in Ingiliz Limanı (English Bay) NTZ, Gökova MPA

Source: Z.Kizilkaya/AKD.

as evidence. In some cases, local officers from the Directorate General of Fisheries and Aquaculture join the community rangers during patrolling. The patrolling and cooperation with Coast Guard and the government system was successfully tested and improved in terms of communication and monitoring. Financing strategies to support long-term enforcement and operation of NFZs are being explored to find the most appropriate solution for the local situation.

Conservation awareness

We organized awareness-raising and education initiatives through community meetings, workshops, thematic events focusing on specific biodiversity issues and key threats to local threatened and endemic species and critical habitats. Stress on specific conservation priorities and on the link with their livelihoods should trigger the sense of connectedness to the environment and facilitate the process of community responsibility and engagement in conservation initiatives. We introduced and encouraged the voluntary adoption of a code of good practice to relevant sea users (e.g. fishermen, boat tour operators, marine and coastal tourists, local business owners, general community members).

We designed and set up NFZ information boards in all areas and built NFZ border poles for further awareness on the MPAs. Community rangers also delivered brochures to visitors coming by boat and anchoring in NFZs areas.

Project results will be evaluated and disseminated to relevant stakeholders and government for formal recognition of project activities and outcomes. Based on the previous experience, we can see that continuous communication and open dialogue are very effective tools to achieve project goals. A Gökova marine conservation forum was initiated to provide a platform for such communication. It also allows us to report project progress, strengthen local support, and encourage NFZ compliance and voluntary participation in marine conservation activities such as reporting illegal fishing incidents or endangered wildlife sightings.

Livelihood diversification

We explored sustainable fishermen and fisherwomen livelihood diversification strategies to reduce dependence and pressure on marine resources (Figure 3). Apart from overfishing dynamic changes in dominant fish composition due to invasive species also

FIGURE 3
Livelihood diversification, traditional fishing tourism has serious potential in the area

Source: Z.Kizilkaya/AKD.

affect the livelihood of the community both positively and negatively. We organized a number of meetings to share our experience and the most successful examples from around the world to widen the understanding of locals about livelihood enhancement and diversification to reduce dependency on overharvested marine resources, develop skills to take advantage of the opportunities that marine protected areas may provide. It allowed us to map local skills, interests and willingness to participate in the development of such initiative. We explored sustainable marine tourism and *Pesca-Tourismo* as one of the opportunities for local fishermen and fisherwomen to engage in. It would allow them to maintain sea-men and sea-women tradition and provide for their families. We started a first pilot *Pesca-Tourismo* in cooperation with the Akyaka Fishery Cooperative and the Directorate General of Fisheries and Aquaculture.

RESULTS

Community marine patrolling model for the the enforcement of NTZs developed and agreed by all stakeholders

A community marine patrolling model for the enforcement of the NTZs of English Bay and Akyaka (two of the biggest NTZs) was developed and put in practice, with close cooperation with the Coast Guards and the Muğla and Marmaris Fisheries and Aquaculture Departments. Eight local fishers were trained; two of them employed full time and two on a part-time basis. Two patrol boats and four marine rangers were equipped for conducting patrols. In two NTZs, three daily patrolling tours were scheduled starting from 6:30-7:00 in the morning. At other times, all illegal activity reports were responded by immediate action by rangers, sometimes with Fisheries and Aquaculture officials.

Codes of good practice produced and disseminated

Codes of good practice were produced and distributed to as many users as possible, especially amateurs, boat users and charter boats. 430 brochures of the Code of Good Practice have been disseminated so far.

Threats to endangered marine species and their habitats decreased from the baseline assessed at the start of the project

In September, professional fishermen caught with nets 20 endangered baby sandbar sharks *Carcharhinus plumbeus,* which were released back to the sea (due to Coast Guard report). This is a first record that the NTZ of English Bay is a habitat for juvenile sandbar sharks.

During marine patrolling between May and September, 12 illegal fish trap were confiscated, 82 amateur fishermen were warned about NTZs while they were attempting to fish within NFZ, 5 spear fishermen were warned, 5 professional fishing boat were caught while fishing and fined by the Coast Guard and their fishing gear were confiscated, 2 spear fishermen were caught and fined by the Coast Guard and their gear confiscated, 2 amateur fishermen were caught and fined by the Coast Guard.

It is very clear from the monitoring that there is a significant increase in the total fish population (27 percent) and *Epinephelus marginatus (19 percent),* the most important commercial fish species in the area (EKAD, 2006).

Community members have knowledge towards more sustainable livelihood changes

The Traditional Fishing Tourism pilot project started in the NTZ of Akyaka. 36 community members attended meetings and 14 fishermen participated in training sessions. Project trial tours started in October 2013. Tourism has a big potential for alternative sustainable livelihood between April and November.

Marine conservation awareness and knowledge on NTZs of local community members and visitors increased in the Gökova MPA

430 copies of the Code of Good Conduct have been disseminated to tourists and local people so far. In addition, with UNDP funding, 20 sign board were set-up in NTZ areas with detailed information on the areas and conservation status. All the NTZ border points were marked with sign poles for community members and amateur fishermen. Another parallel project funded by UNDP and carried out by MCS consists in measuring awareness of MPAs. In the Gökova MPA, marine conservation awareness and knowledge have been measured by interviews with different user groups. According to the results, 92.7 percent of the fishing community is aware of the NTZs and Gökova MPA overall. Local people's awareness about NTZ is 77.7 percent, while among people running tourism business it corresponds to 88.8 percent. According to interviews with local fishing communities, 98 percent of the members believe that NTZs are useful management technique as long as proper enforcement is sustained.

The project led to improvements in the effectiveness of marine management

Our project led to very positive improvements in the effectiveness of fisheries management. The manager of the Akyaka Fishery Cooperative (the biggest one in the bay) declared the revenues of the cooperative before and after the NTZs were established. According to cooperative accounts, the revenues of its members increased by 53 percent after the NTZs were established. This increase is the result of an increase in the amount of catch as well as some of half-time members quitting the fishing business after NTZs were declared to bring less fish. This helped the management of fisheries in the bay.

DISCUSSION

The establishment of a NTZ in the Gökova MPA as well as proper enforcement (since April 2013 in more than 60 percent of the NTZs) has already demonstrated positive results. Fish biomass already substantially increased in well protected areas and fisheries management improved in the area. Our organization's capacity to deliver effective marine conservation also improved. We have been running four more projects in the Gökova MPA in parallel to the community centered marine conservation:

- Ghost Net Hunters project: Clean-up of discarded fishing gear "ghost nets" in the Gökova MPA in cooperation with the Gökova Sailing Club. We mainly cleaned up the NTZ and surrounding fishing grounds in the Gökova MPA. Awareness events were organized at the site and a network was created to collect data about potential lost fishing gear at the national level;
- Training and supporting the fisherwomen community in the Datça-Bozburun peninsula (tip end of Gökova MPA). There are approximately 100 fisherwomen who work in harsh and poor conditions without any social security. We will train them on sustainable fisheries, women and labour rights, and provide them with safety gear and some microcredits.
- Traditional Fishing Tourism Project: first pilot project on taking tourists to traditional small-scale fishing boats to show them local fishing culture and enjoy a day with a fisherman or fisherwoman in Akyaka.
- Invasive pufferfish, *Lagocephalus sceleratus,* Project. The pufferfish, *Lagocephalus sceleratus,* is one of the lessepsian species which has invaded the eastern basin of the Mediterranean Sea (Akyol *et al.*, 2005). It has colonized new territories of the eastern Mediterranean at a very rapid rate after its first record in Turkey in 2003 in the Gökova MPA. As of 2012, it was found to rank among the 10 most dominant species in terms of biomass in the eastern Mediterranean basin. Today, it is regarded as one of the worst invasive species in the Mediterranean Sea with a significant impact on the surrounding ecosystem and on the fisheries sector. It

is one of the most poisonous fish in the world (Ali *et al.,* 2011). The project team aims to isolate the toxin called TTX from the samples. Such an option would create many employment opportunities in the region, but more importantly, it will create a fishery with economic benefits to the fishers while controlling the wild populations through increased fishing pressure.

All those projects running parallel in the Gökova MPA underpin the community conservation marine ranger project. Four community members now work as rangers and the community as a whole now feels responsible for protecting NTZs. In this way, they are continuously in contact with government officials with whom they had never communicated before. They are confident in sharing management information or other opinions with the government easily. They also appreciate our efforts to bring special fisheries management tools for Gökova MPA.

CONCLUSION

Although the positive outputs of NTZs are clearly observed in the Gökova MPA in terms of both fishing income and fish abundance, sustainable success will depend on the participation of fishermen and other interested resource users in the conservation process as well as overall management of fisheries and marine ecosystem.

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The North Sporades Marine Park and historical co-management with its artisanal fishing community

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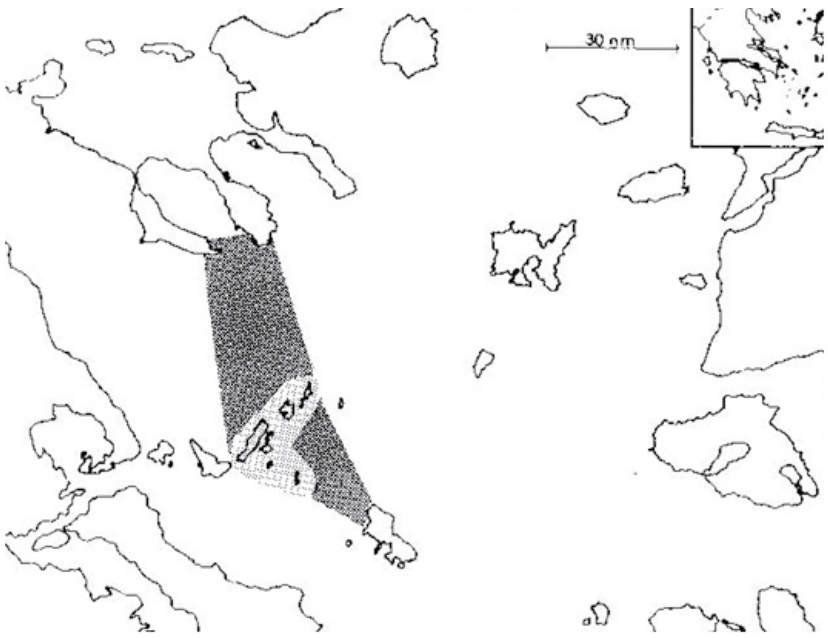
INTRODUCTION

The North Sporades islands are located in the north Aegean Sea, Greece, within GSA 22 (Figure 1) and consist of seven main islands and 13 smaller ones. Only the island of Alonissos is permanently inhabited. A national Marine Park embracing 2 200 km^2 exists in Sporades, dedicated to the protection of the interesting and well preserved ecosystems, rare flora and fauna of the area (including the Mediterranean seal *Monachus monachus,* Eleonora's falcon *Falco eleonorae*, Audouin's gull *Larus audouini* and exuberant coralline beds).

FIGURE 1
Location of the fishing shoals of Sporades local fishers. Dense dotting shows pelagic shoals for tunidae. Sparse dotting shows demersal shoals



Dialogue at the local level strongly involving scientists and conservationist groups led to the volunteer agreement of the small-scale fishermen cooperative of Alonissos to cooperate from 1982 for the creation and safeguard of the park, provided that several conditions were implemented by the State. The main one was the request of exclusive fishing rights for the local fishermen community, with traditional methods, within the Park area and the effective guarding against all sort of illegal fishing.

The fishers community of Alonissos has been engaged in a cooperative since 1979; a non common fact in Greece, where most small-scale fishermen abandon themselves to their fate. Only 0.07 percent from a total of 22 327 professional vessels belonged to cooperatives in the mid 1990s, while 91.26 percent belonged to single fishers businesses.

Small-scale fishing plays a basic role in the fishing industry of the Mediterranean and it is conspicuous in Greece (Table 1). The fishing vessels are wooden boats (called "*kaikia*"), usually between 9 and 12 m long, which fish with surface and bottom long lines, as well as with trammel nets pulled up with winches. The *kaikia* of Alonissos (64 to 66 units during the studied period) operated either one-day journeys around the main island or three-day trips to the smallest islands within the area in order to get better catches. Around September they travelled to open sea (figure 1) to catch migrating tuna fish, by using surface long lines and angling.

TABLE 1
Greek fishing fleet in the Mediterranean within the study period

Category	1986	1987	1988	1989	1990	1991
Mediterranean trawlers	3	0	1	11	14	7
Trawlers	399	402	386	403	410	384
Purse- seiners	388	395	423	403	404	398
Small- scale vessels	13 888	14 463	15 017	16 367	?	17 341
Sponge- fishing vessels	60	25	45	48	34	15

The above fishers' requests related to the creation of the park were finally satisfied attended by the government with the publication on 31 August 1986 of a regional fisheries restriction resolution prohibiting medium fishing vessels (purse seiners and trawlers) to fish within the limits of the designed marine park to be created. In order to implement the surveillance, three local wardens and two speedboats were assigned to the future marine park area from the beginning of 1987 until the end of 1988. One of the wardens continued patrolling during a few months in 1989 but stopped after discontinuation of resources. From then on, the fishing restrictions (but not the state warding) were annually extended until the creation of the park by a Presidential Decree on 28 May 1992. From 1990 onward, the warding support was implemented by a private environmentalist group, but without legal power to issue fines.

The changes in the warding of the Sporades created much discomfort to the local community, which argued that the lack of local warding provoked serious damage to their fishing resources, although they had not a tangible proof of the efficiency of the locally managed surveillance. The occurrence of these events allowed testing the efficiency of such conservations schemes based on local participation and ecosystem exploitation restrictions, by analyzing the average total catch obtained by every small-scale fishing boat in the area of the future park during the eight-year period studied, from 1985 to 1992, year of the official creation of the marine park.

OBJECTIVES

This research attempted to check if the different reported degrees of the fishing shoals protection were reflected in a significant difference in the catch for the important species within the marine park traditional small-scale fisheries. The work analyzed all the available data on landings of the local fleet from January 1985 to December 1992.

METHODS

Functioning of the fishermen's cooperative

Open interviews with local fishermen were carried out in order to obtain sociological data on the cooperative running details.

Fisheries trend

The daily records of individual landings from all the cooperative vessels from 1985 to 1992 for every important commercial species were selected. Possibly, no similar register exists concerning small-scale fisheries in Greece. The landings are hereinafter referred also as catch. Although catch may be higher than landings the great majority of catches used to be landed by this fleet.

After 1992, as a consequence of the depletion of the captures, the fishermen started to sell the catch by themselves, in an attempt to get a better income. This fact, apart from proving to be catastrophic for their economies, made the data on landings entered afterwards in the cooperative logbook surely partial. Therefore, these data could not be selected for the analysis.

Data were analysed separately for the different species and groups in monthly chronological strata in order to neutralise the natural phenological oscillations yearly produced in the catch by all the species. The non-parametric test for paired samples Ts was chosen for the analysis. Species contributing with less than 1 percent to the total fleet catch were not analysed.

RESULTS

The fishermen's cooperative of Alonissos – social factors

The cooperative was integrated by 66 *kaikia* at the end of the study period. The crew of every vessel is usually 2-3 persons. Over the last years, long distant trips aimed to fish tuna took place more frequently, partly to compensate for incipient reduction of catch in the park.

Afterwards, even if it was out of the operating rules of the cooperative, an important amount of fish started to be sold in the island by the members independently.

That fact can be explained by the catches decrease and the drop of prices, especially in comparison with the rate of the expenses. The cooperative fish sale to the merchants allowed to the latter full power to control the prices, resulting in expensive fish for the public and low prices for the fishermen. An example was the tuna fish *Thunnus thynnus*. When they begun to fish systematically bluefin tuna, they earned 4 000 to 7 000 Greek drachmae/kg, since the fish was marketed to the well-paying Japanese market. After two years of increase in the species landing, the price paid to the cooperative had fallen to 1 000 to 1 500 GRD/kg.

Even under these circumstances most of the *kaikia* continued to fish tuna. A reason for this is the high production for this kind of fishing and another one is the decrease of fish in the park area.

The fishermen of Alonissos did not believe in general that fishing resources could decrease. They explained the historical reduction of individual catches only in terms of an increased number of fishing boats at sea.

Towards the end of the study period, Alonissos fishermen reacted as being in self-defence when they were speaking about their entities in relation to the park organization. They shifted to considering the general regulations of the park as something foreign and hostile to them since the loss of their role as wardens of the park.

They felt that the prohibitions to approach some areas around two islands with important monk seal breeding spots were unfair for the local population that traditionally "owned" the area. They further felt offended by rumours considering them as seal killers, a species which had to be "protected" from Alonissos fishermen. This fishermen community did not historically chase the species and this could somehow explain the existence of a group of more than 40 individuals of this rare species at the time.

All the above could be explained by the fact that they could not see anymore profit for their professional group from the creation of the park, while they had to stand the constraints.

Fisheries in the park

The importance of the different commercial species for the traditional fisheries of Sporades can be assessed in Figures 2 and 3 and Table 2, evaluated from data between 1985 and 1992. The main role played by *Boops boops* and tuna in the captures is clear. Considering that the latter is caught mainly out of the park limits, the former constitutes more than half the catch obtained within the park shoals. The importance of *Palinurus elephas* and the so-called "A class fish" (Sparidae and Mullidae), constituting the most expensive species, should also be noticed.

FIGURE 2
Catch diversity in Sporades fleet

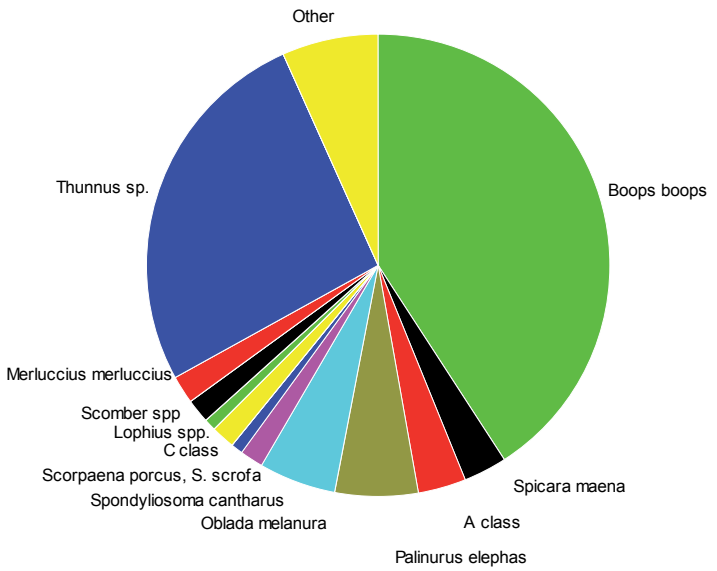


Figure 3 provides additional information on the composition of the minor species catch, each constituting less than 1 percent of the global catch. One can notice the insignificant importance of cephalopods for the fisheries in the area, representing less than 0.7 percent of the global catch.

FIGURE 3
Catch diversity of less important species (<1 percent of total)

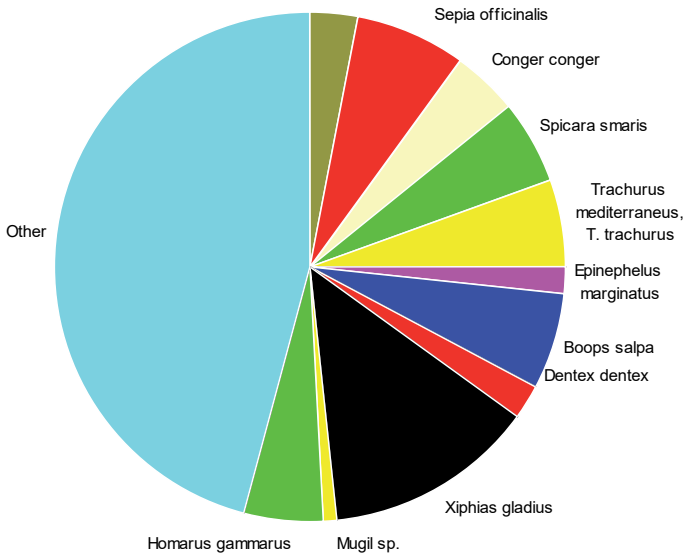


TABLE 2
Contribution of the main collected species to the income of Alonissos fishermen for every 1 Tm of global catch (1990 prices in GDR)

Species	Weight (kg)	Amount (GDR)
Boops boops	409	85 276
Tuna	264	94 380
Palinurus elephas	58	136 242
Oblada melanura	54	55 782
A class	34	39 508
Spicara maena	29	6 220
Merluccius merluccius	21	18 417
Spondyliosoma cantharus	15	17 378
C class	15	4 418
Scomber sp.	14	5 625
Scorpaena sp.	11	8 184
Lophius sp.	10	3 705
Other	66	?

Table 3 and Figure 4 show the average total landings of every boat in the park during the study period. An additional row in the table considers the total landings except those of tuna, aimed to compare the captures that are really obtained within the park. Figure 5 shows the monthly demersal catch by vessel in the park shoals.

TABLE 3
Total catch per vessel in Sporades Marine Park

	1985	1986	1987	1988	1989	1990	1991	1992
With tuna	3 973.91	3 339.97	3 796.57	4 488.12	5 619.88	4 689.82	3 918.05	4 606.83
Without tuna	2 689.11	2 524.22	3 084.36	3 576.91	4 734.31	3 694.24	3 419.53	3 213.43

A minimum catch occurred in 1986, when the regulations limiting industrial fishing were decreed. From then on, during the warding implementation by local wardens (1987-1989), catches increased. When the local warding of the park stopped, catches diminished without an appreciable positive progress during NGO warding.

Significant increasing trend up to 1989 and decreasing trends afterwards were found for most commercially important groups before and after the local warding was implemented, and included: *Boops boops*, Mullidae, Sparidae, Maenidae and Serranidae.

Other species, such as the lobsters did not experience a significant change and Scorpenidae steadily decreased, showing to be affected mainly by local fisheries.

FIGURE 4
Fish catch by Sporades vessels in the Marine Park (local warding between 1987 and 1989)

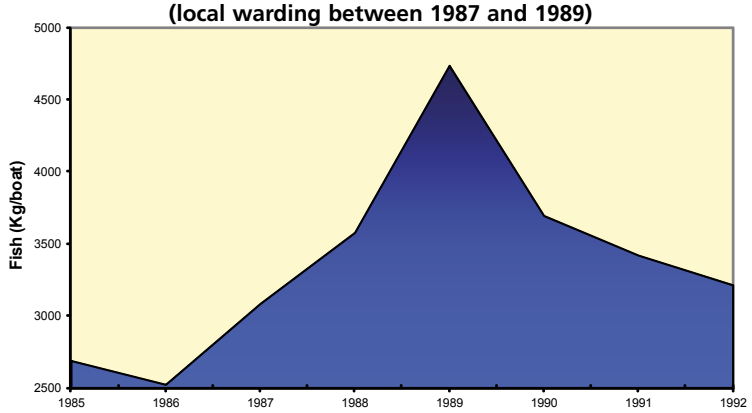
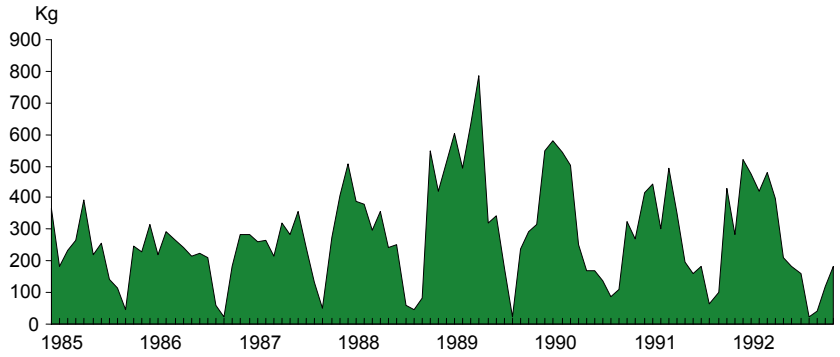


FIGURE 5
Monthly catch per vessel in Sporades, excluding tunidae



Over the same period, the average CPUE trend of the country small-scale vessels was as follows: the catch increased in 1987, in parallel with an improvement in fishing vessels quality, then it decreased continuously. Except for 1987, the tendency to decrease over the period 1986–1991 seems to be a general fact.

These considerations suggest that the park catch experienced an important recovery trend over the period 1987–1989. This was not a reflection of a parallel phenomenon in the rest of the country, therefore being originated by local factors. It also suggests that local warding was very effective both against local and foreign illegal fishing activities.

CONCLUSION

The State guarding of the park with local personnel engaged from the artisanal small-scale fishing community was linked to a statistically significant recovery in the catch of most fish species, some of them key for the local fishermen economy. The continued depletion in some others (i.e. *Scorpaena spp*.) may be linked to overfishing by the local fleet.

It is most probable that medium fisheries were responsible at least for the depletion of the species which increased in the area when these vessels were kept away from the park by law enforcement through the local wardens. Such increase should not be considered just as a shift on the fleet that benefits from the captures without positive consequences for the ecosystem, but also as a reduction of the impact to the ecosystem produced by trawler and purse seine gear fishing close to the coast. Fishing gear used by small-scale local vessels was by far much less impacting than trawling. The Sparidae recovery up to 1989 was probably related not only to medium fisheries ban but also to the sport spear-gunning ban.

In addition to the above benefits to the marine resources sustainability of the area, other emerging regulations benefitting the ecosystem but affecting the life of locals during the inception of the marine park were being easily accepted during the period in which they could notice a local benefit linked to the recovery of their fisheries through the existence of the park. This supports the importance of active involvement of local small-scale fishing communities in fisheries management.

ABSTRACTS

Oral contributions

PRESENT SITUATION OF FISHERMEN ENGAGEMENT INTO THE MANAGEMENT OF MEDITERRANEAN MARINE PROTECTED AREAS

Antonio Di Franco, Pascaline Bodilis, Paolo Guidetti, Patrice Francour, Catherine Piante, Giuseppe Di Carlo and Chloë Webster

Small-scale fishing is an historical activity deeply rooted along the coasts of the Mediterranean basin. It involves a considerable number of fishermen and vessels. Compared to industrial fishing, small-scale fishing may have a fairly limited impact on marine ecosystems, but, if not properly managed, it may anyway affect local stocks. Small-scale fishing has thus a number of socio-economic, cultural and ecological implications. Marine protected areas (MPAs) represent a valuable tool for both fishery management and marine conservation. MPAs may allow fish population to recover, fishery profits to be enhanced and fishermen traditions to be maintained. Only scarce information, however, is available about the success/failure of small-scale fishing management in Mediterranean MPAs. The aim of this work was to improve the available knowledge on small-scale fishing in Mediterranean MPAs through: 1) questionnaires submission to 30 MPA's managers/scientists; 2) literature review. A set of variables describing the interdisciplinary (ecological and socio-economic) attributes and performance of management of small-scale fishing in MPAs were defined. A management success score (from 0 to 100 percent) was built up by combining variables. Results (based on questionnaires received from 25 MPAs) suggest a generalized lack of studies addressing ecological and socio-economic aspects of small-scale fishing management in Mediterranean MPAs. Five MPAs do not allow fishing within their boundaries, 12 have a specific management plan, while 8 authorize fishing activities without a working management plan. Regression trees and random forests analyses highlighted that the most important condition explaining the management success is the level of fishermen involvement, with the highest success scores displayed by MPAs where fishermen are strongly engaged. According to our results, further management effort should be made and research activity carried out to improve management of small-scale fishing in MPAs, having the long-term vision towards a progressive decision power sharing between management bodies and fishermen.

ARTISANAL FISHERIES AND MARINE PROTECTED AREAS IN THE WESTERN MEDITERRANEAN: MONITORING FOR ASSESSING EFFECTS AND BENEFITS

Raquel Mallol and David Federico

MPAs are effective management tools for restoring biomass and community structure in exploited areas in need of conservation. Fisheries restrictions, and in particular the implementation of no-take zones, force the spatial redistribution of fishing effort, while biomass recovery within MPAs enhances recruitment of fishery species well as the yields of adjacent fisheries. The area covered by Mediterranean coastal MPAs amounts to 9910 km² (0.4 percent of the total area of the Mediterranean Sea), with a cumulative surface of no-take area of 202 km² (0.01 percent of the total area of the Mediterranean Sea) (MedPAN, 2008). The 19 MPAs currently existing in the Spanish Mediterranean protect 910 km² of which 83 km² (9.2 percent) are no-take areas. Two case studies of Mediterranean "artisanal fisheries – MPA" systems are presented to

illustrate monitoring approaches and documented effects of spatial fishery restrictions/closures: 1) the Llevant de Mallorca-Cala Rajada marine reserve (LMCRMR) created in 2007 in the Balearic Islands with an extension of 113 km², of which 12 km² are no-take; 2) the Columbretes Islands marine reserve (CIMR) created in 1990 in the Gulf of Valence with an extension of 55 km², all of which is effectively no-take. In the LMCRMR, artisanal fisheries in the area were described and characterized prior to its creation and have been monitored thereafter. In the CIMR, target species and their fisheries have been monitored since 1998 inside and outside the MPA.

MARINE PROTECTED AREAS FOR ARTISANAL FISHERIES: RECENT ACTIVITIES IN THE SOUTHERN AND EASTERN MEDITERRANEAN

Alain Jeudy De Grissac

Since 2011, IUCN Mediterranean, in collaboration with different partners and under different projects (MedRAS, NEREUS and MCC-Morocco) has been testing and reviewing a methodology involving fishermen and fisheries administration for improving the management of artisanal fisheries in coastal waters, following a participatory approach, to identify and select sites, realize a local diagnostic, negotiate with fishermen management measures and regulatory mechanisms for MPAs in fisheries, in line with the objectives and guidelines developed by FAO for MPAs and fisheries and according to the IUCN category VI of management for MPAs. The presentation illustrates the first results obtained in Morocco as well as the activities under development in North Africa and in Lebanon and reviews the lessons learned during the implementation of the different projects.

ACCOBAMS-GFCM JOINT PROJECT ON INTERACTIONS BETWEEN CETACEANS AND FISHING ACTIVITIES

Célia Le Ravallec

The presentation illustrates a project implemented by the Secretariats of ACCOBAMS and GFCM in 2014–2015 and supported by the MAVA foundation. This project aims at improving the conservation of endangered marine species, such as cetaceans, marine turtles and seabirds, with respect to fishing activities in the Mediterranean. The project is based on case studies in the western Mediterranean Sea with aview to extending this experience to the rest of the area of competence of both organizations. The project consists of of the following components: 1) Reducing negative interactions between endangered marine species and fishing activities considering at the same time by-catch and depredation issues; 2) Reducing pressure on marine species through the diversification of the artisanal fishermen activities by promoting the development of ecotourism activities.

For the first component of the project, information on the technical characteristics of fishing gear as well as fisheries practices that cause negative interactions will be collected and assessed. Innovative and concrete solutions/methods will be tested; their efficiency and their impacts will be assessed. The project will also pay attention to improve fishermen's awareness and to build capacity in terms of reduction of negative impacts. The information collected and the lessons learned from the case studies will be then used to replicate management actions to similar fisheries cases in the region and to develop appropriate strategies.

The second component of the project includes activities dedicated to promote the development of ecotourism activities in Morocco and Tunisia and thus contribute to raise awareness on the conservation of whales and dolphins. The initiative will include the development of responsible whale watching activities and "pescatourism" activities.

PROJET PILOTE DE CRÉATION DE TROIS AIRES MARINES PROTÉGÉES AUX FINS DE PÊCHE AU MAROC

Mohamed Naji

Dans le cadre du "Projet pêche artisanale", financé par la Millenium Challenge Corporation (MCC) et exécuté par le Département des Pêches Maritimes (DPM), trois AMP aux fins de pêche ont été mises en place au Maroc durant la période 2010–2013. Ces AMP visent à contribuer à un développement durable du secteur de la pêche artisanale tout en préservant les ressources et les habitats marins. Après l'élaboration d'une stratégie nationale pour la mise en place d'un réseau d'AMP aux fins de pêche, trois AMP pilotes ont été mises en place en adoptant une approche écosystémique et participative. Toutes les étapes clefs du projet ont fait l'objet d'une large concertation auprès des parties prenantes, notamment les usagers des AMP. Les AMP ont été renforcées par des récifs artificiels à vocation d'enrichissement et de protection contre les activités de chalutage de fond. Elles ont été aussi dotées de moyens de surveillance en mer et d'un plan d'aménagement et de gestion.

PETITE PÊCHE CÔTIÈRE ET GESTION D'AIRES MARINES PROTÉGÉES: DES OBJECTIFS PARTAGÉS

Alain Pibot

Sur les côtes rocheuses de Méditerranée française, gestionnaires d'aires marines protégées et pêcheurs convergent progressivement vers des travaux collectifs de protection et de gestion du milieu marin. C'est en avril 2013 que la prud'hommie de pêche d'Ajaccio adressait au président de la collectivité de Corse un courrier sollicitant une réflexion, avec l'appui de l'Office de l'environnement de Corse et de l'Agence des aires marines protégées, sur le déploiement d'un réseau d'aires marines à finalité halieutique. Mais les pêcheurs méditerranéens n'en sont pas à leur coup d'essai car depuis longtemps ils ont élaboré des règlements locaux destinés à améliorer la durabilité des stocks et de l'activité. Mais c'est aujourd'hui dans un contexte de confiance partagée de protection et de gestion que s'engagent les nouveaux chantiers. En Corse, la première étape va être de réaliser une synthèse des connaissances sur les zones à fonctionnalités halieutiques, frayères, nourriceries, couloirs migratoires, etc., définissant ainsi dans l'espace et dans le temps des secteurs qui doivent bénéficier de repos biologique. C'est sur la base de ces travaux que très rapidement des mesures seront prises pour améliorer la cohérence des règlements existants et proposer des zones, des périodes, des espèces, des techniques ou des combinaisons de ces quatre types d'interventions à réglementer. Cependant, l'objectif est plus large. Dans un avenir proche, il faudra s'attacher à entreprendre tous les chantiers transversaux: protection renforcée des habitats fonctionnels au regard des autres pressions (aménagements, pêche plaisance, mouillage forain, pollution, etc.), renforcement des mesures de surveillance et de police et mise en œuvre de mécanismes financiers devant permettre de rendre opérationnels ces projets. Ces mécanismes financiers pourront s'appuyer sur un permis de pêche plaisance, dont les recettes devraient pouvoir être affectées aux moyens de contrôle et de formation des pêches plaisances et professionnelles. Tout ceci est encore en discussion. Une réflexion autour d'une amélioration du mécanisme de paiement d'amarrage sur mouillage organisé (dont les ZMEL) est également en cours.

LA CONSULTATION ET LA CONCERTATION AVEC LES PÊCHEURS POUR LE CLASSEMENT DE LA ZONE MARINE DU PARC NATIONAL DE TAZA

Nadia Ramdane

Pour le classement de sa partie marine en tant qu'AMP, le parc national de Taza et a engagé un processus de consultation et de concertation avec ses partenaires, plus particulièrement les pêcheurs dont la plupart font partie de la catégorie des pêcheurs artisanaux. Un long chemin de négociations a été entrepris depuis 2009 sur l'idée du classement de ce territoire, en vue de trouver un terrain d'entente et parvenir à une cogestion durable. À ce jour, le parc national de Taza a besoin d'échanger d'autres expériences semblables afin de mieux gérer les opportunités qui lui sont offertes et d'optimiser l'efficacité de la cogestion future.

HOW CAN MPAS BE USED TO BRIDGE FISHERIES MANAGEMENT AND BIODIVERSITY CONSERVATION?

Lena Westlund

MPAs were initially introduced mainly as a tool for biodiversity conservation. In fisheries, spatial-temporal-gear closures are historically a common management measure. However, closures are not always the preferred one and MPAs generally need to be combined with other management measures to avoid negative effects, including increased fishing pressure outside the MPA and higher costs of fishing. In fact, not all MPAs provide direct benefits to fishers, especially not when designed mainly for conservation purposes. Many small-scale fishing communities are sceptical to MPAs and do indeed suffer hardship when they are introduced in a top-down manner and with limited understanding of fisheries and fishery based livelihoods. The FAO Technical Guidelines[1] on MPAs and fisheries discuss the biological and ecological effects, as well as social and economic impact of MPAs in the context of fisheries. They address the interface between biodiversity conservation and fisheries management with a view to promoting better collaboration and coordination for enhancing the use and benefits of MPAs with multiple objectives. These issues were also discussed in a couple of workshops at the IMPAC3, the international MPA congress organised by IUCN and the French Government in October 2013. It was noted that the participation of fishers in MPA design and management is fundamental for successful outcomes. The livelihoods of fishing communities have to be respected and legal and institutional structures established that guarantee their customary rights and access to the marine and coastal resources on which they depend. The SSF Guidelines provide an important framework for supporting small-scale fishing communities through the application of a human rights based approach. The SSF Guidelines are closely linked to the Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (the Tenure Guidelines) that recognise the importance of secure and equitable access to natural resources for food and nutrition security and sustainable livelihoods, in particular for vulnerable and marginalised groups. Both these instruments are of direct relevance to MPA management in the context of small-scale fisheries. MPAs have the potential to be a powerful tool to support sustainable environmental, social and economic development, but they should be used wisely and equitably. It has to be ensured that their benefits also flow to the small-scale fishing communities bearing their costs.

[1] FAO. 2011. Fisheries management. 4. Marine protected areas and fisheries. FAO Technical Guidelines for Responsible Fisheries. No. 4, Suppl. 4. Rome, FAO. 198p.
Available at http://www.fao.org/docrep/015/i2090e/i2090e.pdf.

Posters

CARACTÉRISTIQUES SOCIOTECHNIQUES DE LA PÊCHERIE ARTISANALE ET ATTITUDE DES PÊCHEURS VIS-À-VIS DE LA CRÉATION DE L'AMP DES ÎLES KURIAT

Yessine Ben Arfa and Scander Ben Salem

Ce travail constitue une photographie de la situation sociotechnique de l'activité de pêche côtière dans le gouvernorat de Monastir (centre-est de la Tunisie) ainsi qu'une première prospection de l'attitude des pêcheurs vis-à-vis de la création de l'AMP des îles Kuriat. Durant cette dernière décennie, la politique de conservation des ressources naturelles en Tunisie a été renforcée en incitant la création de parcs et de réserves naturelles ainsi que d'AMP. En partant de ce principe et en relation avec l'activité de la pêche côtière dans la zone, il s'est avéré que la mise en place de l'AMP affecte les comportements socioéconomiques des pêcheurs et, par conséquent, conditionne les bénéfices écologiques des AMP ainsi que leurs performances en termes de conservation et de gestion. Afin de mieux comprendre ces enjeux, une analyse sociotechnique de la pêche artisanale ainsi que de la perception des pêcheurs vis-à-vis de la création de cette APM est nécessaire. Ce travail s'appuie sur des enquêtes élaborées à cette fin, réalisées d'une manière aléatoire dans les quatre ports représentatifs de l'activité de pêche dans la zone, à savoir les ports de Monastir (hauturier), Sayéda (côtier), Teboulba (sardinier) et Bkalta (côtier). Le taux d'échantillonnage correspondait à 14 pour cent de la population maritime active dans la zone d'étude. Les résultats des enquêtes ont révélé que la flottille côtière active dans la zone d'étude est une flottille âgée, modestement équipée et ayant une motorisation relativement faible. Quand à la population maritime, celle-ci est relativement jeune et la majorité présente un niveau d'éducation primaire et une expérience de plus de 20 ans. Il est important de mentionner aussi que 94 pour cent des pêcheurs n'ont aucune formation professionnelle et que 80,4 pour cent n'exercent aucune autre activité supplémentaire. La structure socioprofessionnelle comprend en moyenne quatre marins pour les barques côtièresartisanales motorisées et deux marins pour les unités non motorisées. Compte tenu du refus majoritaire face à la création d'une AMP, contre une bonne volonté de participation dans l'élaboration de plan de gestion de la zone, la situation se révèle inquiétante. De plus, plusieurs problèmes ont été relevés lors de l'enquête, à savoir, par ordre d'importance: l'utilisation d'engins prohibés, la surexploitation des ressources marines, le faible revenu des pêcheurs et la pêche illicite. À ce stade, l'établissement d'une AMP devient donc indispensable afin de garantir, d'une part, la conservation des ressources écologiques et marines vivantes et, d'autre part, d'assurer une certaine continuité du secteur dans le cadre du développement durable.

ÉTUDE SOCIO-ÉCONOMIQUE DE LA PÊCHE CÔTIÈRE ARTISANALE ET ÉVALUATION DES ACTIONS DU PLAN DE GESTION LIÉES À L'AMÉNAGEMENT DES RESSOURCES HALIEUTIQUES DE LA LAGUNE DE BOUGHRARA

Scander Ben Salem, Nadhem Bouchrika, Nadhem Mtimet and Adel Gaamour

La lagune de Boughrara, qui s'étend sur 430 km^2, est la première lagune tunisienne en termes de superficie. Elle se situe à l'extrême sud tunisien et elle est délimitée par l'île de Djerba, au nord, et par le continent, au sud. La pêche côtière artisanale constitue l'activité principale de la lagune. La flottille côtière artisanale compte 344 unités non motorisées et 217 unités motorisées, distribuées entre trois ports, qui sont par ordre d'importance: Ajim, Boughrara et Hassi Jellaba. La lagune de Boughrara est soumise à différentes dégradations d'origine anthropique, notamment une surexploitation chronique de ses ressources halieutiques due à un effort de pêche excessif, et à des pollutions diverses, entraînant l'eutrophisation et la prolifération du phytoplancton toxique, qui ont un effet négatif sur la qualité de ses eaux. La lagune de Boughrara a donc été choisie parmi cinq sites sensibles pour la création d'aires protégées marines et côtières dans le cadre du projet «Protection des ressources marines et côtières du golfe de Gabès», financé par la banque mondiale (GEF). Parmi les cinq objectifs opérationnels du plan de gestion élaboré pour la lagune de Boughrara, deux concernent principalement l'activité de la pêche côtière artisanale, à savoir: 1) orienter la pêche vers des pratiques respectueuses des ressources halieutiques; 2) développer des activités alternatives permettant de réduire la pression sur les ressources naturelles. Pour concrétiser ces objectifs, le plan de gestion prévoit en premier lieu la limitation de l'effort de pêche, soit par la cessation définitive de l'activité soit par l'orientation de certaines barques vers de nouvelles activités génératrices de revenus. De plus, il a été proposé de créer un fonds spécial pour la compensation matérielle des barques qui quitteront la pêcherie. La présentation s'intéresse à l'analyse socioéconomique de l'activité de la pêche côtière artisanale et à l'attitude des pêcheurs vis-à-vis de la création d'une aire protégée dans la lagune, notamment leur disponibilité à abandonner leur activité contre une indemnisation monétaire. Les données de bases ont été collectées à partir de 48 enquêtes de terrain réalisées dans les trois ports de la lagune. La méthode d'échantillonnage stratifiée a été adoptée en prenant comme niveaux de stratification le port et le type d'unité de pêche. Le taux d'échantillonage était de 8,7 pour cent pour les barques motorisées et de 8,3 pour cent pour les unités non motorisées. En ce qui concerne l'avis des pêcheurs vis-à-vis de la création d'une AMP, l'analyse a permis de conclure que les pêcheurs propriétaires de barques interrogés ayant participé au projet de protection des ressources marines et côtières du golfe de Gabès (sessions de sensibilisation) et trouvant qu'il y a des effets d'atténuation de la pollution dans la lagune de Boughrara étaient plus hostiles à la création d'une aire marine protégée. Pour ces pêcheurs, la création d'une aire protégée aurait pour conséquence une réduction des zones de pêche et, de ce fait, une diminution de leur productivité. Quant à la question d'abandonner l'activité de pêche contre une indemnisation monétaire, le même modèle d'analyse a permis de conclure que parmi les pêcheurs interrogés, ceux ayant atteint un niveau d'études secondaires et disposant de plus d'une source de revenus au sein du ménages accepteraient de suivre une formation afin de se réorienter professionnellement et se montrent les plus favorables à l'abandon de l'activité de pêche. D'une manière générale, le montant de disposition à recevoir (DAR) varie en fonction du type d'unité de pêche. Pour les unités non motorisées, les propriétaires acceptent de recevoir une compensation moyenne de 28 000 DT avec un minimum de 5 000 DT et un maximum de 60 000 DT. En ce qui concerne les barques motorisées, la compensation moyenne pour l'abandon de l'activité a été estimée à 42 700 DT avec un minimum de 10 000 DT et un maximum de 100 000 DT. Les activités

envisageables par les pêcheurs favorables à l'abandon de l'activité de pêche contre une indemnisation sont les suivantes, par ordre d'importance: l'agriculture (37 pour cent des réponses), le commerce (30 pour cent), l'élevage (18 pour cent) et d'autres activités telles que la restauration, le tourisme, l'artisanat et le transport (15 pour cent).

FROM THE REGULATION OF THE EGADI ISLANDS MARINE PROTECTED AREA TO THE LOCAL MANAGEMENT PLAN FROM CASTELLAMMARE DEL GOLFO TO MARSALA, INCLUDING THE EGADI ISLANDS. AN EXAMPLE OF INTEGRATION AND EXCHANGE OF BEST PRACTICES

Francesco Bertolino, Ilaria Rinaudo, Giovanni Basciano, Eliana Asaro, Stefano Donati, Fabio Fiorentino, Sergio Vitale and Mario Maltese

In recent years, the Egadi Islands – an archipelago located off the western coast of Sicily – have become "strategic" to experiment sustainable fisheries through two different management tools. Since 2010 (when the implementing regulation on the MPA entred into force by decree of the Ministry for the Environment) the Egadi Islands MPA, the largest in Europe, has been in charge of implementing in the territory more restrictive rules compared with the current regulation on fisheries. In addition, from September 2012, the local management plan of the area from Castellammare del Golfo to Marsala, including the Egadi Islands, has been effective in this field. This plan was presented within the European Fisheries Fund (2007-2013) by the Consortium for the management of artisanal fisheries (Co.Ge.P.A.) of Trapani, with the scientific support of the Institute for coastal marine environment of the National research council (IAMC-CNR, U.O.S. of Mazara del Vallo) and included about 70 percent of the fishing fleet in the area. The general objective of this plan is to improve the state of fish stocks through the management of fishing effort and the introduction of technical measures in order to ensure sustainable fisheries. In particular, the plan is aimed at maintaining a sustainable level of fishing impact on marine ecosystems, reducing conflicts among different fishing gear, improving the economic conditions of workers in the sector and maximizing employment opportunities in areas that are dependent on fisheries. Unlike what usually happens in MPAs where the protection of the sea coincides exactly with its perimeter, the Egadi Islands MPA and its rules cover a much larger area where management measures have been proposed following a bottom-up approach by the same fishers who participate in the Co.Ge.P.A. of Trapani. This allows the area covered by the local management plan to work as a buffer zone where the fisheries pressure is handled within a co-management approach.

PRÉSENTATION DES RÉSULTATS DU PROJET «RÔLES DE L'AIRE MARINE PROTÉGÉE CAP NEGRO/CAP SERRÂT DANS LA DURABILITÉ DE LA PÊCHE ARTISANALE À CAP SERRAT»

Yassine Skandrani

L'intérêt principal du projet MADPA porte sur la conservation de la diversité biologique au sein de l'AMP, qui revêt une grande importance sociale et économique au niveau local. À ce titre, le projet fournit un appui aux différents acteurs de la zone pour développer la coopération et la solidarité requises afin d'assurer la durabilité des ressources naturelles et des écosystèmes. Il faut souligner que la zone Cap Serrat, ciblée par le projet, est exploitée par la pêche artisanale, un sous-secteur bien intégré dans l'économie locale et assurant l'approvisionnement des populations en produits de la mer.

Source: Fishermen at the port of Dikky, Morocco ©FAO/Abdelhak Senna.

Thematic Session IV

Enhancing small-scale fisheries value chains in the Mediterranean and Black Sea

Source: Fishermen setting out to sea to fish ©FAO/Abdelhak Senna.

BACKGROUND DOCUMENT

Enhancing small-scale fisheries value chains in the Mediterranean and Black Sea: Part 1

Mohamed Naji

1. OUTLINE OF THE SSF SECTOR, ITS VALUE CHAINS AND ECONOMIC ACCOUNTS IN LIGHT OF THE CURRENT ECONOMIC CRISIS

1.1 Trends in international production, trade and consumption

The important contribution of fisheries to human well-being is frequently underestimated. Not only do fisheries generate employment for millions, but fish provides vital nutrition to billions and is often essential to the diet of the poor (World Bank, 2010).

The last 15 years have been marked by significant changes (FAO, 2010), namely: the rapid increase in global aquaculture production, which is in turn a response to the rising demand for fish and fishery products; a growth in world trade of fish and fisheries products, particularly in value terms and an overwhelming call for more responsible management, as global consciousness for the well-being of our natural resources within their ecosystems.

Global fisheries and aquaculture production

According to the FAO database on capture production, for inland and marine fisheries, the total global capture production in 2011 was the third ever, slightly after 1996 (93.8 million tonnes) and 2000 (93.5) (FAO, 2013b).

TABLE 1
World capture production in 2010 and 2011 (in million tonnes)

	2010	2011
Inland capture	11.2	11.1
Marine capture	77.7	82.4
World total	89.0	93.5

Source: FAO, 2013b.

Out of the 145 million tonnes produced in 2011, about 90 million tonnes came from capture fisheries. Inland fisheries have shown an increasing trend in recent years and reported a record catch exceeding 11 million tonnes. For aquaculture, production in both inland and marine waters has continued to increase, and total production in 2011 reached about 64 million tonnes and this sector continues to be the fastest-growing food sector, maintaining a growth rate of almost 7 percent per year (FAO, 2010).

Fishing fleets, fishers and fish farmers

The total number of fishing vessels in the world in 2010 was estimated at about 4.3 million, which is similar to previous estimates. Globally, this number has been relatively stable in recent years (FAO, 2012). The most recent estimates indicate that in 2010 there were 54.8 million people engaged in the primary sector of capture fisheries and aquaculture. In the period 2005–2010, employment in the fisheries sector continued to grow faster (at 2 percent per year) than the world's population (at 1.2 percent per year), the vast majority in developing countries (FAO, 2012).

Most fishers are small-scale artisanal fishers operating on coastal and inland fisheries. When we count the secondary sector such as handling and processing, women make up half of those employed. All in all, about 4.2 percent of the 1.3 billion people economically active in the broad agriculture sector worldwide depend on fisheries for their well-being and livelihoods (FAO, 2012).

Fish consumption

Despite commitment to restore global fish stocks to sustainable levels by 2015 whenever possible, consumption of fish is rising at increasingly unsustainable levels. The total food fish supply and hence consumption has been growing at a rate of 3.6 percent per year since 1961, while the world's population has been expanding at 1.8 percent per year (FAO, 2012).

In 2011, capture fisheries and aquaculture supplied the world with 131 million tonnes of fish for human consumption, an all-time-high average of 18.8 kg per capita (FAO, 2012). Globally, fish provides about 3.0 billion people with almost 20 percent of their intake of animal protein, and 4.3 billion people with about 15 percent of such protein.

At present, the overall maximum potential from wild capture fisheries in the oceans has been reached. Since it is foreseen that the global demand for fish will continue to increase, future growth will have to come from aquaculture (FAO, 2010).

TABLE 2
Perspectives of fish supply

Fish supply (mt)	2010 (baseline)	2030 (projection)
Aquaculture	59	123
Capture fisheries	88	88
Total supply	**147**	**211**
Percentage share of aquaculture	40 (48 for human consumption)	58

Source: FAO, 2010.

Market situation

The fish market is adjusting to recent supply and demand imbalances which have caused price fluctuations. After a period of strong growth in 2011 and early 2012, the fish sector experienced a slower expansion (Sapkota *et al*., 2012). Further strong growth is expected, despite slowed trading due to the current global economic crisis and food price volatility (FAO, 2010).

During 2012, the value of trade set a new record at more than USD 129.3 billion, but it was only a modest increase over 2011 (+1.5 percent) as international prices of fish and fishery products for human consumption have been under downward pressure in 2012. The price dip was the result of a reduced consumer demand in many key markets. These tendencies were reflected in the FAO fish price index, which shows international fish prices sliding by almost 6 percent in 2012 compared to 2011 for total fisheries products, but by more than 17 percent if taking into account only farmed fish (Sapkota *et al.,* 2012).

Fish has become among the most highly traded food commodities with nearly 40 percent of all production now exported. This has particularly benefited developing countries who now account for more than 50 percent of all fishery exports in value terms and more than 60 percent in quantity (live weight) (FAO, 2012).

Projection highlights

Economists expect a continuing strong growth in fisheries, according to summaries published from the upcoming OECD/FAO ten year food supply outlook (due June 26). Capture fisheries' output is projected to rise by only 5 percent by 2022 with aquaculture increasing by 35 percent. World fisheries production is projected to reach

181 million metric tonnes by 2022. Aquaculture is projected to surpass capture fisheries as the main source for human consumption by 2015 (OECD and FAO, 2013).

Fish product prices are projected to rise strongly over the coming decade as a result of strong demand, rising production costs and slowing production growth with continuing price volatility associated with supply swings. Rising prices are also projected for fish-meal and fish oil to 2022 with continuing rapid growth in per capita consumption and slowing production trends (OECD and FAO, 2013).

World per capita consumption (round weight) is expected to increase by 8 percent over the decade, from 19 kg to 20.6 kg per person. Most of this growth will be supplied by aquaculture (OECD and FAO, 2013).

1.2 Figures of the SSF sector

Introduction

Small-scale fishing is much more significant than most people realize. Like small-scale agriculture, small-scale fishing is widespread and crucial to employment and food supply in many communities in developing nations, where some 95 percent of all fishers ply their trade (FAO, 2002a quoted in Yumiko, *et al*., 2004).

Raising awareness on the importance of SSFs is particularly relevant not only because these livelihoods depend on sustainable use of the natural resource base, but also because these fisheries provide vital local nutritious food and a safety net for many poor households in coastal communities in developing countries (World Bank, 2010).

Because of their variety, dispersion and social complexity, SSFs are often poorly documented, poorly regulated and many of the complex management issues remain largely unresolved. At a time when fisheries resources are increasingly depleted and climate change poses a growing threat, failure to effectively address the issues confronting small-scale fisheries places the livelihoods of millions of people at risk (World Bank, 2010).

An accurate picture of SSFs at the global level is also hard to assemble, because the definitions of small-scale and artisanal fishing vary by country, and because the fish caught by small-scale fishers frequently go unreported in official government statistics. This means that the economic importance of the sector remains hidden from official view, and the implications for national fisheries policy remain unclear (Yumiko *et al.*, 2004).

Definition

SSFs are diverse and need to be defined within each particular context. In general, however, small-scale fishers may fish without craft, or use smaller craft and manually-operated seasonally-specific fishing gear (FAO, 2012a). While the term "small-scale fisheries" is commonly used in international fisheries literature and discussions, this classification is rarely explicitly defined. The conceptualisation of scale depends very much on context, a fishing boat that would be considered small-scale in one place could be considered large-scale in another (FAO and WFC, 2010).

Many countries divide their fisheries into several categories and SSFs are generally one. However, the terminology varies and the classification can also include a wider range of categories. The terminology often includes artisanal, traditional and recreational or subsistence fisheries depending on how the categories have been defined (FAO and WFC, 2010).

The FAO Glossary indicates that artisanal fisheries are "traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amounts of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption. In practice, the definition varies between countries, e.g. from gleaning or a one-man canoe in poor

developing countries, to more than 20 meters trawlers, seiners, or long-liners in developed ones. Artisanal fisheries can be subsistence or commercial fisheries, providing for local consumption or export. They are sometimes referred to as small-scale fisheries" (FAO, 2013a).

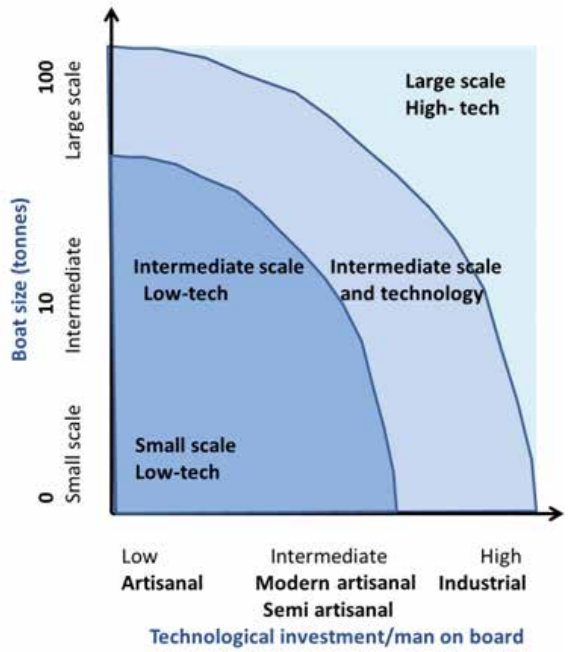
While small-scale and artisanal fisheries clearly differ from industrial and recreational fisheries, the subtle distinctions between them are hard to pin down. The FAO Glossary tends to equate "artisanal" with "small-scale". From a technological point of view, however, these are connected but have somewhat different concepts related, on the one hand, to the size of the fishing unit (the scale) and, on the other hand, to the relative level of technology (or "artisanality") expressed as the capital investment/ man-on-board (FAO, 2013a).

The term "small-scale fisheries" is more frequently used by anglophones. The term "artisanal fisheries" is often used in French and Spanish-speaking areas to mean relatively low levels of technology, sometimes paired with low levels of organization and industrialization, but with little reference to size (FAO, 2013a).

"Relatively" is the key term to bear in mind when trying to determine if a given fishing operation is small-scale, artisanal, or industrial. The best test is to graphically combine both the vessel size and degree of technology. This is illustrated in the accompanying figure which plots two axes (FAO, 2013a):

1. relative scale (or vessel size), as measured by tonnes of displacement; and,
2. relative technological complexity (the inverse of "artisanality"), as measured by the relative capital investment in boat and equipment per fisher on board (FAO, 2013a).

FIGURE 1
Graphic definitions of small-scale, artisanal and industrial fisheries as a function of vessel size and relative technological investment



Source: FAO/Fisheries Department.

Within a given region, with homogenous socio-economic characteristics, all boats which fall somewhere within the lower left-hand quadrant with smaller size and lower technological investment per fishers are usually considered as being small-scale and/or artisanal (FAO, 2013a).

In the Mediterranean context, the word "*métier*" corresponds to a combination of gear, target specie and fishing geographic zone. It is a pragmatic definition to give answer to the need of study of the management systems defined using the traditional knowledge. Temporal dimension is underlying through the seasonal nature brought on by the couple target species per zone.

The *métier* notion enables to better define the effective effort implemented on a resource and it leads to a fleet distribution bearing in mind the strategies, the usage and the knowledge of fishers. It allows identifying more operational management units.

A comparative analysis of the definition of artisanal fisheries in each country shows that three criteria are most commonly used: length, gross tonnage and fishing gear/ target species. In fact, this last criterion helps the most to characterize what is not included in artisanal fisheries.

Employment

The FAO estimates that about 120 million people are directly dependent on commercial capture fisheries for their livelihoods as full-time or part-time workers, including employment in the post-harvest sector. Small-scale fishing is a labour-intensive activity and it is estimated that each fisher's job creates at least two other jobs in processing and distribution (Le Sann, 1998). Ninety-seven percent (116 million) of "fishworkers" live in developing countries and over 90 percent are small-scale operators – people who use small fishing vessels with a relatively low level of capital investment. This number does not include the many millions of fish farmers also working at the small scale or artisanal level.

In SSFs, about half (47 percent) are women, mainly engaged in post-harvest activities, handling the fish after it is caught and ensuring that this important source of nutrition reaches more than 1 billion consumers for whom fish is a key component of their diets (World Bank, 2010). Estimates of women's participation in the fisheries workforce in the Big Number Project (BNP) case study countries showed that there are almost as many women as men employed in the fisheries sector when also including post-harvest activities. If excluding China, the average proportion of women fishers and fishworkers approaches 60 percent (FAO and WFC, 2010). Data on fisheries employment in Europe shows that, also in developed countries, very few women work onboard vessels. Still, they represent a third of the total sector workforce of some 400 000 people (fulltime and part-time) and they are mostly employed in the fish processing industry (Salz *et al.*, 2006) (FAO and WFC, 2010).

Inland water fisheries are particularly important in developing countries and over 48 percent (60 million) of those employed in fisheries in developing countries work in small-scale inland fisheries (lakes, rivers, wetlands) (World Bank, 2010).

In addition to full-time and part-time employment, the small-scale sector – in particular in inland waters – provides a source of food and income to millions of occasional fishers and fishworkers. The sector plays an important role in food security and poverty prevention, constituting a security net for poorer populations both in inland water and coastal areas (FAO and WFC, 2010).

Based on the BNP's case study information, it is estimated that the total number of small-scale fishers in all developing countries reaches some 25-27 millions. More than half of them are based in inland waters. The large scale sector employs much fewer workers; only 1-2 million people. Therefore, in terms of employment, small-scale fishing is a bigger factor in many national economies than large-scale industrial fishing, even though industrial fishers are usually responsible for a larger share of the catch. In general, although industrial fleets are more efficient at catching fish, and therefore more profitable, they generate much less employment than small-scale fishing. Globally, the fisheries sector is likely to employ some 30 million fulltime and part-time fishers of which 90 percent are in developing countries (FAO and WFC, 2010).

Although the growth in industrial fishing is clearly putting pressure on small-scale fishing in many regions, the number of small-scale fishers continues to increase in many countries (Yumiko, *et al*., 2004). According to FAO (2013c), the small-scale fisheries sector, including fishing and fish farming, is estimated to employ some 37 million people, of whom around 90 percent are in Asia. An additional 100 million people are estimated to find employment in associated activities. Many more people are involved in part-time or seasonal fisheries activities, and the benefits of fish consumption are much more widely significant around the world (FAO, 2013c).

Production

The global aggregate capture fisheries GDP is slightly below 1 percent of global GDP. The total commercial capture fisheries sector's contribution to the global GDP (including marine and inland harvest and post-harvest subsectors) was estimated at approximately USD 274 billion in 2007 (World Bank, 2010). In addition, fisheries also create upstream employment and economic activity in other sectors such as boat building, gear manufacturing, port services, telecommunications, retailing and restaurants. Upstream economic activities and recreational fisheries may add a further USD 160 billion to the GDP estimate (World Bank, 2010).

In addition, subsistence fisheries constitute a vital but largely unquantified economic activity and livelihood component of rural communities and particularly of the poor. In some cases, the unrecorded subsistence fish production is greater than the officially recorded production, particularly in inland waters and for dispersed coastal communities (World Bank, 2010).

Global expenditures on recreational fisheries represent about USD 190 billion in the global economy and provide recreation and food for some 220 million anglers. Recreational fisheries can be of greater economic importance than commercial fisheries in some countries and contributes in the order of USD 70 billion to global GDP (World Bank, 2010).

Large-scale fisheries land more fish, but small-scale fisheries produce more fish for domestic human consumption. Over half of the catch in developing countries is produced by the small-scale sector and 90-95 percent of the small-scale landings are destined for local human consumption (World Bank, 2010).

Like other primary production sectors, the fisheries sector tends to be more important in developing economies than in developed economies. The catch per unit of fossil fuel is similar in motorized small-scale and large-scale fisheries, but SSFs employ several times more fish people per ton of harvest than large-scale fisheries and generate less wastage in the form of discards (unwanted catch dumped at sea) (World Bank, 2010).

Some experts estimate that, as a whole, small-scale fishers produce as many fish for direct human consumption as industrial fishers (Berkes *et al*., 2001; Misund *et al*., 2002; World Bank *et al.,* 1992). As indicated earlier, fish harvested by small-scale fishers often go unreported, and there are no global statistics on the size of the aggregate small-scale catch. Small-scale operators traditionally catch a variety of fish species for domestic consumption, including small, low-valued pelagic species as well as more valuable demersal species. Large industrial fleets tend to concentrate on the most profitable species only, such as shrimp and demersal fish suitable for export (Horemans, 1998 quoted in Yumiko *et al*., 2004).

Advantages of small-scale and artisanal fisheries

Several factors have contributed to the lack of attention to small-scale fishing. One of the most potent is the dearth of information. Data on this sector are notoriously poor, with the number of small-scale fishers – and especially subsistence level freshwater fishers – grossly underestimated by national governments.

On the other hand, small-scale and artisanal fisheries often compete, and conflict, with industrial fisheries. Some of the relative advantages of small-scale and artisanal fisheries in certain conditions are (FAO, 2013a):

- Lower running costs and fuel consumption;
- Lower ecological impact because artisanal/small-scale fishers employ mainly passive gear;
- Higher employment opportunities (being more labour-intensive, artisanal/small-scale fisheries are naturally suited in rural areas with high demographic growth, providing employment in catching as well as processing and trade of fish and fishery products);
- Higher versatility (small-scale fishing boats can operate from small ports and landing sites relatively close to the fished resource);
- Lower construction costs (as small-scale boats do not usually stay out long, nor go far offshore, they can be relatively lightly – and inexpensively – built and either stay ashore or run for nearby cover when the weather turns foul); and
- Less expensive technology (artisanal fisheries require relatively low investment in technology and equipment and are consequentially more competitive in most developing regions where labour is cheaper than equipment).

However, many SSFs in developing countries are vulnerable to both internal and external threats. The current volatility of fuel prices constitutes a particular concern in this respect since fuel typically constitutes a major part of overall costs in small-scale fishing in developing countries (FAO and WFC, 2010).

1.3 Mediterranean fisheries sector

The countries bordering the Mediterranean host a population characterized by a wide gap in terms of development. The presence of countries belonging to the EU with high levels of socio-economic welfare and development, accentuates the differences between countries in the Mediterranean basin, thus making it more difficult to give a unique profile of the Mediterranean area (Malvarosa and De Young, 2010).

Marine fisheries are crucial, both socially and economically, to the Mediterranean region, providing animal protein and supporting food security for over 452 000 000 people. An estimated 32 percent of this population lives in close proximity to coastal areas, relying on fish resources not just for food but also for their livelihoods – from fishing and induced activities, but also increasingly from fishing-tourism (Sauzade and Rousset, 2013).

SSFs play a particularly important role in Mediterranean fisheries, where they represent more than 80 percent of the total vessel fleet (Sauzade and Rousset, 2013). In the Euro-Mediterranean area, artisanal fisheries represent 70 percent of European fishing vessels (30.000 of the 35.000 vessels operating in the Mediterranean).

The FAO CopeMed project (Coppola, 2006) has tentatively identified the main technical and economic features of the Mediterranean artisanal fisheries (Sauzade and Rousset, 2013):

- Fishing boat owners (or their family) also practice another professional activity;
- The crew is small (1 to 5 people);
- High employment in connection with investment;
- Direct sales to fish traders or restaurants;
- Individual catches of low tonnage but of relatively higher value; and
- Low level of hierarchy in the work at sea.

Fishing fleet

TABLE 3
Estimated fishing feet of the Mediterranean countries operating in the Mediterranean Sea in 2008

Group of countries	Artisanal	Total
Northern and Eastern Mediterranean countries	40.680	49.700
Southern Mediterranean countries	27.451	32.307
Total	**68.131**	**82.007**

Source: Sacchi, 2011.

The status of the Mediterranean fishing fleet has been assessed by Sacchi (2011) quoted in Sauzade and Rousset (2013):

The artisanal boats represented 83 percent of the total fleet, respectively 82 percent in the northern and eastern Mediterranean countries and 85 percent in the southern Mediterranean countries. In 2008, the fishing fleet of the southern Mediterranean countries represented approximately 40 percent of the total Mediterranean fleet (Sauzade and Rousset, 2013).

For the European Commission, the length of the vessels is generally the main criterion for the application of relevant regulations, with thresholds of 10 meters or 12 meters most often used. For instance, the recent project on the CFP reform provides that vessels less than 12 meters will be exempted from the application of individual transferable quotas (ITQ) measures (Sauzade and Rousset, 2013). Some Mediterranean countries have adopted their own definition.

Production

In 2007, the total fishery production (capture and aquaculture) of Mediterranean countries was 5.6 million tonnes (3.6 percent of the total world fishery production). The production from Mediterranean waters, 2 million tonnes, amounted to 35 percent of the total (40 percent for capture and 23 percent for aquaculture production). In recent years, aquaculture has been the fastest growth activity in global food production, and this trend is also confirmed in the Mediterranean basin (Malvarosa and De Young, 2010).

The total catch from the Mediterranean marine capture fisheries rose from 420 000 tonnes in 1950 to about 1 093 000 tonnes, reached in 1995. Ever since, the level of catches has been slowly decreasing (Sauzade and Rousset, 2013).

Currently, Mediterranean fisheries deliver annual revenues that amount to around USD 1.3 billion and support directly and indirectly 458 000 jobs. When the total direct and indirect economic effects arising from fish populations in the regional economy are accounted for, the total contribution of the sector to national economic outputs is estimated at some USD 3.1 billion a year (Sauzade and Rousset, 2013).

A significant difference in landed values between the southern Mediterranean countries and the northern and eastern Mediterranean countries can be explained by the very low level of value added for catches sold locally in the southern Mediterranean countries (Sauzade and Rousset, 2013).

Mediterranean marine fisheries, and more particularly the northern ones, are not only overexploited, they also have been underperforming in both economic and social terms for decades (Sauzade and Rousset, 2013).

By analysing the context of intra-Mediterranean trade, the Mediterranean exchange matrix reveals that approximately 23 percent of the fishery products imported by Mediterranean countries come from the Mediterranean basin (Malvarosa and De Young, 2010).

Employment
While employment in capture fisheries has declined since the 1990s in countries on the northern shore of the Mediterranean, figures are much higher on the southern shore, where 319 000 individuals are still employed in the sector (Sauzade and Rousset, 2013). Over 55 percent of this workforce is employed in SSFs.

In spite of the importance of this sector for so many coastal populations, most of these fisheries are exploited at an unsustainable level, which directly threatens stocks with overexploitation and the attendant long-term depletion of the whole sector, increasing economic costs and employment losses (Sauzade and Rousset, 2013).

Fish consumption
Changes in fish consumption patterns in the Mediterranean basin (mostly due to a growing population, urbanization and income level) are supported by FAO forecasts on total fish consumption (ISMEA, 2004; Malvarosa and De Young, 2010). The model output shows that total consumption in the Mediterranean basin is forecasted to grow. In the case of continuous growth of the fish *per capita* consumption, the total Mediterranean consumption of fish products will reach about 9.5 million tonnes in 2030, showing an increase of 30 percent.

Sustainability
Most, if not all Mediterranean fisheries, now face serious challenges resulting from a series of impacts: environmental degradation, overexploitation of the stocks targeted and poor managements of these shared resources. In addition, the impacts of climate change are now starting to be felt, exacerbating the impacts on both ecosystems and species (Sauzade and Rousset, 2013).

The situation is slightly less worrisome in the home fishing areas of southern countries, where the number of their resources in overexploitation has only increased by a third, while it has more than doubled in those of other Mediterranean countries during the same period (Sauzade and Rousset, 2013).

1.4 Global crisis and its impact on SSFs

Global fish crisis
Fishing remains key to food security for millions of people, a bulwark of local employment, and a significant factor in the global economy. The increase in the world's population and the need for economic development has brought a rapid expansion of commercial fishing and an overwhelming upsurge in our capacity to exploit fish stocks. The result has been a rapid depletion of key stocks, and serious disruption and degradation of the marine and freshwater ecosystems they live in (Yumiko *et al.,* 2004). Since 1992, overfishing has become one of the major natural resource concerns in the industrialized world, and increasingly in developing nations as well.

Seventy-five percent of commercially important marine and most inland water fish stocks are either currently overfished, or are being fished at their biological limit, putting them at risk if fishing pressure increases or the habitat degrades (FAO, 2012). Unfortunately, pressure on fish stocks is expected to increase even as stock conditions continue to worsen.

Demand for seafood products has doubled over the last 30 years and is projected to continue growing at 1.5 percent per year through 2020 as global population grows and per capita fish consumption rises (Yumiko *et al.,* 2004). As ocean catches have dwindled, aquaculture has burgeoned and diversified to take up the slack to meet food and income needs in developing and developed countries. In fact, over the past three decades, aquaculture has become the fastest growing food production sector in the world. But the heavy dependence of intensive systems on human inputs – water, energy and chemicals – and on wild fish for feed and seed, as well as the effects on ecosystems

and species are major constraints to the sustainability and future growth of this industry (Yumiko *et al.,* 2004). Although much of the world's aquaculture production comes from small- and medium-scale operations, the tendency is toward intensification and higher reliance on wild fish for fishmeal and seed fish.

Trade has become a driving force in the global fishing enterprise, influencing the species of fish targeted and farmed, the intensity of fishing pressure, and, in many cases, the incentives for fishing either sustainably or destructively. Whether trade encourages overfishing or is part of its solution cannot be answered with certainty. However, it is likely that trade simply magnifies the environmental effects of existing fishing practices (Yumiko *et al.,* 2004).

Another important and damaging feature of the growing international trade is the rise in illegal, unreported, and unregulated (IUU) fishing, which is especially prevalent in fisheries of high commercial value, such as sashimi-grade tuna (Yumiko *et al.,* 2004).

Impact of economic crisis on fisheries

In late 2007, a global financial crisis began. This crisis erupted into a full-blown economic recession in September 2008, representing the greatest financial and economic challenge since the Second World War. The global economic crisis started in the United States of America mainly due to "sub-prime mortgages" where interest rate was slower down and there was a great demand for housing loans. (FAO, 2010). Then, this mortgages crisis affected worldwide. Developed countries have so far been the most affected, with a decline in foreign direct investment (FDI) inflows in 2008, mainly due to sluggish market prospects. Flows into developing economies continued to grow in 2008, but at a much lower rate than the year before (FAO, 2010).

The impacts of the economic crisis on developing countries fisheries were transmitted through three distinct channels: financial sector, exports and exchange rates. The impact manifests itself in several direct and indirect ways. Some of the impacts were decreased GDP growth rate, high inflation, FDI inflows and international trade (FAO, 2010). Global gross domestic product (GDP) declined by 2.2 percent in 2009, and trade flows contracted sharply, with a drop of 14.4 percent in world merchandise trade in 2009 (FAO, 2010).

Roughly speaking, the economic crisis had negative impacts on fisheries and any fisheries-related business. In domestic fish markets, demand for fisheries products was on decline. Wholesale and retail prices fell down. Export of fisheries products declined, mainly for the European market. Exporters, processing companies, and any type of fish dealers suffered from market slump. Their financial positions get worse, which causes a decline in fish prices in production sites (FAO, 2010).

With the crisis, food prices fell dramatically. The FAO fish price index reported a drastic drop from 128.0 in September 2008 to 112.6 in March 2009, after which it recovered to 119.5 in November 2009. Virtually no country has escaped the impact of the widening crisis, whose effects are likely to be felt through to 2011 (FAO, 2010).

Estimates indicate that trade in fish and fishery products declined by 12 percent in 2009 compared with 2008. Although the most acute phase of the global financial crisis seems to have passed and GDP growth rates are starting to improve (FAO, 2010).

Today, the global community faces multiple and interlinked challenges ranging from the impacts of the ongoing financial and economic crisis to greater climate change vulnerabilities and extreme weather events (FAO, 2012). After the 12 percent drop experienced in 2009, world trade recovered strongly in 2010 and, according to the World Trade Organization (WTO), merchandise exports increased by 14.5 percent, sustained by a 3.6 percent growth in global output as measured by gross domestic product. In 2010, economic conditions rebounded in both developed and developing economies. However, since late 2011 and early 2012, the world economy has entered a difficult phase characterized by significant downside risks and fragility, with great

uncertainty on how markets will evolve in the medium term. The financial turmoil generated by the intensification of the fiscal crisis in Europe has expanded to both developing and high-income countries. As a result, and despite relatively strong activity in the United States of America and Japan, key markets for fisheries trade, global growth and world trade have slowed sharply (FAO, 2012).

Constraints faced by small-scale/artisanal fisheries

In many countries small-scale/artisanal fisheries are still developing rapidly, expanding markets (e.g. export markets) and adopting new technologies. In many others, however, they are experiencing difficulties. Except where these fisheries contribute substantially to exports (as in northwest Africa), have strong ethnic links with the political leaders or involve most of the population (as in island countries), it is generally not given priority consideration in a country's modernization and development process (FAO, 2013a).

Artisanal fisheries are often thought to be backwards, sometimes because of a lack of data and understanding on real trends and socio-economic impact. They are difficult to administer in the conventional top-down mode because of their physical scattering along the edges of the aquatic systems, rivers, lakes and marine shores, including in areas with difficult access. This last characteristic explains the severe constraints faced by these fisheries in terms of management, access to modern technology, capital, health care, markets, electricity, education, manpower, etc. These constraints are furthermore compounded by the lack of mobility out of the sector and the area – except perhaps through migrations (FAO, 2013a).

The inexorable globalization – with its overriding political and economic consequences – is affecting small-scale/artisanal fishers' lives well beyond their control. Another set of constraints and threats is added by the high pressures exerted by manifold coastal activities causing water pollution, destruction of fish habitats, and increasing competition and high prices of coastal land (FAO, 2013a).

Moreover, with the constant pressure of continued population growth, migration from the hinterland and development of industrial fishing, the "survival" of small-scale/artisanal fisheries depends to a large extent on the recognition and protection of traditional or acquired fishing rights. The extent and nature of these rights (individual or communal, transferable or not) are still hotly debated and there is a danger of exporting industrial-sector solutions aimed at maximizing individual profits. To develop and maintain the advantages of small-scale/artisanal fisheries, the system of diversified family livelihoods characteristic of the sector should be protected and strengthened through rights of access of the communities to a sustainable matrix of productive activities (FAO, 2013a).

1.5 Sustainability issues in fish supply chains

SSFs receive less attention

The importance of fisheries, especially SSFs, as a source of nutrition, employment and income for many of the world's coastal and rural poor can hardly be overestimated. Small-scale fishing is a key livelihood strategy for millions of households in coastal and rural communities in developing countries and plays an important part in food security and poverty alleviation. The growing threat to sustainable fisheries represented by overcapitalisation, overfishing and environmental degradation is a global concern but even more so for the many small-scale fishers and fishworkers in developing countries who are dependent on fishery resources as a key component of their livelihood strategies (FAO and WFC, 2010).

SSFs in developing countries, which are often unregulated and subject to the pressure of rapid population growth, receive less attention with less interest being directed towards their monitoring and management. Still, it is clear that overfishing, overcapitalisation and environmental degradation are global problems and that the

situation looks precarious both to small and large-scale operators, often depending on the same or adjacent resources (Pauly, 2006; FAO, 2007; quoted in FAO and WFC, 2010).

The depletion of fish stocks and a collapse of the economic activities based on these resources will have far more severe consequences in small-scale fishing communities in developing countries, where there are few livelihood alternatives and social security systems are generally non-existent, than in more affluent areas of the world (FAO and WFC, 2010).

Small and large scale fisheries interactions

Small and large-scale fisheries interact, with regard to the resource base but also at the level of processing, marketing and other auxiliary activities, and there may be both synergies and competition within and between the two sectors (FAO/RAP/FIPL, 2004; Jacquet and Pauly, 2008). Small-scale fisheries in developing countries are vulnerable to such competition as well as to other internal and external threats (FAO and WFC, 2010).

As fishing technology advances and developing nations continue to support the growth of industrial fishing, the face of small-scale fishing is changing. Marine fishing in Southeast Asia is gradually becoming modernized, and industrial fleets are expanding rapidly (Yumiko *et al.,* 2004). Compared to Southeast Asia, industrialization of the fisheries sector in western Africa seems slower (Yumiko *et al.,* 2004).

Conflicts between industrial fleets and small-scale coastal fishers are becoming increasingly prevalent in Asia and Africa alike, with small-scale fishers gradually losing ground. In response to increasing competition from industrial operators, some small-scale operators are attempting to move toward more profitable forms of fishing, targeting high-value species, such as crab, prawn, redfish, and molluscs destined for export (SEAFDEC, 2001b quoted in Yumiko *et al.,* 2004).

Any shortfall in fish supplies due to competition with industrial fleets is bound to have a wide array of negative effects on small-scale fishers, their families, and the communities that are highly dependent on the local supply of fish for food and livelihood. Small-scale fishers are extremely vulnerable to problems such as stock depletion, and local employment alternatives may be fewer if fishing becomes unviable (Yumiko *et al.,* 2004)

Fisheries co-management

Co-management offers an alternative. In SSFs, particularly in developing countries, the idea of shared power and responsibilities between the government and fishing communities has emerged as an alternative framework for managing fish stocks (Yumiko *et al.,* 2004).

What are the conditions that lead to good community management of common resources? Research on thousands of cases of community-based management shows that key factors to success include a community-wide understanding of the value and scarcity of the resource; good communication among community members; an effort to monitor whether rules are being followed; a credible system of sanctions (Yumiko *et al.,* 2004)

Factors undermining the sustainability of Mediterranean fisheries

The factors that undermine the sustainability of Mediterranean fisheries have been the subject of multiple analyses. Specifically, FAO organized a regional workshop focused on the southern Mediterranean, the conclusions of which are still relevant (Bodiguel, 2009 quoted in Sauzade and Rousset, 2013):

- **Strong demand for limited resources.** Almost all species in the Mediterranean are subject to strong demand by national and regional markets. In addition to strong national and local demand, there is also regional and international demand for some high commercial value species. This strong demand, which is not controlled through appropriate management of fishing capacities, leads to a generalized fleet overcapacity and then, inevitably, to overfishing.
- **Failure of institutions and policies.** The policies and laws of many countries are out of date and take insufficient account of the current approaches for sustainable fisheries management. The management of the fisheries sector is sometimes undefined, or insufficiently formalized in institutional, legal and operational terms. Mediterranean fisheries are also seriously affected by failure to apply the rules and regulations.
- **Inappropriate incentives.** Many incentives are inappropriate. Market-related incentives are often wrongly interpreted and poorly regulated. Subsidies granted to the sector are too often still being channeled, directly or indirectly, to the purchase of fisheries inputs, in a situation of generalized fleet overcapacity. More generally, it has been noted that the management system does not encourage fishers to behave responsibly, even when they have rights to the resources or rights of access to the resources, which should guarantee them continuity of their activity.

Suggestions for steering toward sustainable fisheries

Sauzade and Rousset (2013) have mentionned the existence of other management tools and funding sources. The necessary downsizing of the fleet should be made whilst trying to protect the small-scale fisheries and the associated fragile coastal communities and not preventing larger fleets from undergoing the necessary adaptations. A possible way could be to have differentiated management regimes: one for large-scale fleets, where capacity adjustment and economic efficiency are at the core, and another for small-scale fleets in coastal communities, with more focus on social objectives.

In line with the principles of the future European CFP, arrangements for the large-scale segment could include economic incentives for fleet adaptation such as market-based allocation mechanisms, while small-scale coastal fisheries would be managed through direct allocation of quotas or effort or through collective schemes.

The approach to public financial support could be different for the two segments: the large-scale fleet would be expected to be economically self-reliant, while public funding may help the small-scale segment adapt to changing conditions towards more sustainable fisheries, thereby strengthening its economic viability, and maintain its contribution to the life of coastal communities.

For example, when looking at the value chain for the fisheries sector in Morocco, it quickly becomes apparent that the largest marginal increase in value occurs very early on, at the so-called first sale stage, when the fishers sell and completely lose ownership of their catches. A small number of fishing cooperatives have attempted to capture that increase in value, by grouping and purchasing all the landings from their members and then re-selling to various intermediaries, thus cutting, to the extent possible, the middlemen who traditionally take advantage of artisanal fishermen under pressure (Sauzade and Rousset, 2013).

Although some of the initiatives described below are still at embryonic stages in Moroccan SSF sector, Sauzade and Rousset (2013) suggested that some key lessons can already be learned:

- Reducing poverty, in the long run, can only be achieved by increasing the value of the catches, rather than their quantity;
- Efforts cannot be applied to the targeted stocks alone, but rather an ecosystem approach is called for, which also takes into account key and related ecosystems;
- Intervention should occur at all stages: when the resources are still in the water, when they are landed, and as they enter the transformation and marketing cycle;
- Small-scale fishers are almost always better off when they organize and form cooperatives. These cooperatives in turn must be supported by local, regional and national authorities, and be provided with significant capacity-building;
- Regional lesson sharing is key, as illustrated in the case of the artificial reefs, where the approach adopted in Morocco was initially tested in Tunisia, for similar fisheries; and
- Because these initiatives are complex and interrelated, different donors are required to cooperate in order to avoid overlap and gaps. The various activities described above were funded by a combination of the Government of Morocco, Japanese bilateral assistance (JICA), US bilateral assistance (Millennium Challenge Corporation, or MCC) and the World Bank.

Guidelines for securing sustainable small-scale fisheries

The twenty-ninth session of the FAO Committee on Fisheries (COFI) held in February 2011 recommended that an international instrument on small-scale fisheries be developed. The Guidelines had to be developed through a consultative process involving governments, regional organisations, civil society organisations, small-scale fishers, fishworkers and their communities. The FAO Secretariat is engaging in an extensive consultative process. A first preliminary draft of the Guidelines for Securing Sustainable Small-Scale Fisheries is ready, taking into account the increased recognition of the important role played by small-scale fisheries – particularly for developing countries in the context of food security and poverty alleviation (FAO, 2012a)

The SSF Guidelines will be grounded in a number of basic principles (FAO, 2012a):

- **Resource governance, access regimes and enforcement.** The SSF Guidelines need to recognize the necessity of a sustainable use of aquatic and other natural resources and to fulfill the right to development by meeting both developmental and environment needs of present and future generations. This implies acknowledging the importance of the ecosystem approach to fisheries (EAF).
- **Safety at sea.** The SSF Guidelines suggest that improved sea safety in SSFs will best be achieved through the development and implementation of national strategies, with elements of regional coordination.
- **Social and economic development.** Fishing communities often have alternative livelihood strategies complementing those based on aquatic resources, forming a web of cross-sectoral linkages. There is a need for secure incomes and actions may be required that aim at improving earnings from fisheries related activities or creating complementary or alternative income-generating activities.
- **Disaster risks and climate change.** Many SSF communities are vulnerable to natural disasters and climate change. They can also be subject to difficult circumstances in cases of conflicts and wars.
- **Post-harvest employment and value chains.** The post-harvest sector comprises all activities from when the fish has been caught until it reaches the consumer. This integral part of the fishery system employs more people than the primary production subsector and most of them are women. In addition to its direct role in providing livelihoods and supporting food security, the sector plays

an important role at the national level, generating tax revenues and foreign exchange. Full consideration and adequate integration of the post-harvest sector and value chain aspects in SSF governance and development are prerequisites for the sustainability of sector as a whole.

- **Social and gender equity.** There are a number of aspects related to social and economic equality and equity that need to be addressed by the SSF Guidelines. These include the need for gender mainstreaming, addressing child labour in fisheries, integration of migrants and avoiding discrimination or marginalisation of certain stakeholder groups.
- **Policy coherence, institutional coordination and collaboration.** In order to ensure policy coherence and the integration of SSFs in broader policy frameworks, it would appear essential to embrace holistic and integrated governance and development approaches as well as to promote cross-sectoral linkages, fostering an environment that facilitates collaboration. Moreover, many issues are transboundary and a combination of local-regional-global linkages and networks are needed.
- **Research and information needs, sources and exchange.** For improved governance and decision-making, a wide range of information may be required. At the same time, valuable information is available but not always accessed. There is a need to promote the use of a combination of scientific data and local, traditional or indigenous knowledge.
- **Capacity development.** Capacity development – including organizational development, training and information – in all areas and at all levels will be key to support the implementation of the SSF Guidelines as well as for support to awareness-raising and empowerment.
- **Implementation support and monitoring.** Together with broad support to capacity development, specific support to and monitoring of the implementation of the SSF Guidelines will be required for successful outcomes.

2. MAIN COMPONENTS OF LOCAL, NATIONAL AND INTERNATIONAL VALUE CHAINS RELATED TO SSF PRODUCTION

2.1 Global fishery value chains

A supply chain is a network of retailers, distributors, transporters, storage facilities and suppliers that participate in the production, delivery and sale of a product to the consumer (Harland, 1996). The supply chain is typically made up of multiple companies who coordinate activities to set themselves apart from the competition (De Silva, 2011). A supply chain has three key parts:

- **Supply** focuses on the raw materials supplied to manufacturing units, including how, when and from what location.
- **Manufacturing** focuses on converting these raw materials into semi-finished or finished products.
- **Distribution** focuses on ensuring these products reach the consumers through an organized network of distributors, warehouses and retailers.

Supply chains for most of the fish species start from oceans and end up with consumer markets far from thousands of miles. It can involve a large number of stakeholders between the fisher/fish farmer and the final consumer. Most seafood is traded internationally; particularly the high-valued species (De Silva, 2011).

Definition of a value chain

Kaplinsky and Morris (2002) define a value chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production, transformation and delivery to final consumers, and eventual disposal after use. In Kaplinsky and Morris' approach, value chain analysis seeks to

characterize how chain activities are performed and to understand how value is created and shared among chain participants.

Value chain analysis can be viewed in a narrow or broad sense (Van den Berg *et al.* 2009). In the narrow meaning, a value chain focuses on a single firm and includes the conception and design stage, the acquisition of inputs, production, marketing and distribution activities, and the performance of aftersale services. The broad approach to value chains looks across enterprises at the range of activities implemented by various actors to bring a raw material to the final product. It also includes linkages with other actors engaged in activities such as trading, assembling, processing and providing business development services such as credit and market information (Van den Berg *et al.*, 2009 quoted in Nang'ole *et al*., 2011).

The main approaches/concepts of value chain relevant for development policies are cited by CYE Consult (2009):

- The French *"filière"* concept, a static model describing the linear flow of physical input and services in the production of a final product.
- Porter's modern value chain analysis (VCA), an instrument for identifying the value created at each step of the production.
- Global commodity chains (GCC), a concept mainly focused on the power relations in the coordination of dispersed, but linked, production systems.
- World economic triangle, a concept pointing out that the combination of strong local linkages within global commodity chains might bring upgrading prospects for regions in developing countries; and thus is an approach for showing the importance of linking vertical (chains) and horizontal (clusters) integration.

Definition of a global value chain

The global value chain (GVC) analysis has emerged since the early 1990s as a new methodological tool for understanding the dynamics of economic globalization and international trade. GVC approach is based on the analysis of discrete "value chains" where input supply, production, trade and consumption or disposal are explicitly and (at least to some extent) coherently linked (Ponte, 2008).

Much GVC discussion has revolved around two analytical issues: how GVC are governed (in the context of a larger institutional framework), and how upgrading or downgrading takes place along GVCs. Much of these discussions have been carried out with an interest in how power and rewards are embodied and distributed along GVCs, what entry barriers characterise GVCs, and how unequal distributions of rewards can be challenged in favour of labour and/or developing countries (Ponte, 2008).

Sustainability of GVC

A targeted effort is needed to integrate poor households into markets, through capacity-building in technical, organizational, managerial and financial areas. There is wide consensus that the private sector has a crucial role to play in achieving pro-poor growth and reaching the Millenium Development Goals. The key challenge is to integrate public objectives into private business operations (CYE Consult, 2009).

2.2 Drivers and governors of change on fish demand and supply

Governance concept

Value chains imply repetitiveness of linkage interactions. Governance ensures that interactions between firms along a value chain exhibit some reflection of organisation rather than being simply random (Kaplinsky and Morris, 2001). Value chains are governed when parameters requiring product, process, and logistic qualification are set which have consequences up or down the value chain encompassing bundles of activities, actors, roles and functions (Kaplinsky and Morris, 2001). In other words, GVC governance is the process of organising activities with the purpose of achieving

a certain functional division of labour along a value chain – resulting in specific allocations of resources and distributions of gains. From this perspective, governance involves the definition of the terms of chain membership, incorporation/exclusion of other actors accordingly, and re-allocation of value adding activities (Gereffi, 1994; Kaplinsky, 2000; Ponte and Gibbon, 2005; Raikes *et al.,* 2000).

Governance implies that transactions between actors in the value chain are organized in a system that allows firms to meet specific requirements in terms of products, processes, and logistics in serving their markets. As such, it recognizes that power is not evenly distributed (*Making value chains work better for the poor*, 2008).

According to Bui Nguyen (2011), governance refers to rules and regulations which are set up by actors within the chains or by those who lie outside the chain like: governments, NGOs and ISO organization**.** Governance refers to both "official" rules that address output and the commercial imperatives of competition that influence how production is structured (*Making value chains work better for the poor*, 2008). Humphrey (2006) further described it as the definition and enforcement of instructions relating to what products are to be produced (product design), how they are to be produced (process controls) and when (timing)**.**

Governance is often interpreted as rules and regulation set up by the government. In fact, "These may be as simple as the requirement imposed by wholesalers that agricultural products be correctly harvested to prevent damage and degradation. Conversely, they may be as complex as a foreign government's enforcement of international standards regarding permissible levels of pesticide residues on imported products" (Bui Nguyen, 2011).

Kaplinsky and Morris, in their *Handbook for value chain research* (2001) proposed how rules and regulations should be categorized. According to them, there are three forms of value chain governance namely legislative governance, executive governance, and judicial governance.

The lead firm(s)

Ponte (2008) argued that GVC research attempts to identify a group of "lead firms" that are placed in one or more functional positions along a value chain which are able to "drive" it — in different ways and to a different degree. Thus, GVCs can be highly-driven, somewhat driven or not driven at all.

In the GVC literature, lead firms are seen as not only dictating the terms of participation to their immediate suppliers (and/or buyers, if applicable) (Gereffi *et al.,* 2005), but also as managing to transmit these demands upstream towards further layers of suppliers, sometimes all the way to primary producers. Lead firms can drive GVCs through a hands-on approach (vertical integration, long-term contracts, explicit control of suppliers, regular engagement with suppliers or buyers), a hands-off approach (use of specifications that can be transmitted in codified, objective and measurable or auditable ways; ability to set standards that are then followed along the GVCs; ability to transmit information that is not easily codifiable in other ways), or a combination of the two (Ponte and Gibbon, 2005 quoted in Ponte, 2008).

According to CYE Consult (2009), exercising power in relationships between firms in the value chain shapes the incentives that drive behavior and determines which and how much actors benefit from participation in an industry. Relationships can range from highly dependent (where one party dominates) to balanced, where all parties involved have some power that they can exercise. Power in commercial relationships is primarily derived from owning the key determinants that drive sales.

Barriers to entry and rent

The value chain is an important construct for understanding the distribution of returns arising from design, production, marketing, coordination and recycling. Essentially, the primary returns accrue to those parties who are able to protect themselves from competition. This ability to insulate activities can be encapsulated by the concept of rent, which arises from the possession of scarce attributes and involves barriers to entry (Kaplinsky and Morris, 2001).

Buyer-driven versus producer-driven value chains

Gereffi (1999) has made the distinction between two types of value chains:

- **Buyer-driven chains** refer to those industries in which large retailers, marketers, and branded manufacturers play the pivotal roles in setting up decentralized production networks in a variety of exporting countries, typically located in the third world. This pattern of trade-led industrialization has become common in labor-intensive, consumer goods industries such as garments and a variety of handicrafts. Production is generally carried out by tiered networks of third world contractors that make finished goods for foreign buyers. The specifications are supplied by the large retailers or marketers that order the goods (Gereffi, 1999).

TABLE 4
Producer-driven and buyer-driven chains compared

	Producer-driven commodity chains	Buyer-driven commodity chains
Drivers of global commodity chains	Industrial capital	Commercial capital
Core competencies	Research & development; production	Design; marketing
Barriers to entry	Economies of scale	Economies of scope
Economic sectors	Consumer durables intermediate goods capital goods	Consumer non-durables
Typical industries	Automobiles; computers; aircraft	Apparel; footwear; toys
Ownership of manufacturing firms	Transnational firms	Local firms, predominantly in developing countries
Main network links	Investment-based	Trade-based
Predominant network structure	Vertical	Horizontal

Source: Gereffi, 1999.

- **Producer-driven chains** describe a world where key producers in the chain, generally commanding vital technologies, play the role of coordinating the various links – producer-driven chains. This is characteristic of capital-and technology-intensive industries such as automobiles. Here producers take responsibility for assisting the efficiency of both their suppliers and their customers (Gereffi, 1999).

2.3 Main components of SSF value chains

A systemic view of value chains

A systemic view of value chains integrates three important levels within a value chain network and allows discovering potentials and bottlenecks within these levels and in the dynamic interactions between them:

Value chain actors. The chain of actors who directly deal with the products, i.e. produce, process, trade and own them. Value chain actors are those who deal directly with the production, processing, packaging, trading etc. of a product. Usually they own the product for a certain time as it travels along the chain (CYE Consult, 2009).

Value chain supporters. The services provided by various actors who never directly deal with the product, but whose services add value to the product. Value chain supporters are people/companies who provide services to the value chain actors such as: improving capacities of producers and small agro-businesses; ensuring access to information, knowledge and know-how and linking numerous, but small producers with markets. However, public and private roles must be clearly defined. Entrepreneurs are partners with a legitimate commercial interest (CYE Consult, 2009).

Value chain influencers. The regulatory framework, policies, infrastructures, etc. (at the local, national and international level). The environment for value chain development is influenced by people, organisations and institutions that are responsible for setting up and managing the regulatory framework. A favourable and enabling business environment provides economic and political stability, ensures low costs for business transactions, and allows for efficient business operations, which lead to greater innovation and creativity (CYE Consult, 2009).

The market both provides for, and restricts, livelihood opportunities for small-scale fishers and market traders. The constraints to market access include weak bargaining power and poor marketing strategies, monopolies among traders, poor product-holding infrastructure, difficulties meeting quality standards and lack of market information. With specialized traders, fishers often have little, if any, control over marketing outlets and the prices that they receive.

Relations and potential inequalities between fishers and traders point to the need to find ways to address these issues in order to increase the return received by fishers and to better sustain fisheries resources (Jacinto and Pomeroy, 2011).

Any value chain operates in an environment which is formed by the macroeconomic landscape, policies and regulations, institutional elements and facilitating services. These elements of the environment, although not directly involved in the production and distribution, do influence the performance of the value chain.

We can distinguish three categories of components in the value chain: end-markets, the business enabling environment and supporting markets. All these components can interact in two different directions: horizontally and vertically.

2.3.1 End markets

Value chains are driven by end markets, and a product or service may have different market channels within an industry. The structure of end markets refer to how end markets work, how large is the buyer pool, how much power do buyers have over producers and whether information exchange takes place within the channel.

Market channels can have various destinations: international wholesalers and retailers, national and local buyers, as well as different markets within one location. In particular, end markets:

- inform on what buyers think about the country (the value chain is being analyzed and the position of value chain *vis-à-vis* the competition);
- allow to understand how much work is needed to place the product into a more competitive posture; and
- define the different opportunities for placing the product in those markets and define the attributes of the product.

Then, analysis is conducted for the industry within the present global market place whether the product is exported or only sold domestically.

From the end markets, we learn about what it takes to compete in the chain from the perspective of quality, size, design information product standards, frequency and speed of delivery and possibly market trends. Chain Information gathered during the data collection is analyzed in terms of the chain's present and potential capacity to respond to end-market specifications.

Stabilizing fish supply: a prerequisite for market development

Jacinto and Pomeroy (2011) argued that it is essential in fisheries to ensure a stable supply before one can successfully engage in market development activities. Amidst this, stabilizing fish supply from small-scale fisheries sufficiently to allow for favourable conditions to undertake market development initiatives is a difficult task. Overfishing, being brought about by heavily subsidized industrial fisheries and a largely fragmented small-scale fisheries sector, points to the probability that future increases in fisheries production would come from aquaculture.

2.3.2 The business enabling environment

Institutional elements may fall into laws, finance, technologies, human development, standards, property rights, research and development (R&D), etc. Such elements influence the performance of the value chain. For instance, R&D institutions are important in coming up with innovations in product development, packaging and other processes that will allow better handling, storage and transport while financial institutions are key vectors for capital loans and investments.

2.3.3 Supporting markets

Supporting markets are key to firm-level upgrading and include finance, business services, and input markets that support the core product market. Supporting markets can be crosscutting or sector-specific and involve embedded business services or value chain finance that flow up and down the chain. They are referred to as markets to indicate that they are commercial and provided by the private sector. Hence, supporting markets does not include government services, donor agencies and donor funded projects that provide business support services unless there is a clear and time-specific exit strategy (CYE Consult, 2009).

The demand for the goods and services that supporting markets provide is derived from the growth of the core value chain. New technologies or technical services can have a substantial effect on the core value chain's competitiveness, even changing the competitive dynamic in certain markets.

2.4 Vertical and horizontal linkages

Inter-firm relationships

Chain analysis looks at how firms interact with each other and how power, learning and benefits are distributed in value chains. Understanding the relationships helps to understand why there are constraints and how and by whom they can be resolved. To understand and measure relationships, we look at the follwing:

- How market power is distributed within a value chain?
- How information and learning flow? Are there learning systems in place? Are association activities geared to knowledge transfer?
- How power, learning and benefits are distributed?
- To what extent are links established between MSEs and businesses at different levels of the value chain and with support markets?

How information and learning take place is crucial to create and sustain competitiveness. It is a pre-condition for upgrading, and learning can impact benefits and incentives. Thus if small producers are to compete and upgrade to respond to market opportunities, chain analysis must focus on whether small producers have access to new skills, know-how and learning on a continuous basis, rather than on a one shot event such as a workshop or a training cycle.

Where do we look to know if learning and acquiring new skills take place on a continuous basis? Initially, knowledge about alternative markets and market opportunities is acquired through horizontal linkages among same line operators. Generally, buyers are not the source of such information.

Where do we look to ascertain if knowledge and skills are acquired about how to produce and deliver a product according to the market standards and requirements? This usually comes from vertical linkages and from buyers.

Regarding relationships between members, it is important to be aware that relationships between members are not only characterized by transactions through which a product/service is transferred from one member to another in return for payment; relationships in value chains are also characterized by a vast exchange of information, knowledge, skills and various embedded services (e.g. loans provided by input suppliers to small producers, training sessions conducted by lead firms, quality control mechanisms, leasing arrangements, provision of equipment and manuals, marketing support, etc.) (United Nations International Labour Organization, 2009). Understanding relationships between members is crucial to know how entry barriers are created and how gains and risks are distributed (Bui Nguyen, 2011).

Vertical linkages

CYE Consult (2009) indicated that vertical linkages in a value chain are defined as the linkages among firms between input or raw material supply and final market distribution. Vertical linkages are critical for getting a product from inception to the market, and for transferring learning and embedded financial and business services from one firm to another along the chain. The efficiency of the transactions between vertically related firms in a value chain affects the entire industry's competitiveness.

Vertical linkage analysis focuses on the degree of cooperative relationships that exist among vertically linked firms up and down the value chain. These relationships can be assessed as being strong, weak, organized, and/or dynamic and can be analyzed in terms of the degree of knowledge sharing, skill transfer and trust foster or hinder growth and expansion of the value chain.

If it is determined that in the studied value chain there is little or no knowledge sharing between producers and collectors/first line traders, or if there is a lack of confidence between the two levels, there are chances transaction costs will be high and the small producer, with little or no information of what the raw product will be used for in the destination market might disregard quality standards. On the other hand, the buyer of the raw product may have a vested interest in helping SME producers and thus inform or provide training to the small producers in meeting production standards requiring new skills. In conducting the analysis, we are looking for signs of win-win or lose-win situations among functional levels and firms.

Horizontal linkages

Horizontal linkages among producers are needed to reduce the transaction costs of working with many small suppliers. For small fishers, they can generate external economies and improve bargaining power. Horizontal linkages can help small firms to generate economies, for example, by buying in bulk or by filling large orders, which can contribute to competitiveness and increase their bargaining power. Horizontal linkages among MSEs can take the form of informal or formal groupings of MSEs, as well as MSE networks that are managed through a third party (such as a lead firm, cooperative, trader, etc.). In order to gain value from horizontal cooperation, it is essential to recognize joint constraints that require collective action.

3. COSTS AND EARNINGS ANALYSIS OF SSFS AND REASONS FOR DIFFERENCES

3.1 Value chain and cost-earnings analysis

Understanding the determinants of income distribution

Value chain analysis can help to explain the growing disjuncture between the global spread of activities and incomes, particularly in a dynamic perspective.

Firstly, by mapping the range of activities in the chain, it provides the capacity to decompose total value chain earnings into the rewards which are achieved by different parties in the chain. In mapping the distribution of income we focus on profits. The greater the barriers to entry, the higher the level of profitability. Profitability is therefore an important window into understanding the pattern of returns in global production networks (Kaplinsky and Morris, 2001).

Secondly, a value chain perspective analyses the way in which particular firms, regions and countries are linked to the global economy. This mode of insertion will determine to a large extent the distributional outcomes of global production systems and the capacity which individual producers have to upgrade their operations and thus to launch themselves onto a path of sustainable income growth. Understanding the determinants of income distribution requires a focus on rents and barriers to entry. Where levels of competition are high, incomes are under threat. The only way in which income growth can be sustained is through an enduring barrier to entry or by the firm, the region or the country developing the dynamic capability to systematically move to activities in which high barriers to entry prevail. The focus in value chain analysis on power relations and institutions explains whose behaviour needs to change if different outcomes are to emerge (Kaplinsky and Morris, 2001).

And, thirdly, by focusing on the institutions which drive international specialisation, value chain analysis identifies the normative levers which can be used to alter these distributional patterns. Value chain analysis does not stop at the level of the firm or groups of firms. It also draws attention to the national system of innovation – the network of institutions which support economic actors. What they do impinges on the competitive performance of firms and groups of firms, and is also subject to the support and regulation provided by governments, whose actions, too, need to be located in value chain analysis (Kaplinsky and Morris, 2001).

Analysis on costs and earnings

After the value chain is mapped, the analysis on costs and earnings should be undertaken. This analysis aims to provide a notion on costs incurred by different actors as well as revenues and profits they earn in return.

Costs are classified into variable or fixed costs. Variable costs are costs that vary in proportion with level of output. On the other hand, fixed costs are costs that are independent of the level of output. In the analysis, shares of cost components are shown, by which activities causing exceptionally high costs could be singled out. In addition, the analysis also presents fluctuations in cost components as well as the total cost. As switching the focus to benefits, the analysis describes changes in revenues over years as well as underlying causes. And by comparing revenues with costs, the analysis reveals how much different actors earn from their businesses (Bui Nguyen, 2011).

The revenue (or retail price) is made up of marketing margins belonging to different actors in the value chain. Marketing margin is the difference between selling price paid by the next stage and purchasing price paid to the previous stage. Marketing margin must cover all costs needed to transfer the product from one stage to the next and a reasonable return to those who perform the job (Shepherd, 2007). Therefore, the marketing margin, showed in percentage, reflects the distribution of revenue to different chain actors.

The total cost of the final product sold to the final customer is composed of added costs incurred by the different chain actors. The added costs are computed by extracting from the total cost the purchasing price paid from the previous level in the value chain. The added costs reflect efforts of different chain actors in adding values to the final product (Bui Nguyen, 2011).

Finally, profit from selling the final product to the final customer includes profits accruing to different chain actors.

3.2 Price linkages in value chains

Price linkages analysis: an approach from the Norad project

The ex-vessel price of fish is ultimately set by the end-user/retail demand for the commodity. Given that the ex-vessel price of fish defines the profits and welfare of fishermen and their communities, it is of interest to enquire as to the link between retail and ex-vessel prices (Bjørndal and Gordon, 2010).

Much of the work in price linkages between producers and retailers is drawn from agricultural economic studies. The standard approach to measuring retail/farm price linkage is based on Gardner's work (1975), where demand and supply functions are specified for both farm and retail sectors, and the equilibrium is solved under general competitive conditions (Bjørndal and Gordon, 2010).

Bjørndal and Gordon (2010) argued that the assumption of perfect competition seems appropriate when applied to setting the ex-vessel price of fish but inappropriate for setting price at the processing-distribution-retailing sector of the fish market. This is due to the fact that in many industrialised countries, few supermarket chains account for more than 80 percent of retail sales in general and fish products in particular.

This notion of non-competitive pricing at the PDR sector of the market may therefore have important welfare implications for fishermen. A study of fish price linkage should account for monopoly/monopsony pricing power at the PDR sector of the market (Bjørndal and Gordon, 2010).

Some other alternative models of price linkage that may be useful to study the price relationship from the vessel to the retail sector do exist. They were summarised by Bjørndal and Gordon in "Notes on Prices and Margins in Fish Marketing" (2010) for NORAD Project.

The ultimate purposes of the price linkages approach is to analyse the factors that determine prices and margins throughout the value-chain as well as the distribution of benefits among the various stakeholders. A possible research strategy for investigating ex-vessel-retail price supply links might be the following (Bjørndal and Gordon, 2010):

1. Identify value chains (countries) and relevant capture and/or farmed products of interest.
2. A value chain analysis to be carried out that identifies for the fisheries sector important government regulations on marketing fish, the market structure from the vessel to either domestic retail or to the export market, identification of 'small-scale' fisheries within this market structure and the fish species of interest.
3. An investigation to be carried out for each value chain that identifies for each segment of the fish supply chain: the type, the quality, the quantity and the time period of data available for analysis.

According to the data available for analysis, such data are used to undertake either a full structural model or a reduced form analysis of ex-vessel-retail price links. It is likely that data would be limited in a time series perspective but could provide a cross-section snap-shot of price links from ex-vessel to export markets or domestic retail outlets (Bjørndal and Gordon, 2010).

The research strategy would proceed under normal research parameters: model development either Structural or Reduced Form, data summary and presentation, econometric modelling, estimation and evaluation, and policy analysis (Bjørndal and Gordon, 2010).

In the case of very limited or no data available to meet requirements of either the Structural or Reduced Form models, it is recommended to collect primary data from source. It is likely that such data would be limited in a time series perspective but could provide a cross-section snap-shot of price links from ex-vessel to export markets or domestic retail outlets. This snap-shot of data and value chain specific

market structure would then be evaluated within the structural and/or reduced form framework previously identified and estimated for other related countries/value chain. The idea would be to combine the available data with general information about the links and parameter estimates in the fish supply chain from other developing countries accounting for changes in the market structure for the country/value chain of interest. In this way, it could be possible to build a model describing the fish supply chain for countries with limited data (Bjørndal and Gordon, 2010)

Project objective

The objective of the project is to achieve a better understanding of the dynamics of relevant value-chains in international fish trade and identify policy recommendations. The project will analyse the distribution of benefits in the value-chain and the linkages between the relative benefits obtained and the design of the chain.

The purpose of the price linkages was to analyse the factors that determine prices and margins throughout the value-chain as well as the distribution of benefits among the various stakeholders. Particular attention had to be given to processing in order to compare the difference in value creation from the export of unprocessed and processed fish.

Three country studies

Japan market

According to Sakai *et al.* (2012), Japanese seafood value chain has typically three markets from producers to consumers: landing market, wholesale market and retail market. This value chain has developed to deal with various fish species and their flexibility of use.

The fisheries agency conducted a research for the seafood value chain in Japan in 2009. The findings have shown that fishers' revenue is 24.7 percent of the retail price while retailers' revenue is 38.5 percent. Indeed, retailers such as supermarkets are said to have a strong market power in the Japanese seafood value chain.

A study was undertaken by NORAD Project in Japan (Sakai *et al.,* 2012) in order to review the market structure of the Japanese seafood value chain using statistical methods. The results have stressed that, in and before 1994, sellers had a stronger power concerning some species and buyers had a stronger power for other species. After 1994, the market power of buyers has apparently increased. The results are consistent with a market observation that retailers obtained a stronger power in Japan after traditional fishmongers were replaced by large supermarkets around 1994.

Spain market

The ex-vessel price of fish defines the profits and welfare of fishermen and their communities and is ultimately set by the end-user/retail demand for the commodity. The demand for fish from the fisherman or fish farmer is derived from demand for the end-user/retail commodity. The impact of a shock to fish landings on retail price will depend on the structure of the relationship between the two sectors.

In the case of Spanish market, by modelling imperfect competition in the processing-distribution-retailing sector, Bjorndal and Fernández-Polanco (2012) have demonstrated that the perfect competitive framework does not fit with the observed data; prices and margins appear to be affected by other variables than ex-vessel price, ex-farm price, retail price, marketing costs, retail demand shifter and supply. These effects vary from one species to another. In addition, there is not a common pricing behavior for all seafood products.

Price linkages are verified in aquaculture species even in markets dominated by far by local production (mussels). Price transmission is more effective in aquaculture than in wild fisheries. Despite the species-related differences, all retail prices are affected at

a larger or shorter extent by import prices more than what they are by local supply. Imports improve price transmission along the value chain.

Imports prevent the rise in wild fishery products prices. Products with a large ratio of imports decrease or stabilize their price. This effect may benefit traders and consumers, but negatively affect fishermen's income.

Prices have shown to be less volatile for retailers than in any other stage of the chain for all species observed. The consequences are improved returns when the price of imported species decreases locally but reduced profits in species with increasing prices.

Bangladesh market

Seafood value chains in Bangladesh are generally long and complex. There are many intermediaries between producers and final consumers of seafood products in the country. The four main types of domestic seafood markets are primary markets located near the source of production, secondary markets located usually in the subdistrict (*upazila*) headquarters, higher secondary markets located in big cities, and terminal markets.

The seafood market structure is not the same for all market levels in Bangladesh; the market appears to be relatively more competitive at the higher secondary-terminal level than in the primary-secondary level. There is a general concern among policy makers that seafood prices may not be proportional along the value chains in Bangladesh.

The objectives of the study undertaken by Sapkota *et al.* (2012) was to examine the causal relationships between wholesalers and retailers; and to compute elasticities of price transmission between wholesale and retail markets, and investigate their asymmetries for five different fish species in Bangladesh.

In most of the cases, we found that the direction of causal relationship was from the retail to the wholesale market. This might be due to the fact that retailers are more organized than wholesalers in the Bangladesh fish market. In such situations, retailers would set the price of the commodity and wholesalers would have to follow the set price.

Unlike previous studies on other agricultural crops, the direction of causal relationships was observed from the retail to the wholesale markets in most of the value chains analyzed indicating that retailers are the price leaders. It further implies that these fish are demand-driven as retail price determines the wholesale price. That is basically due to a lack of organization from the wholesale market compared to the retail one.

The asymmetric price transmission behavior was also analyzed. Results suggest that, in general, the price transmission is mostly symmetric in the short-run while a mix of symmetric and asymmetric in the long-run. But, usually, the characteristics of price asymmetries differ substantially depending on the markets and the species.

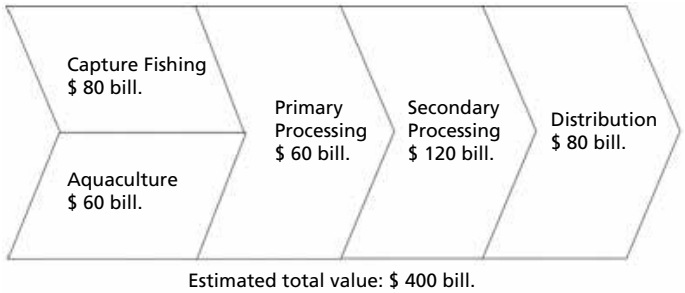
The study found variation in price transmission behaviour between aquaculture and capture fisheries products. For aquaculture products, elasticities of price transmission from retailer to wholesaler were generally greater from increases in price than from decreases in price.

3.3 Revenue distribution through the seafood value chain

The study undertaken by Davidsson (2007) shows that the majority of benefits generated throughout the value chain are captured by the retail, the wholesale and the secondary processing sector of the fish industry and that this trend is shown both in developing and developed countries.

It is useful to compare some value chain analysis. In a FAO study that deals with "revenue distribution through the seafood value chain", four value chains were compared. Results from four different countries (i.e. Morocco, Iceland, Tanzania and Denmark) have been analysed. The objective of this study was to demonstrate how the

FIGURE 2
The seafood industry value chain



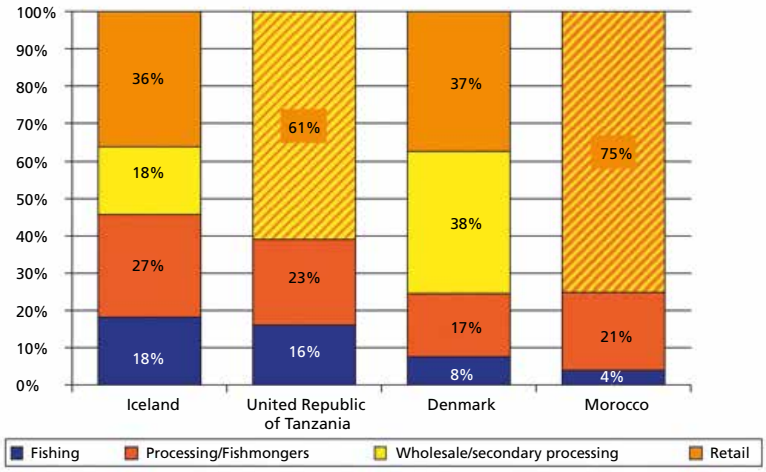
Source: Glitnir Bank.

revenues from seafood trade are distributed over the entire seafood value chain. The value chains were shown to have similar characteristics to value chains for agricultural products where the primary sectors receive a relatively lower share of the retail value of highly processed products and a higher share in less processed and fresh products (Gudmundsson *et al.*, 2006).

The study also revealed that the developing countries seemed to control a relatively lower share of the overall value chain than developed countries. An example is the Icelandic case where Icelandic owned companies control as much as 70 percent of the entire value-chain while Tanzanian and Moroccan companies controlled less than 50 percent (Gudmundsson *et al.*, 2006).

When looking at the value chain for the fisheries sector in Morocco (Figure 3), it quickly becomes apparent that the largest marginal increase in value occurs very early on, at the so-called first sale stage, when the fishermen sell and completely lose ownership of their catches (Sauzade and Rousset, 2013). The Tanzanian fishermen receive about 15 percent of the retail value versus the 19 percent which the Icelandic fishing companies receive (Gudmundsson *et al.*, 2006).

FIGURE 3
Comparison of value chains in four countries



Source: Gudmundsson *et al.*, 2006.

In the Tanzanian case, the retailer absorbs about 60 percent of the overall value in the value chain while in the Icelandic case the retail level represents about 36 percent. This reflects the different structure of the two value chains. Icelandic companies control a bigger share of the value chain than the Tanzanian companies. The Tanzanian

processing sector adds about 18 percent of the overall retail value while the Icelandic processing sector adds 28 percent (Gudmundsson *et al.,* 2006).

Figure 3 shows all four value chains on one graph with two striking differences. First, the Danish and Moroccan harvesting sectors (pelagic fisheries) receive a lower share of the value chain than the Icelandic and the Tanzanian fisheries (demersal fisheries). The Danish harvesting sector receives about 8 percent of the retail value while the Moroccan fishery receives about 4 percent (Gudmundsson *et al.,* 2006).

The Danish and Moroccan primary processing sectors receive 17 and 21 percent respectively. When comparing the secondary processing and retail levels for each country an interesting fact is revealed. In Denmark the retail level adds 38 percent and the secondary processing adds 37 percent of total value to the overall value chain, while in Morocco the retail value adds up to 75 percent of the total value chain. Hence, the Danish processing sector receives a considerably higher portion of the value chain (Gudmundsson *et al*., 2006).

Another interesting comparison is that despite the low quality of some of the data from Morocco and Tanzania the pelagic and demersal industries show similar characteristics in the value chain structure. For pelagic fisheries, the retail and secondary processing sectors combined receive about 75 percent of the retail value while in demersal fisheries this combination represents 55–60 percent of the total retail value (Gudmundsson *et al.,* 2006).

The study also shows that the share in the value chain does not reflect the profitability of firms or well-being of fishermen. The Danish companies in this study seemed to control a larger share of the value chain than their Moroccan counterparts, but this did not ensure profitability of the harvesting sector (Gudmundsson *et al.,* 2006).

3.4 Value added opportunities in the small-scale seafood industry

The sum of the value chain should create a value that is greater than the sum of each individual activity; in other words, it should create a profit margin. Local and regional networks enhance value addition: different institutional end-markets are linked to different forms of coordination and control of value chain.

We first looked at what the customers want, how they want it, and at what price. After all, consumers and producers remain connected along the value chain. Buyer requirements often send a mixed message, due to pressures of management and problems in the work environment.

Some reasons for promoting value added production may consist in higher profits, more stable market conditions, job creation, diversification of products and markets, and down-stream economic benefits through industry support sectors.

However, value chains are not a magic formula to solve all problems in a company. An awareness of common challenges that most fisheries businesses are facing at some stage, helps to position a company to confront its own particular difficulties. Among these key challenges are (Russell and Hanoomanjee, 2012):

- Different locations of fish resources and markets;
- Complex global trading links and patterns of exchange;
- Delivered quality levels and value adding options depend on earlier chain activities;
- Diverse raw materials require transformation and allocation to specialised value chains;
- Satisfying different market needs;
- Chains and activities are interdependent and have a mutual impact;
- Vertical communication networks and chain management; and
- Consumers are the ultimate determinant of value.

Value chain analysis can help maximise profits but it can also identify activities that are not profitable. The main emphasis here is the need for good quality products which

in turn promote a better price on the market. Quality assurance starts right from the time the fish is caught till it reaches the consumer. The need for market information and market research are also very important.

Reducing value losses along the value chain may be a value addition approach which requires anticipating and minimising problems, and planning ahead to maximise value. Some strategies include (Russell and Hanoomanjee, 2012):

- Decrease product variability;
- Improve product quality;
- Streamline administration;
- Reduce handling and movement;
- Improve plant layout;
- Optimise the use of equipment and inputs;
- Improve staff productivity; and
- Reduce damage and theft.

In general, good fisheries management is essential to ensure that fishermen will reap the benefits of higher export prices. Without proper management, increased prices can lead to increased fishing pressures and hence threaten the sustainability of the resource and profitability of fishing companies (Russell and Hanoomanjee, 2012).

4. ANALYSIS OF SMALL-SCALE FISHERIES PRODUCTION THROUGH THE VALUE CHAIN METHOD

4.1 The value chain concept applied to fisheries and aquaculture

4.1.1 What does "value chain" mean?

Value chain definitions

Every enterprise is positioned in a value chain. Generally speaking, a value chain is defined as a sequence of organisations that are involved in production/farming, processing, marketing, distribution, sale, consumption and disposal of consecutive units and steps. As passing through the chain, the product gains some value. The chain of activities as a whole gives the product more added value than the sum of independent activities. The value chain exists if and only if all members in the chain cooperate to deliver maximum value at the lowest possible total cost to the end customer.

CYE Consult (2009) stressed that current theories on value chains show that the discussion focus on how to better create and distribute gains from economic activities, and how to do so in developing countries. This includes questions on how enterprises or regions from developing countries gain access to dynamic markets and to a higher share of value.

Unlike the traditional focus on production, the concept stresses the importance of value addition at each stage, thereby considering production as just one of the value-adding components of the chain. Value chains can be restricted to local markets, but do also expand globally. This is just as true for small and medium-sized enterprises in developing countries as it is for enterprises in Europe and North America (United Nations International Labor Organization).

Using a definition of Kaplinsky and Morris (2001), the value chain describes the full range of activities which are required to bring a product or service from conception through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumer, and final disposal after use (CYE Consult, 2009). In Kaplinsky and Morris' approach, value chain analysis seeks to characterize how chain activities are performed and to understand how value is created and shared among chain participants.

One question could arise: are the value chain and the supply chain different from each other? Hobbs *et al.* (2000) define the value chain as one particular form of the supply chain. In this approach, the supply chain refers to the entire vertical chain of activities: from the on-site production, through processing, distribution and retailing

to the consumer (Nang'ole *et al.,* 2011). Value chain and supply chain are physically the same, because they both overlay the same network of members who are tied up with each other to provide goods or services to the final customers. If we compare the definition of a supply chain with that of a value chain, we may realize that they cover the same things. The idea behind, however, is different. The supply chain, as the name implies, focuses mainly on the costs and efficiencies of supply. The supply chain is meant to bring materials into manufacturing operation and finished products to customers smoothly and economically (Bui Nguyen, 2011).

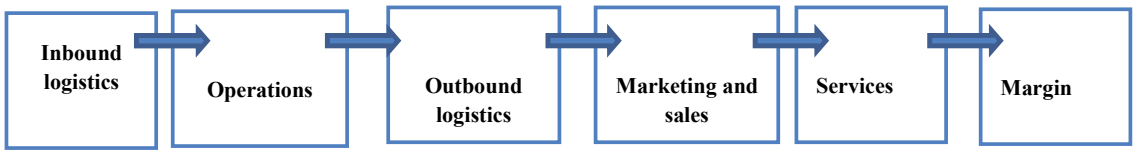
Nang'ole *et al.* (2011) stressed that more recently, the concept of value chain analysis seems to have become synonymous with market analysis in general by including aspects of the horizontal analysis of a set of specific actors at one stage of the chain and the role of policies, institutions and laws in shaping markets. Often, the terms "supply chain" and "value chain" are used interchangeably.

The competitiveness of firms not only depends on the functioning of suppliers and buyers within a cluster, but also and often most importantly, on the entire chain at the national and global levels (CYE Consult, 2009).With the concept of value chain, enterprises are no more treated as a single entity but as a part of an integrated chain of economic functions and linkages across geographic boundaries (Gudmundsson *et al.*, 2006).

Narrow sense versus broad approach

The definition can be interpreted in a narrow or broad sense. In the *narrow sense*, a value chain refers to all activities performed within a firm in order to transform raw materials into a desired product. This definition is attributed to Porter (1985). In his work *Competitive Advantage: Creating and Sustaining Superior Performance*, Porter (1985) developed the so-called modern value chain analysis (VCA) as an instrument for identifying the value of each step of the production. Considering the production of companies, Porter identified primary and support activities that form the chain. Porter also argued that firm activities should be separated in order to identify source of competitiveness. And activities within a firm are categorized into primary and supporting activities. Primary activities fall into inbound logistics, production, outbound logistics, marketing and sales, and after sales services. On the other hand, supporting activities include firm infrastructure of the company, human resource management, technology development and procurement. Porter's value chain has served as a tool assisting management decision and executive strategies (Bui Nguyen, 2011).

FIGURE 4
Porter's generic value chain



Source: Roduner, 2004 quoted in Nang'ole *et al.,* 2011.

The broad approach

The broad approach in contrast does not look at activities conducted by a single firm. Rather, it pays attention to the participation of various members in the chain whose activities are meant to help bring the raw materials to the sale of the final product. Value chain system coined by Porter (1985), which comprises supplier's value chain, firm's value chain, distributor's value chain and buyer's value chain, resembles this broad sense definition (Bui Nguyen, 2011).

Other related concepts

Various chain conceptualizations are mentioned in the literature. All of them deal with the flow of products and services along the chain, relationships between firms and coordination of production chains. There is a considerable overlap between the concept of a value chain and similar concepts used in other contexts. The linkage approach and Porter's value chain constitute the two most influential chain conceptualizations.

The "filière" concept

Another concept which is similar in some respects to the value chain is that of the "*filière*". It is used to describe the flow of physical inputs and services in the production of a final product (a good or a service) and, in terms of its concern with quantitative technical relationships (Kaplinsky and Morris, 2001).The early *filière* analysis emphasised local economic multiplier effects of input-output relations between firms and focused on the efficiency gains resulting from scale economies, transaction, transport costs, etc. The later work gave the modern version of *filière* analysis an additional political economy dimension insofar as it factored in the contributory role of public institutions. However a *filière* tended to appear as static, reflecting relations at a certain point in time. It does not indicate growing or shrinking flows either of commodity or knowledge, nor the rise and fall of actors. Although there is no conceptual reason why this should have been the case, in general *filière* analysis has been applied to the domestic value chain, thus stopping at national boundaries (Kaplinsky and Morris, 2001).

Global commodity chain

Another concept which has been used to describe the value chain is that of global commodity chains, introduced into the literature by Gereffi during the 1990s. As we shall see below, Gereffi's contribution has enabled important advances to be made in the analytical and normative use of the value chain concept, particularly because of its focus on the power relations which are embedded in value chain analysis. By explicitly focusing on the coordination of globally dispersed, but linked, production systems, Gereffi has shown that many chains are characterised by a dominant party (or sometimes parties) who determines the overall character of the chain, and as lead firm(s) becomes responsible for upgrading activities within individual links and coordinating interaction between the links. This is a role of governance, and here a distinction is made between two types of governance: those cases where the coordination is undertaken by buyers ("buyer-driven commodity chains") and those in which producers play the key role ("producer-driven commodity chains") (Kaplinsky and Morris, 2001).

World economic triangle

Other authors (Messner 2002, Humprey/Schmitz 2002) are pointing out that the combination of strong local linkages within global chains might bring upgrading prospects for regions in developing countries. Messner developed the concept of the "world economic triangle", where actors, governance and regulation systems are determining the scopes of action open to regions in the global commodity chains. He determined six critical aspects: actor constellations, interests, power structure, situational mindsets, action orientation and trust (CYE Consult, 2009).

This approach deals with the upgrade of whole regions or clusters through their integration in value chains, that is to say the economic triangle theory links horizontal (cluster development) and vertical approaches (value chain) (CYE Consult, 2009).

4.1.2 Fish value chain

Value chain describes a high-level model of how fishery businesses receive raw materials as input (captures and culture fisheries), add value to the raw materials through various processes and sell finished products to customers (De Silva, 2011).

The same author stressed that value chains for capture and culture fisheries differ from fish to fish and from country to country, and frequently within regions. Value chains of economically important species, such as tuna, salmon, skipjack, shrimp, tilapia, etc. are composed of several nodes and products that pass through longer chains to meet the consumer.

The nature of value chain activities differs greatly in accordance with the types of species and companies. The value chains of companies have undergone many changes in the last two decades due to technological advances facilitating change at a very rapid pace in the business environment. Value chain analysis can help fish export of developing countries to be competitive in the international market (De Silva, 2011).

A relatively new feature of the global supply chain is the emergence of a third country processor – a country to which nations export unprocessed products simply to become processed, only to have those products re-exported (Roheim, 2008). The main countries performing this role are China and Thailand. A growing and significant amount of fish is exported to China post-harvest, processed, then re-exported around the globe (De Silva, 2011).

4.1.3 Value chain analysis

What is value chain analysis?

Value chain analysis (VCA) is a method for accounting and presenting the value that is created in a product or service as it is transformed from raw inputs to a final product consumed by end users. Value chain analysis is about identifying the full set of economic costs along the value chain, to determine where and how much value is added and what is the relative importance of the different actors (i.e. the formal and informal governance structure) (CYE Consult, 2009). It gives an overview of the available services and the supporting institutional framework.

In practice, it is important to define what you must know, what you do not need to know and what you cannot know. Checking the reliability of data and filtering out the essential information will be one of the main challenges of any practice-oriented value chain analysis. Perfectionism is counterproductive. For value chain analysis, there are many methodologies/steps offered by authors throughout the globe that are similar and different at the same time (CYE Consult, 2009).

The value chain analysis process is a systematic approach to improve the growth potential of value chains with large numbers of small firms, to enhance small firm contributions to value chain growth and to insure benefits to small firms. The process allows us to identify end market opportunities, constraints related to those opportunities, and to understand the factors and conditions under which individual firms and the value chain as a whole can achieve higher levels of performance.

A value chain approach helps us understand the obstacles to accelerated growth and poverty reduction, and it helps us to identify where the highest value opportunities for investment (human and capital investments) are located to improve industry performance. It also identifies the constraints to the success of those investments. Finally, an analysis can help donors target their resources to where they will leverage the greatest impact on growth.

The value chain is an important construct for understanding the distribution of returns arising from design, production, marketing, coordination and recycling. Essentially, the primary returns accrue to those parties who are able to protect themselves from competition. This ability to insulate activities can be encapsulated by the concept of rent, which arises from the possession of scarce attributes and involves barriers to entry (Kaplinsky and Morris, 2001).

Another consideration which helps transform the value chain from a heuristic to an analytical concept is that the various activities in the chain – within firms and in the division of labour between firms – are subject to what Gereffi has usefully termed

"governance" (Gereffi, 1994). Value chains are governed when parameters requiring product, process, and logistic qualification are set which have consequences up or down the value chain encompassing bundles of activities, actors, roles, and functions (Kaplinsky and Morris, 2001).

A value chain perspective of the small-scale fisheries sector

Capture-fisheries feed into diverse and spatially extensive networks of supply and trade that connect production with consumers, adding significant value and generating important levels of employment (the value chain). To some extent, value chain analysis can be used to provide an important mediation and buffering function to increasing variability in supply and source location, but direct impacts will also affect its ability to do so. This approach can also be used to reduce vulnerability and increase adaptive capacities of fishers and fishing households (Jacinto and Pomeroy, 2011).

The value chain encompasses many economic agents (individuals, companies, government). From the perspective of the value chain, it is relatively unimportant how impacts are distributed among the economic agents that comprise it. As a result, value chain analyses do not have to address many of the difficult policy decisions that determine how impacts are distributed. The value chain perspective is important because it offers insights that would not surface in studies focused on individual economic agents or particular policy frameworks. A value chain analysis can also uncover insights into the challenges that face the sector as a result of different drivers of change, such as climate change, including small firms' and fishers' competitiveness in changing markets (Jacinto and Pomeroy, 2011).

A value chain perspective of the small-scale fisheries sector can reveal response strategies that enhance the sustainability and competitiveness of the entire value chain and the economic agents that comprise it. Value chain analysis helps effectively isolate the binding constraints that constantly affect the sector. The set of issues that emerge from such a detailed analysis at a sector level has implications for both the public and private sectors. Some of the issues are sector-specific, and others are relevant across an economy and apply to many sectors and firms in a country. It also provides an opportunity to find policy positions that can be supported by the different economic agents and important stakeholders of the sector (Jacinto and Pomeroy, 2011).

Value chain approach

The value chain approach can apply to whole supply chains and distribution networks. By exploiting the upstream and downstream information along the value chain, the firms may try to bypass the intermediaries by creating new business models, or in other ways enhancing improvements in its value system (CYE Consult, 2009).

However, the world of production and exchange is complex and heterogeneous. Not only do value chains differ (both within and between sectors), but they also differ within national and local contexts. There is therefore no mechanical way of applying value chain methodology; each chain will have particular characteristics, whose distinctiveness and wider relevance can only be effectively captured and analysed though an understanding of the broader issues involved (Jacinto and Pomeroy, 2011).

4.1.4 A model of a value chain analysis

A value chain is both an analytical and an operational model. The model illustrates the fact that a product is rarely directly consumed at its production place. It is transformed, combined with other products, transported, packaged, displayed etc. until it reaches the final consumer. In this process the raw materials, intermediate products and final products are handled by various actors who are linked by trade and services, and each add value to the product. Various types of public and private services are as important as favourable framework conditions (CYE Consult, 2009).

The value chain model assumes that by understanding these interactions, it is possible for private and public agencies (including development agencies) to identify points of intervention to:

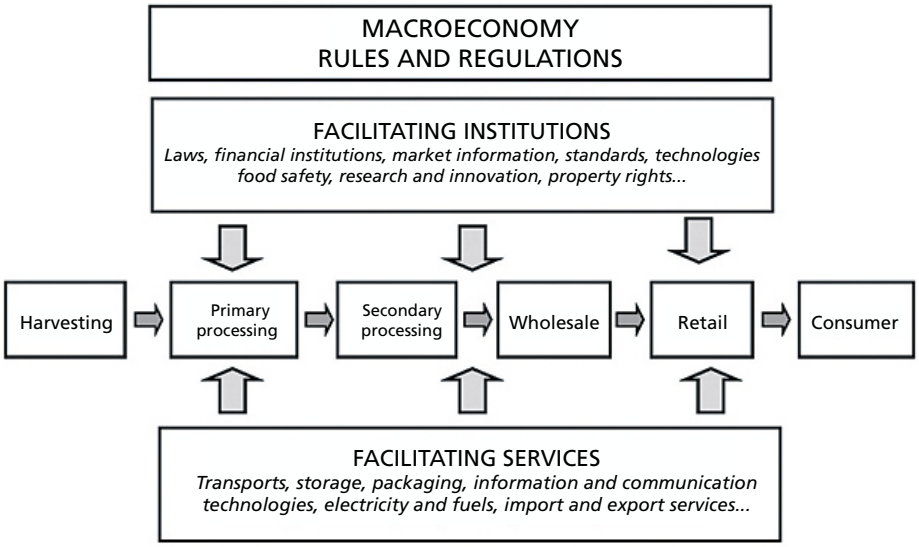
- increase efficiency and thereby increase total generated value, and
- improve the competence of intended actors to increase their share of the total generated value (CYE Consult, 2009).

Value chains are complex, and particularly in the middle tiers, individual firms may feed into a variety of chains. Which chains are the subject of enquiry therefore very much depends on the point of entry for the research inquiry. In each case, the point of entry will define which links and which activities in the chain are the subject of special enquiry. The entry point and the concentration of the value chain analysis are directly related to the desired development outcome from supporting the value chain (Jacinto and Pomeroy, 2011). For example, one key entry point that could be used is the impact of the development and operation of the small-scale fisheries value chain on food security and poverty resulting from climate change.

Jacinto and Pomeroy (2011) suggested that the methodology should address the following issues, and begin with the understanding of the nature of end markets, which are increasingly the driver in many value chains:

- the point of entry for value chain analysis;
- mapping value chains;
- product segments and critical success factors in end markets;
- how producers access end markets;
- benchmarking production efficiency;
- governance of value chains;
- upgrading in value chains; and
- distribution issues.

FIGURE 5
The value chain analysis



Source: Adapted from United Nations Industrial Development Organization (2009): Agro-value chain analysis and development.

Kaplinsky and Morris (2001) stress that there is no "correct" way to perform a value chain analysis: rather, the approach taken fundamentally rests upon the research question that is being answered. Nonetheless, four aspects of value chain analysis as applied to agriculture are particularly noteworthy (Jacinto and Pomeroy, 2011):

1. At its most basic level, a value-chain analysis systematically maps the economic agents participating in the production, distribution, marketing and sales of a particular product (or products). This mapping assesses the characteristics of economic agents, profit and cost structures, flows of goods throughout the chain, employment characteristics and the destination and volumes of domestic and foreign sales (Kaplinsky and Morris, 2001).

2. Value chain analysis can play a key role in identifying the distribution of the economic agents' benefits in the chain. That is to say, through the analysis of margins and profits within the chain. This is particularly important in the context of developing countries (and fisheries in particular), given that the poor in particular are vulnerable to the process of globalization (Kaplinsky and Morris, 2001).

3. Value chain analysis can be used to examine the role of the upgrade within the chain. An analysis of the upgrading process includes an assessment of the actors' profitability within the chain, as well as information on current constraints. Governance issues play a key role in defining how such upgrading occurs. In addition, the structure of regulations, entry barriers, trade restrictions and standards can further shape and influence the environment in which upgrading can take place (Jacinto and Pomeroy, 2011).

4. Value chain analysis can highlight the role of governance in the value chain. Governance in a value chain refers to the structure of relationships and coordination mechanisms that exist between economic agents in that value chain. Governance is important from a policy perspective through identification of the institutional arrangements that may need to be targeted to improve capabilities in the value chain, remedy distributional distortions and increase value added in the sector (Jacinto and Pomeroy, 2011).

4.2 Main steps in value chain analysis

4.2.1 Methodology for undertaking Value Chain analysis

Kaplinsky and Morris (2001) stressed that the world of production and exchange that we are observing is complex and heterogeneous. So there is no mechanical way of applying a value chain methodology. Every chain will have particular characteristics. The methodology outlined in the next sections will address the following issues, and begins with understanding the nature of the end markets, which are increasingly the drivers in many value chains (Kaplinsky and Morris, 2001):

1. The point of entry for value chain analysis ;
2. Data collection;
3. Mapping value chains;
4. Product segments and Critical Success Factor's in end markets;
5. How producers access end markets;
6. Benchmarking production efficiency;
7. Governance of value chains;
8. Upgrading in value chains; and
9. Distributional issues.

1. The point of entry for value chain analysis

Which chain – or chains – is/are the subject of enquiry therefore very much depends on the point of entry for the research enquiry. Some possible points of entry reflecting concerns are: the global distribution of income, small-scale fishermen and firms, women, etc. In each case, the point of entry will define which links and which activities in the chain are to be the subjects of a special enquiry (Kaplinsky and Morris, 2001).

2. Data collection

Collecting data about a value chain includes gathering information from chain participants (firms, individual, stakeholders); about their functions and the quality of their relations; about the factors that affect the performance of the industry such as

the business enabling environment, end markets, supporting markets and inter-firm linkages; and about the presence or lack of investments to upgrading the value chain product or service.

3. Mapping value chains

"Having identified the value chain in question, the task is then to put numbers and values to the variables under investigation. It is crucial to choose which dimensions are to be mapped, based on available resources, the scope and objectives of the value chain analysis and the mandate of the organization" (*Making value chains work better for the poor,* 2008). Regardless of what choices are made, the following dimensions are necessary and therefore should be mapped to provide an overview of the studied value chain (Bui Nguyen, 2011):

- What are the core processes through which the product has to pass in order to reach the final customers?
- Who are the actors directly involved in such processes?
- The product flow has to be identified. The product flow will reflect the story of the product life.
- In addition to internal actors directly involved in the core processes, there are external actors indirectly involved who have an impact on the performance of the chain in one way or another.
- When mapping services feeding into the value chain, it is worth keeping in mind that services could be classified among transactional services and embedded services. The value chain map will include the initial identification of difficulties experienced by different actors in the value chain while performing their functions (Bui Nguyen, 2011).

Constructing a value chain map starts with a rough map. Then, when performing the value chain analysis, more information is gathered and added to the map to make it more detailed. Mapping a chain means creating a visual representation of the connections between businesses in value chains as well as other market players (United Nations International Labor Organization, 2009). Value chains can become complex when they reflect multi-stage production systems with multiple types of firms operating in different locations in one country or multiple countries around the world (CYE Consult, 2009).

4. Product segments and critical success factors in end markets

It will almost always be important to decompose the end market in the value chain into different market segments. Contemporary global markets include a number of segments and key characteristics which will need to be analysed to understand value chain dynamics. These market characteristics are referred to as Critical Success Factors (CSFs). Not only are markets increasingly segmented, with each segment having distinctive combinations of CSFs, but they are also increasingly volatile. The Critical Success Factors in each market can be readily grouped into those factors which are "order qualifying" (which means that producers need to achieve these in order to participate in these markets), and those which are "order winning" (i.e. these are the critical factors which lead particular firms to succeed, by selling at a premium price for example) (Kaplinsky and Morris, 2001).

5. How producers access end markets

From the perspective of value chain analysis, the key issues to analyse are:

- The identification of the key buyers in a particular chain;
- The dynamics of the buying function;
- The critical success factors which these buyers exercise;
- The strategic judgements buyers will often have about specific sources of supply;
- The supply chain management policies; and
- The supply chain upgrading policies.

6. Benchmarking production efficiency

Once the dynamic nature of end markets and the ways producers enter these markets are mapped, it is then necessary to analyse the productive efficiency of different parties in the value chain. This is referred to as "benchmarking". The key drivers for this chain are cost competitiveness, quality, lead times to satisfy customer orders, the capacity to make changes, etc. Meeting each of these market drivers requires operational practices, and will be reflected in performance outcomes; both these performance outcomes and practices can be benchmarked (Kaplinsky and Morris, 2001).

7. Governance of value chains

The extent of chain power may be related in complicated ways to the relative size of a particular firm in the chain. In general, the larger the firm, the more influential its role. There are a number of possibilities, the most important being the share of sales, added value, profits, relative rate of profit and buying power; the control over a key technology and distinctive competence, the holder of chain "market identity" (Kaplinsky and Morris, 2001). These indicators are important and will be contingent on the characteristics of a particular chain and the question being pursued. But it will also be important to distinguish the territory of the enquiry, that is to say whether the relevant size is indicated by the firm's share of global, national or local activities (Kaplinsky and Morris, 2001).

8. Upgrading in value chains

Value chain analysis is essential for developing an upgrading strategy. It includes the assessment of the factors that affect value chain performance, including tangible constraints such as access to finance, technology and markets, and less tangible dynamics that involve the nature of relationships and incentives that can equally constrain competitiveness. Understanding how industries in which MSEs participate can become more competitive requires a systemic view of the markets, industries, and firms. The value chain framework ensures both systematic and systemic analysis of the value chain and the factors and relationships affecting its competitiveness (CYE Consult, 2009).

The four forms of upgrading are related to:

- Improvements in process, either within a firm, or as a result of a series of linked actions in the relationships between firms;
- Improvements in product, either within a firm, or as a result of a series of linked actions in the relationships between firms;
- Changing functional positions, by adjusting activities undertaken within a particular link, or moving to activities taking place in other links; and
- Moving out of the value chain, into a new value chain.

9. Distribution issues

Distribution has both power and income components. The former concerns the balance of leverage which different parties have in determining the distribution of who does what in the chain and the returns which accrue to different parties. It is necessary to work through the following components of value chain analysis (Kaplinsky and Morris, 2001):

- What are the different forms of rents and barriers to entry which are the underlying determinants of the distribution of the returns from global production chains?
- In what circumstances value added and turnover data are relevant for the analysis?
- How is profitability measured, and are profits an appropriate measure of distributional outcomes?
- The geographical dimensions of value chain distribution – global, national and local
- Decomposing income streams – class, income groups, gender and ethnicity.

- How can a knowledge focus be incorporated into the analysis, opening up the distribution between skills?
- How do SMEs fit into global value chains?

4.2.2 Information to be collected in fish and aquaculture value chain analysis: the NORAD project approach

A value chain analysis, providing both qualitative and quantitative background information, is to be undertaken for all products included in the project before an econometric analysis is undertaken. Sources of information for this analysis may include secondary data, published or unpublished literature, surveys, focus groups, and rapid appraisal. The value chain analysis will include the following stages (Bjørndal, 2010):

1. Production: capture fishery or aquaculture.This will include information on whether it is capture fishery or aquaculture, freshwater or marine, production quantity, price and technology/technologies used in the harvest process. How many people are directly employed in the production sector? What information is available on relative incomes of fishermen/fish farmers and the non-fishing sector and how has this changed overtime? Are there fishermen's associations to support fishermen/fish farmers in discussions with government, regulators and buyers? What is the structure of fisheries management? Is it open access, licenses, net size regulations, etc.? How are regulations enforced? For capture fisheries, stock information must be included (Bjørndal, 2010).

2. Processing. This will include information about products (e.g. fresh, salted, dried, canned, refrigerated or frozen), technology/technologies used, major inputs and costs. How many people work in the processing sector? What proportion of catch is processed in the region and what proportion is sold out of the region or exported for processing? (Bjørndal, 2010).

3. Transportation. This will include pre and post processing transportation, where applicable. Two parameters are relevant: first, how important is transportation in the fish supply chain and second, what is the cost of transportation and how has this changed over time. Is transportation a public or private business matter (Bjørndal, 2010)?

4. Final consumption. What portion of the product is sold domestically versus exported? This includes information about what kind of products are sold in the different markets (Bjørndal, 2010).

5. Regulations. This would include fisheries management regulations for capture fisheries, entry/environmental regulations for fish farms, sanitary/health regulations, tariffs and non-tariff barriers to trade etc. Also what regulations are imposed on the sale of fish? Are there restrictions on who can buy and sell fish? (Bjørndal, 2010).

6. Market structure. The product will be traded at each stage of the value chain (first hand market, intermediate market, export market, retail market etc.). It is important to learn about market structure at different stages, in particular, how many buyers and sellers there are. How are prices determined? Are fish sold under contract or in auction? In addition, information about substitutes is required (Bjørndal, 2010).

7. Data availability. This must give an overview of data availability (variables, length of time series etc.) at the different stages of the value chain. For this section, follow the data requirements of both the structural and reduced form models as set out in Bjørndal and Gordon (2010). Some products will go through different types of processing. An example is given by tuna from the Maldives. This product will involve limited processing in the Maldives before export to Sri Lanka or Thailand, where it is canned prior to export to overseas markets. Where this is the case, the product must be followed throughout its lifecycle (Bjørndal, 2010).

As pointed out, this background analysis will partly be qualitative and partly quantitative. The purpose is to give the reader a good understanding of the relevant

value chain. It will also be important for interpreting the results from the econometric price analyses (Bjørndal, 2010).

4.2.3 Dynamics analysis

Value chains constantly evolve and can rapidly change. Therefore any value chain analysis faces the limitation of providing a static picture, a snapshot at one moment in time. Development practitioners must learn to use analytical tools that help them understand the dynamics and tendencies (CYE Consult, 2009).

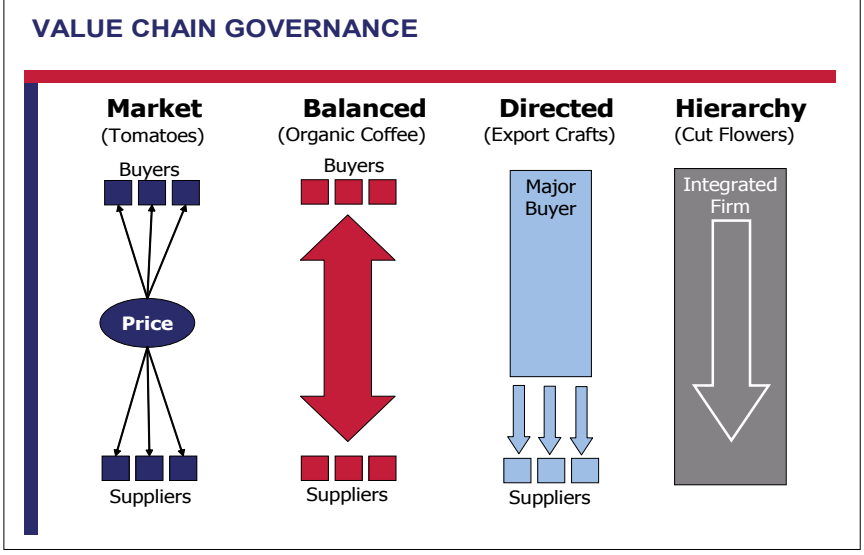
The dynamics of the value chain include the determinant elements based on the individual's and the firm's behavior and functioning within the chain; of how power, learning and benefits are distributed. They include VC governance, inter-firm relationships, upgrading and information exchange.

Value chain governance

A distinguishing dimension of value chain analysis is the emphasis not only on the dynamics of end markets but also on the importance of understanding the dynamics and shifts in relationships. How a value chain is managed or coordinated and what is the degree of power between buyers and sellers defines the "governance structure" of a chain. When conducting a value chain analysis, we must identify and understand the type of "governance structures," as it will significantly determine the nature of interventions selected to increase competitiveness.

The figure below illustrates at least four different governance types, followed by a description of each:

FIGURE 6



1. Example 1 describes market-based relationships, which are characterized by transactions in which there is little power difference between buyers and sellers. Exchange of goods and services are negotiated daily on the basis of the market price. There is little information exchange and learning from the interaction. It is an "arm's length" transaction. There is little or no formal cooperation among participants.
2. Example 2 describes a more balanced governance in which decision-making is fairly equal among the participants. The relationships usually create mutual dependence. There is cooperation among buyers and sellers and no one dominates over the other.

3. In Example 3, a "directed" relationship is typical where small suppliers (in this case craft products) are transactional-dependent on much larger buyers. The supplier is "controlled" by one or several lead firm who determine product specifications and trade rules. We should determine whether the supplier is "captive" to the buyer by his/her cost of shifting to another firm.
4. The governance on the right (Example 4) is when the value chain has a dominant player who sets or controls various functions along the chain and may want to govern the chain. The lead firm determines the overall character of the chain and can be a vertically integrated enterprise.

In conducting the value chain analysis, we must understand the relationships between lead firms and local producers and the opportunities and constraints that result from SME or even MSE entering such a relationship.

Inter-firm relationships – embedded in vertical and horizontal linkages

To understand and measure relationships we look at how market power is distributed within a value chain and how information and learning flow.

- How power, learning and benefits are distributed? To what extent are links established between MSEs and businesses at different levels of the value chain and with support markets?
- How information and learning takes place is crucial to create and sustain competitiveness. It is a pre-condition for upgrading, and learning can effect benefits and incentives. Therefore, if small producers are to compete and upgrade to respond to market opportunities, chain analysis must look to see if small producers have access to new skills, know-how and learning on a continuous basis, rather than on a one shot event such as a workshop or a training cycle.
- How do we know if learning and acquiring new skills take place on a continuous basis? Initially, knowledge about alternative markets and market opportunities is acquired through horizontal linkages among same line operators. In general, buyers are not the source of such information.
- How do we know if knowledge and skills are acquired about how to produce and deliver a product according to the market standards and requirements? This usually comes from through vertical linkages and usually from buyers.

Upgrading – Incentives, risks and benefits

Upgrading is the process sought for firms and value chains to increase their competitiveness and to impact in a positive manner social development. In value chain analysis, we must find if there are catalysts to firm and chain upgrading. The starting points are where learning takes place, and if it takes place, are there indicators that learning is continuous?

Learning is a precondition to upgrading at the firm level, and continuous learning comes from fostering improved vertical and horizontal relationships between buyers and sellers. We need to know if improvement in these inter-firm relations is taking place within the chain.

Learning can improve benefits, and benefits over time can change power. Benefits create incentives (or disincentives) for upgrading and thus affect competitiveness.

Information exchange

Value chain analysis must determine where learning comes from over time. If buyers are the catalysts for change and learning, is there evidence that some buyers are pushing for change and learning? What drives them to push and can it be replicated?

If input suppliers are the sources of information, is there evidence that they are providing reliable and transparent information? What would drive them to become agents for product information dissemination?

If traders are to be disseminators of innovation and new products, is there evidence from interviews that they are fulfilling these tasks? What incentives would entice traders to share product and technical innovation?

If service providers are to contribute to learning at different levels of the chain, is there evidence that value chain firms are hiring them as trainers or consultants, and have the firms become repeat customers of the service provider? In a market system, what is missing to increase sector specific or cross-cutting presence of service providers in the value chain?

To sum up, relationships among actors in a value chain are important because relationships can be improved without creating market distortions, and can be modified through effective leadership, incentives, increased knowledge sharing and trust building that increase benefits not only to SMEs trying to participate and gain more from the value chain, but will drive enterprises to move into higher value added activities.

4.3 Value chain upgrading

Definition

Value chain analysis reviews activities and services that are required to bring a product or service from inception to end markets. It helps design interventions to increase competitiveness while ensuring the equitable distribution of the benefits from growth. It is particularly useful in creating a private sector driven vision for change, and a plan to reach that vision.

In value chain analysis, upgrading is used to identify the possibilities for producers to 'move up the value chain', either by shifting to more rewarding functional positions, or by making products that have more value-added invested in them, and that can provide better returns to producers. In the value chain approach, the upgrading process is examined through the lenses of how knowledge and information flow within value chains from "lead firms" to their suppliers (or buyers) (Gereffi, 1999).

Value chain development is a multiple and participatory process that leads to coordinated interventions. It has the enormous advantage of bringing together stakeholders from different production stages and sectors, to create a productive and innovative dialogue and to draw the attention to "collective competitiveness" (CYE Consult, 2009). Upgrading is the process sought for firms and value chains to increase their competitiveness and to impact in a positive manner social development.

Different types of upgrading

Firm-level upgrading refers to changes made by firms to improve their competitiveness through product development and improvements in production techniques or processes. Firm-level upgrading requires access to information, technology and capital or finance. Product development and improvements in production processes are essential to support competitiveness while enabling firms to meet the market's constant demand for innovation (CYE Consult, 2009).

However, we need to look at the upgrading challenge in a wider perspective, capturing the central idea that it may bring about changes in the nature and mix of activities, both within each link in the chain, and in the distribution of intra-chain activities. This relates both to the achievement of new product and process development, and in the functional reconfiguration of who does what in the chain as a whole.

Hence, upgrading is about acquiring capabilities and accessing new market segments through participating in particular chains (Humphrey and Schmitz, 2002b). Humphrey and Schmitz (2002a) have developed a typology of upgrading based on four categories, which are less conspicuous improvements that may in fact be the most common forms of upgrading among poorer producers (Ponte, 2008):

1. Process upgrading: achieving a more efficient transformation of inputs into outputs through the reorganisation of productive activities (Ponte, 2008).

2. Product upgrading: introducing new products or improving old products faster than competitors. This implies changing new product development processes both within individual links in the value chain and in the relationship between different chain links;

3. Functional upgrading: increasing value added by changing the mix of activities conducted within the firm or moving the activities location to different links in the value chain; and

4. Inter-chain upgrading: applying competences acquired in one function of a chain and using them in a different sector/chain.

Although functional upgrading continues to be regarded by global value chain analysts as the optimal form that developing country farms and firms can achieve, attention has also been paid to the practical difficulties lying in its path (Gibbon 2001; Gibbon and Ponte 2005; Schmitz and Knorriga, 1999) and to the fact that functional downgrading, combined with economies of scale, can also be successfully employed to maximise returns or to remain in an increasingly demanding GVC (Ponte, 2008).

The role of learning and innovation

Learning and innovation are essential to create and support an industry competitive advantage since industry upgrading depends on knowledge of what the market requires and the potential returns on investments in upgrading. It is essential that learning and innovation flow through the value chain in order to optimize these returns. The most competitive industries are those that institutionalize learning mechanisms. However, even with strong incentives to limit learning and innovation, fostering access to a new market (typically requiring a change in product or process) or new support markets that deliver new technology can substantially shift the learning dynamic (CYE Consult, 2009).

Benefits are closely related to power relationships and learning. In the context of MSEs development, benefits are much broader than just increases in income, although that is an important part of the equation. The distribution of benefits depends also on the strength of a value chain infrastructure, which means the quality of the business enabling environment, the number and nature of vertical linkages, the effectiveness of cooperation to address joint constraints, and the depth and robustness of support markets (CYE Consult, 2009).

Fish value chain upgrading policies

In fish production, capture fisheries as well as fish farming, a large share is carried out by the small-scale sector. It is therefore of crucial importance to build policies that promote the interests of the small-scale producers not only by enabling them to access national, regional and/or international markets but also to obtain prices and margins that let them achieve long-term sustainability from an economic, social and biological resource perspective.

In the fisheries sector, the value chain approach is relatively new. It targets one chain, often starting with one project or enterprise in one location. The value chain approach can be well suited to contribute to local economic development. It enhances the analysis of specific constraints experienced by fishers, processors, cooperatives,

etc. and solutions not merely focus on business development, but in recent years also address networking, social, institutional and environment issues and/or micro finance (CYE Consult, 2009).

According to Jacinto and Pomeroy (2011), small-scale fishers need to strengthen their organizations for resource management and market development. They also need to identify and examine the types of markets with which they can engage and benefit from.

Value chains can provide the poorest segments of the population with opportunities of creating new markets if supported and managed in a targeted manner. Moreover, the value chain approach takes into consideration that the small, medium and micro enterprises (SMMEs) often have a different (less empowered) position in the value chains than the other actors. Through value chain analysis, this position can be analyzed and opportunities for strengthening their position in the chain can be explored and hence contribute to improve livelihoods and local economic development (CYE Consult, 2009).

Developing countries face tremendous challenges and competition for economic growth due to the economic liberalization worldwide. The effects of globalization and liberalization are creating exclusive supply chains between preferred business partners, with serious effects on local economies in developing countries. A holistic approach is therefore needed to protect and include smallholder producers in integrated supply chains to support poverty reduction, food security and sustainable livelihoods (CYE Consult, 2009). Hence, a strong business environment based on sound institutions and policies is a necessary basis for enhanced competitiveness of private firms.

Building mutually beneficial relations among the various actors in the value chain while maintaining priority on improving the livelihoods of small-scale fishers can start from the hypothesis, on the part of small-scale fishers and their support organizations, that traders can be potential partners rather than being the adversaries in a zerosum game (Jacinto and Pomeroy, 2011).

Traders play necessary roles in the functioning of value chains, such as helping to develop consumer markets, providing financial services and adding value to fishery products. On occasion they bear more risks than primary producers'spoilage, low prices in consumer markers, non-payment of loans -and in the course of trading operations devise means to manage and mitigate such events. The margins that they obtain in the markets should be appraised in the light of these risks, as well as the costs they incur and the services they provide (Jacinto and Pomeroy, 2011).

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Enhancing small-scale fisheries value chains in the Mediterranean and Black Sea: Part 2

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INTRODUCTION

The maintenance of small-scale fleets is a widespread policy objective in many countries. In fact, small-scale fisheries contribute about half of global fish catches and employ over 90 percent of the world's capture fishers and fishworkers; considering also fish processing and other related jobs, about half of the persons employed are women (FAO, 2013). In many marginalized coastal areas of the world, small-scale fisheries represent a key economic activity of direct and indirect employment and provide nutritious food for local population. Furthermore they tend to be strongly anchored in local communities, reflecting often historic links to adjacent fishery resources, traditions and values, and supporting social cohesion. In contrast, in some regions, such as in EU, regional income and employment generated by small-scale fisheries is very low compared to the other economic sectors (Macfadyen *et al.,* 2011).

Despite the marginal impact on the economy and the general trends indicating that fishing activity (especially small-scale fisheries) is decreasing in EU, the recognition of the social and cultural role of small-scale fishers was explicitly included in the European Commission's Green Paper on the reform of the common fisheries policy (CFP). On the other hand, existing data (Sacchi, 2011) seem to indicate that the fleets of Middle Eastern and North African countries have tended to grow, in line with the development policies of these countries.

Actually, knowledge on small-scale fisheries is still limited, especially in the case of non-EU countries. In the EU, however, few case studies have been well documented, while most of the statistics can show only limited and aggregated indices of production and effort. Thus, we can see that the EU small-scale fleet has declined by 20 percent in terms of numbers of vessels over the last 10 years, to just over 70 000 vessels. Greece (23 percent), Spain (11.3 percent), Portugal (11 percent), Italy (13.3 percent) and France (8.8 percent) account for the largest share of the total small-scale fleet (Macfadyen *et al.,* 2011).

The total value of landings of the fisheries sector in EU-27 was estimated at about euro 7.9 billion, of which euro 2.1 billion (27 percent) was produced by small-scale fisheries. Between 2006 and 2008, small-scale fisheries employed on average around 90 000 people, compared to some 78 000 on board of vessels over 12 meters of length overall. The average value of landings per person employed was about euro 23 000, while the larger vessels achieved a turnover of euro 75 000 per employed person. This seems to indicate that part-time employment is quite widespread within the small-scale fleet (Macfadyen *et al.,* 2011).

There are not many information about complementary activities carried out by the fishers; one useful source is the FAO regional project CopeMed[1], which produced a comprehensive listing of all the communities performing artisanal fisheries in the western and central Mediterranean including their localization, description, practices, pictures and some other ancillary information (Coppola, 2006). This study reports that Mediterranean artisanal fishers fish mostly throughout the year; more than half of them (54.4 percent) reported no interruptions in their activity. On the other hand, in many cases, fishing is not the only activity carried out by fishers, as in Nador Lagoon (Morocco) where some work in the field of agriculture, or in Dikky (Morocco), where a cooperative of fishers-beekeepers has been created, while a specific project has been developed for women groups in fishing correlated activities (sardines processing) or in independent activities (weaving).

Aggregate EU statistics also indicate that most of the vessels below 12 meters of length overall use passive gear (about 73 percent); differences however can be significant from a country to another. The use of passive gear is generally considered important to reduce the negative impacts of fisheries on the environment (i.e. by-catches and effects on sea bottom). In this perspective small-scale fisheries have a positive ecological function compared to other fisheries.

A study realized for the EU Commission (Ifremer coord. 2007) on nine small-scale fisheries, of which only two are from the Mediterranean Sea (one in Greece[2] and the other in Corsica[3]), can provide some more detailed data:

The average age of vessels is 23 years (25 in Greece, 26 in Corsica), that is just a little higher than large scale vessels in the same areas (22 years)

The average crew is 2 (1.8 in Greece, 1.3 in Corsica), compared to 5.3 for large scale vessels in the same areas.

The average age of a vessel owner is 46 (52.3 in Greece, 49.1 in France), higher than in large scale fisheries in the same areas (42.9).

The average gross revenue per boat is €61 000, but it is extremely variable, depending on the fisheries (in Greece €7 000-25 000 depending on the vessel size); in the same areas revenue for large scale vessels is €356 000.

Contrary to expectation, the multispecificity of EU small-scale fisheries (always considering the 9 cases of Ifremer coord. 2007) is limited; all extra-Mediterranean cases rely on 1-3 species (number of species representing 70 percent of the revenue), and only for the cases in Greece and Corsica, the fisheries rely on 8 and 5 species respectively.

Plan Bleu (Sacchi, 2011), collecting several international and national sources, stated that the total number of small-scale vessels in the Mediterranean Sea (including EU and non-EU States, Black Sea is not taken into account) in 2008 was 68 100 (83 percent of total vessels), with the largest fleets in Greece, Tunisia, Italy and Turkey (together they represent 63 percent of the small-scale Mediterranean fleet). Bulgaria and Romania jointly count another 3 150 boats. The number of fishers in small-scale fisheries was around 136 900 in the Mediterranean (55 percent of total) mostly employed in Tunis ia(36 100 fishers), Greece, Italy, Algeria and Turkey. The mean number of fishers on board small-scale vessels was (depending on the country) between 1 and 5. Larger crews were found in Morocco, Tunisia, Palestinian territories (4 fishers) and Algeria (5 fishers).

As observed in the literature, small-scale fisheries generally set higher prices than large-scale fisheries. This may be explained by both the differences in quality, linked to the freshness of the products and trip duration, by the marketing channels but also by the steps taken to better identify the products. The relatively low quantities landed by

[1] Coordination to support fisheries management in the western and central Mediterranean (CopeMed).

[2] Mesolonghi Lagoon and Gulf of Patras small-scale fishery.

[3] Spiny lobster and finfish netters of southern Corsica.

most small-scale fisheries also allow the crew to devote more time to clean and prepare the landings for favourable presentation and that is likely to be more richly rewarded products. Distinctions, however, should be made case by case: in fact, the small size of the vessels may hamper on-board handling and storage facilities and that may have a negative impact, which might even reduce the quality of the product. In other cases, the absence of appropriate infrastructures in the fishing ports may have the same results, determining a first weak point of small-scale fisheries products in the value chain. Marketing channels for some live products are logistically difficult and require significant investment in on-board but especially in onshore storage facilities. Finally, in some cases, that large volume of landings of large-scale fisheries on the markets may seasonally have a significant impact on the price of the products landed by the small-scale fisheries. The impact of illegal landings on the price is not to underestimate either. In other cases (where the product is intended for export), the price of products is subject only to international price drivers (Ifremer coord., 2007). We cannot forget that the Mediterranean area (as well as the EU) is more and more dependent on import of fish from other regions, with clear repercussions on all prices.

It is also important to state that, using FAOSTAT and Word Bank data, Plan Bleu (Sacchi, 2011) found that the total self-sufficiency degree of Mediterranean countries (including aquaculture production) was 69 percent; only 3 countries resulted to be self-sufficient: Morocco (313 percent, thanks to the Atlantic production), Turkey (112 percent) and Egypt (108 percent). The mean consumption of aquatic produce in Mediterranean countries was 18.6 kg per capita. Six countries were above this average: Spain (40 kg per capita), France (35 kg per capita), Malta (30 kg per capita), Italy (24 kg per capita), Croatia (23 kg per capita) and Greece (21 kg per capita) (Sacchi, 2011). These data seem to attest that fish can be considered as food for high income population. Furthermore, while Turkey, Algeria, Syria and Morocco are large consumers of pelagic fish (characterized by lower prices), EU countries like Spain, France and Italy consume more demersal species.

The scarcity of resources, the low investments of small enterprises, the weak market position, the sanitary and safety problems linked to new distribution markets, are all elements causing important difficulties for small-scale fishers. Thus, against the high number of enterprises abandoning the fishing sector, we can see several attempts of diversification and reconversion, in order to generate alternative and/or integrative forms of income (e.g. fishing-tourism). This can also be a means to connect fishers and community at large. A large diffusion of the culture and traditions linked to the fishing activity in Mediterranean areas is, in fact, considered essential for a higher appreciation of fish products (and thus to get higher prices) and for the development of extra-fishing activities in coastal areas. Finally, fisheries development should be part of a larger development strategy of the coastal areas, finding all possible synergies with the other marine and maritime sectors.

On the other hand, it is important to give specific emphasis to the remote areas where alternative activities to fishery are not easily identifiable, and where small-scale fishing still represents the main or even the only work opportunity. In this case, it is possible to consider the relevance of both infrastructures for the integration of landings in the market (i.e.development of auctions, vertical and horizontal cooperation), and infrastructures for improving the quality of life of fishers communities.

INVESTING IN QUALITY IMPROVEMENT: QUALITY OF LIFE OF SMALL SCALE FISHERS

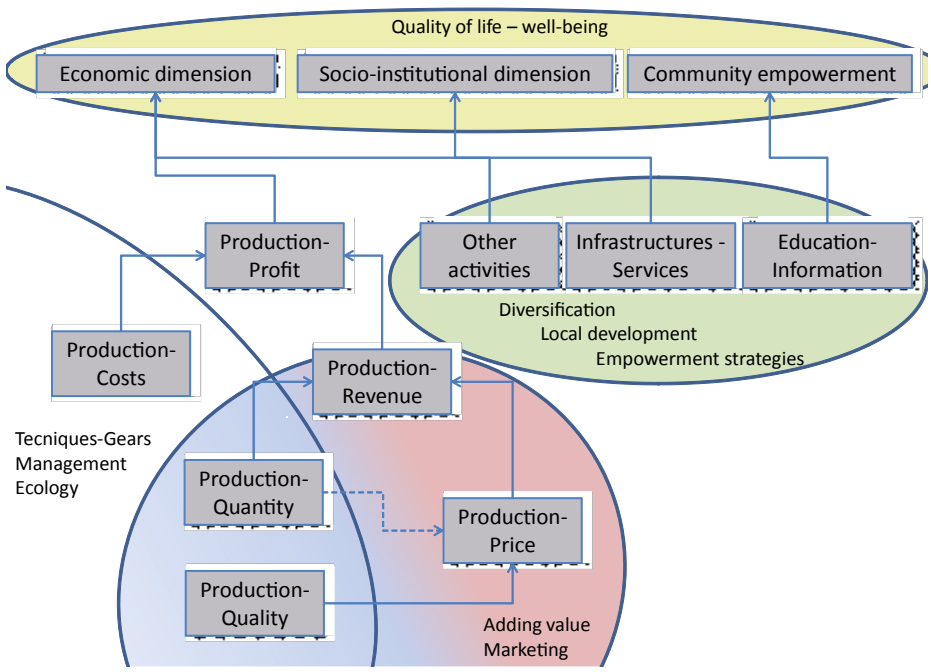
Frequently, when the well-being of fishers is discussed, the main concern is finding a way to increase fishers' income. In EU, the gross value added (GVA) per employee in small-scale fisheries is around the half of the GVA generated by large-scale fisheries, and around 18 percent compared to the GDP (14 percent in Spain, 26 percent in Italy)

generated by persons employed in coastal areas (Macfadyen *et al.*, 2011). This low earning capacity is negatively affected by a high level of part-time employment and by the low capital intensity of this activity. Broadly speaking, small-scale fisheries are characterized by low levels of investments at any level of the value chain, which include pre-harvest, harvest and post-harvest stages. On the one hand, this low level of investments is probably a characteristic that provides higher adaptability and resilience of fishing communities, because economic risks are reduced and there are fewer restraints in work mobility. On the other hand, low investments involve difficulties in getting new technologies and consequently low productivity and low capacity to meet market requirements. As a consequence, young people are less attracted by traditional fisheries and are led to find new opportunities in other activities and other regions (urbanization).

From a technical perspective, strategies to increase fisher's incomes mainly entail actions leading to higher production and lower costs through, for example, sustainable management of fish resources, and/or technological improvements (this issue will not be part of this paper). From a marketing point of view, increased income can be the result of higher product prices, through some specific strategy that enable to increase the added value of the raw material (e.g. processing, direct sale, labelling, etc.); from a different perspective (local development), increased income can be the result of integrating fishing incomes with other economic activities (diversification).

On the other hand, economic issues are just a part of fisher's well-being (see the framework in Figure 1). As attested by FAO (2013), where poverty exists in small-scale fishing communities, it is of a multidimensional nature and is not only related to low incomes but also to factors that limit their human rights including civil, political, economic, social and cultural rights. Small-scale fishing communities are commonly located in remote areas and tend to have limited or disadvantaged access to markets, and may have poor access to health, education and other social services. The opportunities available are limited, as small-scale fishing communities may face a lack of alternative livelihoods, youth unemployment, unhealthy and unsafe working conditions, forced labour, and child labour (FAO, 2013).

FIGURE 1
Drivers determining the well-being of fishing communities (author elaboration)



Gender mainstreaming should also be an integral part of all small-scale fisheries development strategies, and policies should recognize the fundamental importance of capacity development for empowering small-scale fishing communities and creating an enabling environment that allows them to effectively participate in decision-making (FAO, 2013). Under this framework, we shall make a distinction between actions improving the socio-institutional environment, and actions aimed at community empowerment. Improvements in the socio-institutional environment entail an external (institutional) actor who directly supplies a new (or improved) service or some infrastructures. Community empowerment, on the other hand, entails encouraging and developing the skills for self-sufficiency, with a focus on eliminating the future need for external aid in the individuals of a group (Iscoe and Harris, 1984; Zani, 2012). While some specific objectives regarding the quality of life (e.g. the physical and institutional structure of a new fish market) can be obtained with both tools, the deep purposes are completely different: in fact, the first way is a top-down approach directly providing the improvement needed (e.g. the market), or supposed to be needed; community empowerment, in contrast, provides the education, information and know-how needed to understand that an improvement is needed (the market) and the capacity to realize it. Intermediate forms of external aid and community empowerment are possible; in other cases, infrastructures and services can be realized exclusively by the public authorities (e.g. schools, hospitals) but empowerment can be important in order to encourage people to claim their rights.

Several non-economic improvements can be found for fishers' communities; two broad areas are distinguishable: a first area is specific to fishers and their activity; the second area is shared with all members of the coastal community. In the first area we can consider work conditions on vessels, including security. It is quite clear that, the incomes being equals, fishers can improve their quality of life if vessels are improved or are better equipped to reduce accidents. This is particularly true for small-scale fisheries, where boats are often old, lack wheelhouse, electronic and deck equipment (such as GPS, radar, sounders and hauling devices), and where engine power is low and crews are very small (sometimes composed of only one person). However, statistical knowledge on accidents and safety risks is very limited, including in the EU.

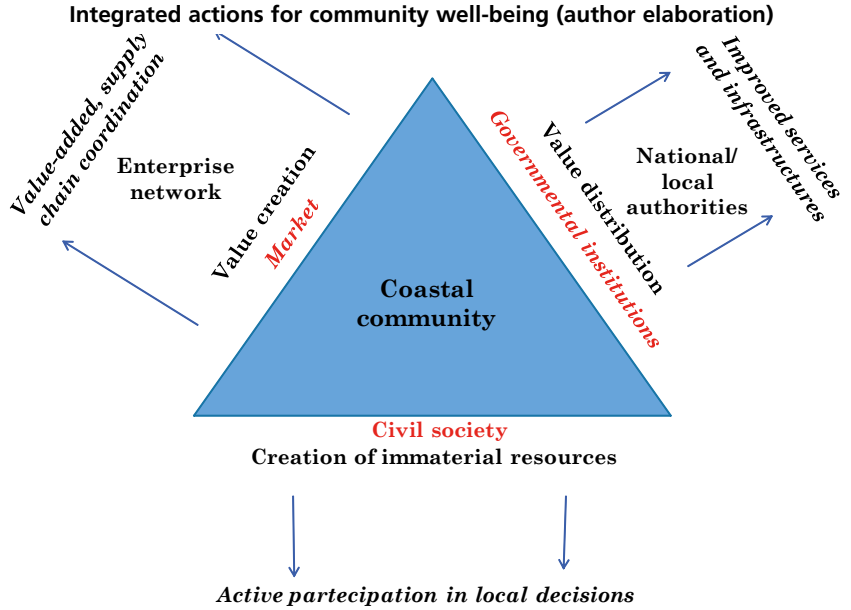
Specific inland investments and infrastructures facilitating work conditions of fishers including the state of moorings, markets, and warehousing services. Here we are moving towards investments that can also have an economic impact on fishers' activities in addition to simplifying landing and selling. States should also support the development of other services that are appropriate for small-scale fishing communities such as savings, credit and insurance schemes, with special emphasis on ensuring the access of women to such services (FAO, 2013).

Community empowerment implies that specific results can be achieved through courses and training instead of capital investments. Human capital can be improved thanks to courses on many different aspects, from technical and marketing issues to administrative steps for the creation of a cooperative. One empowerment typical strategy consists in assisting marginalized people to create their own organization, using the rationale that only the marginalized people, themselves, are able to define what their own people need most. We will come back to several forms of profit and non-profit organization in the last section of the paper.

Another important aspect related to the quality of life of fishers is the social insurance system which includes the pension system, the unemployment assistance, and rights linked to maternity/paternity, incapacity, death and work-related accidents. In this case, the external intervention of the state is essential, but empowered fishers organization can lobby for their rights. All these elements are quite unknown, especially for developing countries.

It is important to state that access to immaterial services and civil rights such as unemployment assistance, social security schemes, and credit facilities are key elements for breaking the vulnerable condition of fishing communities. Finally, broader actions realized for improving the quality of life of coastal communities have also an important impact on fishers, their families, and their decision to continue fishing and not moving to a large city. Again, investments can be made in material (infrastructures), non-material (improved services) and empowering (alphabetization programmes) assets. This is a crucial element if we do not want to see a constant emigration process from marginal to urban areas, especially of young people (see in Figure 2 a general framework on the importance of an integrated strategy for the well-being of coastal communities, with the involvement of privates, institutions and civil society).

FIGURE 2
Integrated actions for community well-being (author elaboration)



ASSESSING EXISTING STRUCTURAL AND COMMUNITY NEEDS AND SOCIO-ECONOMIC APPROACHES TOWARDS MULTIFUNCTIONALITY AND DIVERSIFICATION

Many steps have been carried out in fishery policies to preserve fish stocks and fishery industries but, despite this, most predictions suggest that the number of fishers who can make a living from fishing alone is likely to continue to fall, due to both biological constraints and competition from external markets (FARNET, 2011a). Furthermore, the development of new coastal and maritime economic activities, through increased pressure on land prices, competition for the use of the sea and lobbying, can mean that fishers become marginalized and isolated.

However, many economic activities have been undertaken at the local level and by individual operators of small-scale fishing independently, and previously by the guidelines and measures taken by the authority. The simplicity of the production technique and the level of involvement in employment have led fishers to combine activities with other economic activities in the coastal area allowing on the one hand the opportunity to supplement familiar income, and on the other to guard the coast.

For these reasons, it is important, in order to reach a sustainable development of fisheries areas to include strategies for the diversification of the fishers' economies and to recognize the multifunctionality of fishing activity.

While multifunctionality (a term used in the agriculture sector) refers to the existing non-trade benefits of fisheries (other than commerce and food production), diversification entails the decision of fishers to change something in their economic activity as far as undertaking a new work outside the fisheries sector (see the framework in Figure 3).

Multifunctionality

Multifunctionality is a new concept in fisheries. The key elements of multifunctionality, addressed by the agriculture discussion, are (OECD, 2001): i) the existence of multiple tradable and non-tradable outputs that are jointly produced; and ii) the fact that some of the non-tradable outputs take on the characteristics of externalities or public goods, with the result that markets for these goods do not exist or function poorly.

In the case this concept is valid for the fishing sector as for agriculture, a policy issue would arise in governments to ensure that the non-tradable outputs correspond in quantity, composition and quality to those demanded by society.

The principal issue on the production side of multifunctionality concerns the nature and degree of jointness in the production of tradable and non-tradable outputs. If productions were not joint, the non-tradable outputs (externalities) could be supplied independently of fisheries commodities, and domestic non-trade concerns could be pursued irrespective of trade considerations (OECD, 2001). The question is: do small-scale fisheries provide non-tradable outputs (positive externalities)? Employment and food security concepts can be easily based on discussions in the field of agriculture and should be debated in the same way. Are there other non-tradable benefits more directly linked to the fishing activities? A preliminary classification of the functions of small-scale fisheries could be as follows:

Food production: this function clearly concerns a tradable commodity but also entails non-trade aspects such as food security and food safety.

Environmental functions: small-scale fisheries are linked to positive externalities (or reduced negative externalities) on environmental issues.

Territorial functions: small-scale fisheries allow the monitoring of the sea, preserve cultural traditions and contribute to the socio-economic development of coastal communities.

Social functions: it concerns impacts that help improving the local quality of life in coastal communities, including employment and reduced emigration rates.

We will discuss briefly these last three functions with some example.

Environmental functions

Do fishers provide positive externalities on environment issues, especially on non-target species and on sea-bottom? Differences with agriculture and forestry are clear, since fishers cannot have a major direct influence to increase fish stocks; they can only affect the size and development of fish stocks through adjustments in the harvest quantity and indirectly through the impacts of their harvesting methods on the aquatic ecosystem (OECD, 2001). Secondly, while each plot of land in farming and forestry is generally tied to a single enterprise, which has well defined property rights on this resource, fisheries are often managed as a common-property resource with access for a certain number of users. In other words, failing well-defined property rights on resources and aquatic spaces (i.e. territorial use rights in fisheries - TURFs), it is not clear if fishers can claim some right for the preservation of resources and the environment. Do they have to be rewarded for using less intensive techniques or or do they simply have to respect specific limits in order to preserve public resources? For example, assuming that small-scale fisheries have less impact on the environment than large-scale fisheries, should citizens and governments compensate small-scale fishers in order to avoid that they are substituted by more impacting industries?

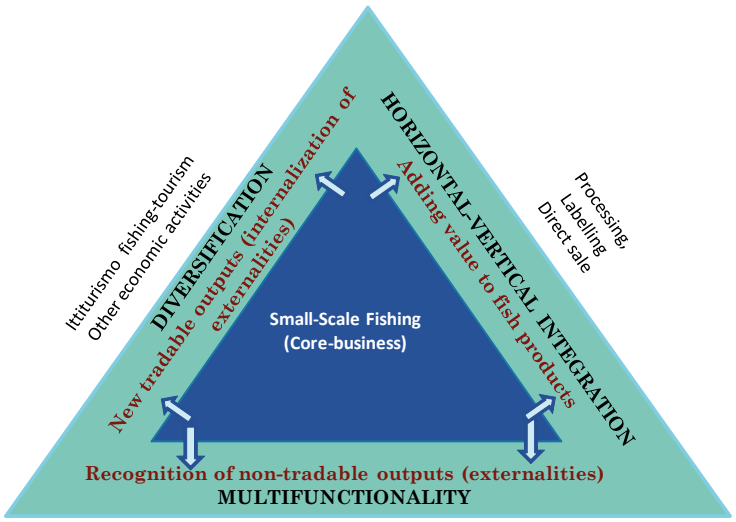
Until now, it seems that these arguments have not found large consideration. Actually, in the real world, only few and well-specified environmental functions have been considered worthy of compensation by a few countries. The French government introduced in 2008 the "blue contracts" scheme ("*contrats bleus*"), based on the concept of the agri-environmental measures of the Common Agricultural Policy (CAP), in order to encourage a more sustainable and responsible approach to fishing. Within this framework, fishing vessels are compensated for undertaking certain measures that contribute to a more sustainable fishing or to the protection of the marine environment. Measures included in the blue contracts fall into three categories: partnerships between fishers and scientists; adoption of more sustainable fishing practices; environmental protection, such as clean-up activities (Farnet, 2011a).

Social and territorial functions

Another externality, which shows common features with multifunctionality in agriculture, is the economic and employment impact of fishing activities on coastal communities, including their social fabric and traditional lifestyles. As we know, a vast number of coastal regions are economically depending on the commercial fisheries sector and there are few economic alternatives to fishing.

Finally, where tourism is widespread, traditional fisheries and lifestyle represent an attraction for visitors. Visitors like to see boats in the ports and fishes in the markets. This is clearly a positive externality produced by fishers of which tourist entrepreneurs take advantage.

FIGURE 3
New roles and strategies for fishers (author elaboration)



Contrats Bleus: partnerships between fishermen and scientists; adoption of more sustainable fishing practices; environmental protection

Diversification

Diversification in the context of the fishing sector can be understood in many different ways. From a more restricted to a broader level we can understand diversification as (Farnet, 2011a):

a. diversification of primary production activities (e.g. new fishing techniques and gear) – i.e. diversification within the fishing sector;
b. diversification of activities within the fish value chain (often into those that add value to fish products: direct sales, marketing, etc.);

c. pluri-activity, whereby fishers and their families continue to obtain some income from fishing but also carry out complementary activities, such as tourism or catering; and
d. broader diversification of the fisheries area into sectors unrelated to fishing, such as social services, renewable energies or other emerging sectors.

While the first category concerns primary production technical strategies (associated or not to management prescriptions) that are not relevant for this paper, and the second category (adding value) concerns post-landings activities that will be further analyzed in the next section, in this section we will focus on the third and (in a lesser extent) to the fourth categories of diversification, i.e. those activities that are outside the fishing sector.

It is very important to note that post-harvest and other diversification strategies can employ more people than the primary production subsector; furthermore, most of them may be women, whom active participation in economic and social life can be increased.

Examples of diversification can be ordered starting from cases that are closer to fishery production toward completely diverse activities (FARNET, 2011a):

a. activities related to by-products from fishing;
b. opportunities linked to the environment and the green economy;
c. activities related to tourism;
d. using arts and culture as a spring board for local economic development; and
e. social services such as care, leisure services and skills acquisition.

From a public and social perspective, it should also be remembered that some economic sectors may have greater potential to create new jobs without displacing existing ones: for instance, the social sector and creative industries, where there are likely to be unmet needs and where markets can be less competitive than in other sectors. The opposite may be true for sectors such as tourism and retail trade, where it is possible that a new restaurant simply competes for the existing market with other local restaurants, thereby impacting negatively on their business. In a free market, this is not a concern for a fisherman who wants to diversify his activity and legitimately enters in competition with other enterprises; on the other hand, if diversification is the objective of public strategies (maybe with public funding), it is important that actions create additional income and jobs, and that they do not replace or displace existing ones.

Here we will list some concrete example of diversification.

Activities related to fishing by-products

Of the 140 million tonnes of fish and seafood available worldwide each year from the fisheries and aquaculture sector, it is estimated that only half is used for human consumption (FARNET, 2011a). Waste from fisheries, including fish skin, heads, liver, guts, bones, shells, etc. are largely used in several sectors ranging from agriculture, where it may be used to make animal feed or fertilizer, to highly specialized products such as pharmaceuticals. The added value generated in these processes varies according to the final destination. It is to be highlighted that for developing and selling sophisticated new products, it is necessary to have sufficient expertise and establish good networks.

In addition to the above mentioned cases of fertilizers and animal feed (which has become a highly competitive industry), a rather new use of fish waste is bio-fuels. For these uses, selling of raw material will probably provide small profits to fishers. Larger added value could be achieved by developing the know-how to process final products, but this would entail large competition with existing actors in terms of volume and quality. To sum up, several requirements are necessary for these activities which are: a suitable location, availability of abundant waste, easy access to other raw materials, an established (or potential) market of final products, availability of human resources.

New and most valuable uses of waste fish include dietary supplements, new food products (e.g. gelatin from fish bones and skin) and elements for cosmetics and pharmaceuticals. In fact, most of the waste produced from fish processing contains protein of high nutritional value, polyunsaturated fatty acids, such as omega 3, as well as antioxidants, minerals and trace elements which can provide important health benefits (Farnet, 2011a). Research projects and building links with actors (such as universities and private companies) who have the needed know-how could help fisheries communities to grow their capacity to take advantage of this untapped resource. In Finland, a project was launched with courses on fish skin tanning and processing, in order to produce skin items.

Opportunities linked to the environment and the green economy

The European Commission's 2007 Blue Book on an Integrated Maritime Policy for the EU refers to the role fishers can play as "guardians of the sea", performing "environmental and other services to the community". How this role can be played in a competitive free economy is however not clear, unless considering a new approach of government interventions for multifunctionality (see below). Occasional revenue possibilities can be linked to data collection and research, to clean-up services, or to combating environmental hazards and guaranteeing marine conservation. The presence and wide dispersal of fishing vessels in the seas can provide, for example, a readymade infrastructure for scientific monitoring and observation (Farnet, 2011a). Within the framework of the State-run *Contrats bleus* scheme in France, fishers are actively engaged in activities that contribute to conservation. This includes water quality monitoring or patrolling against illegal fishing in certain conservation areas as well as data collection and participation in scientific work.

The co-presence of small-scale-fisheries and protected areas can provide synergic opportunities for fishers, which can lead tourists to visit specific locations and explain, such as guides, the characteristics and main elements of the marine and coastal ecosystems. This educational role may easily bypass financial constraints linked to a theoretical public recognition, and find market possibilities in areas where tourism is developed, or where developing strategies are going to be applied. Furthermore, small-scale fishers can successfully join public authorities and scientists to ensure adapted and regulated co-management. A successful case study of this kind is given by the Torre Guaceto marine protected area (Italy), where small-scale fishers have formed a cooperative and created a quality mark for fish caught, once a week by a limited number of boats, inside the protected area[4].

Finally, fishers can find revenue possibilities in the new renewable energy (i.e. offshore wind) sector (not developed yet in the Mediterranean). Fishers have, in fact, a number of assets (boats, access to ports and water, ability to handle heavy machinery in high winds and rough seas, knowledge of the waters and the sea bed) that can allow them to generate a financial return from the development of offshore energy farms, through the supply of vessels, transport, guard ships, logistical support, survey work and offshore maintenance (Farnet, 2011a). On the other hand, large-scale vessels and owners, rather than small-scale, are more likely to benefit from these opportunities.

Activities related to tourism

Tourism tends to be among the first ideas that spring to mind when considering options to diversify the local economy of fisheries areas. Indeed, fisheries areas typically have many natural and cultural assets and offer a variety of activities that can appeal to tourists.

[4] www.riservaditorreguaceto.it/

Tourism activities can create direct and indirect benefits to the territory, supporting the development of other services needed by tourists in a virtuous cycle of new jobs and added value. However, some tourism requirements should be considered before launching new investments. We will consider here some elements that are included in the Farnet analysis (2011a):

- Tourists have a variety of needs (sleeping, eating, travelling, doing, and visiting) and an isolated project is unlikely to be successful if the area does not address this range of needs.
- It is not enough to have a good offer: it is necessary to have an offer that is better or different than that of others.
- Information and promotion are of crucial importance as well as skills and knowledge to deal with visitors.

Potential and limits of the territory should be carefully considered both in a spatial (carrying capacity of the environment) and temporal (seasonality, possibilities to expand tourism periods) dimension.

There are plenty of examples of fishers who, alone or in organized groups, have developed touristic structures for accommodation and food provision. This is known as "*ittiturismo*" in Italy and is governed by national and regional legislations[5]. When the food provided to the tourists is the same fish that fishers have caught, we are in the case of adding value to the product through a processing phase (cooking) and a shortening of the supply chain (direct sale to final consumer).

Examples of family-run restaurants can be found wherever, and in most cases it requires a crucial role and initiative of fishermen's wives: in the small fishing village of Tajao, in southern Tenerife (Spain), there was no restaurant at all until 1980. Then, one fisherman's wife started preparing fish dishes and selling them to tourists and local workers. The activity quickly succeeded and other women followed the example so that now, 8 restaurants are opened. In Corsica (France), the fishing port of Centuri is also famous for its local lobsters offered in family-run restaurants. Some of the most characteristic restaurants rely on the highest quality of its products, such as "The Captain´s Galley" in Scotland, which is not run by a fisherman family but is thought to provide only fresh (in season) and local products and where the menu is decided on a daily basis, depending on which species are available on local boats and market, especially lesser known species being underutilized (examples taken from Farnet, 2011a).

Finally, fishing-tourism is probably the most original form of tourist service directly linked to fishing activity.

In 1996, in Cilento (Italy), the fishers from Camerota established a fishing-tourism cooperative (Consorzio Mare Cilento) composed of 13 members to better manage the tourism activities. Ten of these members were fishers, each with their own vessel. Three new traffic boats with a capacity of 112 people on board have been acquired by the cooperative with the income from the trade, in order to meet the growing request for boat tours (Colloca *et al.*, 2002).

A recent study performed in Sardinia (Italy) reveals that on this island, 84 enterprises are authorized to practice fishing-tourism and 9 for ittitourism (Pili and Sai, 2012). In both cases, cooperatives are the most common juridical forms, but interesting differences exist in the structural characteristics of these two activities. In particular, while a large amount of fishing-tourism employees are men over 40, the majority of employees in ittitourism enterprises are young (less than 40), and almost half of them are women. At the same time, the study reveals that fishing-tourism employees need

[5] According to the Italian Law 7 august 2012, n. 134 thefishing-tourismis atourist andrecreational activity thattakes placeon board the craftof artisanal fishing; the Ittiturismo integrates the tourist offer of the fishers with a range of services on the ground.

training in foreign languages, marketing and informatics, while ittitourism employees, who already have more knowledge in those fields, would need education on fish biology, traditional culture and cooking.

In the EU Member States, the main challenges for the development of these activities are related to legislative issues. Besides Italy, where two laws have established the conditions for carrying out fishing-tourism, "it seems that there is little legislation dealing specifically with tourism on professional fishing boats. This absence of specific legislation means that such activities tend to be carried out as commercial activities which, moreover, are subject to the conditions that apply to transporting passengers. Such conditions can sometimes imply unrealistic demands for fishing boats" (Farnet, 2011a).

In Spain, for example, the national legislation prevents taking passengers on professional fishing boats, while in France there are taxation problems due to a special regime for fishers which cannot be used for tourist activities. A specific project, "Pescatourisme 83", has been launched in Var (Mediterranean coast of France) in 2009, establishing the necessary conditions to put fishing-tourism into practice in the area and adapting experience gained in Italy to the local context (Farnet, 2011a).

Other tourist activities which can be offered by fishers include recreational fishing, marine tourism (e.g. visits to marine parks or other interesting sites), as well as water sports such as diving, surfing and sailing. On the other hand, recreational fishing is frequently considered as a competitor on resources for small-scale fisheries. However, in a diversification perspective, this activity, when properly managed, can be important to attract visitors and to develop work opportunities for coastal communities, for example by implementing approaches of catch and release as promoted by the international committees International Game Fishery Association (IGFA) and European Federation of Sea Anglers (EFSA).

Other activities

Theoretically, any economic activity can be thought as a diversifying strategy for fishers and their families. Furthermore, in many contexts small-scale fishery is already a part time activity representing the main or, in some cases, a secondary source of income.

From a perspective of coastal development, we can still list some cultural activities which entail appreciation for traditional fisheries heritage, such as museums, exhibitions or festivals. These can both provide job opportunities to fishers and increase the interest for fisheries products. Interesting ideas include cooking competitions and demonstrations, such as the cooking "jam session" organized in the restaurant run by the fishermen' *cofradia*[6] of l'Escala (Spain), where well-known chefs are invited to improvise fish recipes in front of an audience (Farnet, 2011b).

Cultural events and festivals are often (with different levels of importance) based around local food products. In Barycz Valley (South Western Poland), "Carp Days" have been organized since 2006, attracting up to 5 000 visitors every year: in 2010, 25 events and 17 restaurants selling different carp products were involved. This innovative concept provides a means for producers to add value to their product through direct sales, and has also led to the development of new products, such as smoked carp. Furthermore, restaurants took part in the competitions and prepared different carp dishes. The best restaurants were nominated "Master of Carp", and awarded with the right to use the sign "Barycz Valley recommended". This initiative

[6] Cofradia: Cofradias de Pescadores or Fishers's Guilds are non-profit sectoral public law corporations which represent the economic interests of fishing vessel owners and workers from the fish catching sector, which act as consultative and collaborative organisms for the competent administrative bodies in areas of sea fishing and regulating the fishing sector, the management of which is carried out in order to meet the needs and interests of its associate members, with a commitment to contributing to local development, social cohesion and sustainability.

was instrumental in promoting different ways of preparing carp and as a result, carp is now proposed in almost every local restaurant (Farnet, 2011b).

To conclude, there are many possibilities to diversify an economic activity (Figure 3). However, several conditions exist for entering into a new activity/sector, and these should be considered carefully, possibly with an external consultancy, before leaping. The product/service proposed must have distinctiveness which make it attractive compared with competitive products/services. Furthermore, in a public perspective, it must meet an unsatisfied demand, create new job opportunities and not displace the existing ones. An optimal scale of investment is required and the entrepreneur must acknowledge it. Size and trends of the existing/potential market must be known as well as the degree of internal and external competition and the degree of accessibility to the market. An essential element for some of the activities analyzed is the state of legal, administrative and fiscal barriers. Finally, other conditions for a good result of the activity are, *inter alia*, the quality of complementary infrastructures and services, the skills available locally, the seasonality characteristics of demand and supply, and other key factors.

OPTIONS TO MAXIMIZE THE PRICE OF SMALL-SCALE FISHERIES CATCHES AT TIME OF SALE, INCLUDING SPECIFIC CERTIFICATION REQUIREMENTS (LABELLING, ETC.)

Flows and destination of primary production are generally not well known for fish and should be investigated more. Depending on species and countries, prevalent flows can be bound, for instance, to local retailers, export, processing and urban supermarkets (processing can be an intermediate stage before export or national consumption). For example, in 2011 in Morocco, the production of small-scale fisheries was mainly sold for fresh consumption (39 percent), while 13 percent was conserved, 38 percent was frozen and 18 percent was used for animal feed. Shares change considerably from region to region, depending on structural characteristics of each coastal area and on species distribution (ONP, 2012). In Emilia-Romagna region (Italy) in 2006, 62 percent of the landings were sold to local wholesalers, 25 percent was directly sold to consumers, 12 percent was exchanged through auctions and only 1 percent was bought by large retailers (Malorgio and Camanzi, 2006).

Despite many possible uses, a substantial number of fishers find difficult to sell their products, including in countries where there is a high dependency on imported fish (as said, Morocco, Egypt and Turkey are the only self-sufficient countries; Sacchi, 2011). The fish market, especially in the case of small-scale fisheries, is in fact characterized by a complex network of relations among the different parties involved in the supply chain, showing a non-integrated structure where the dominant position is generally hold by the distribution sector. On the other hand, the high dispersion of production, through a high number of ports and selling points, does not foster a concentration of suppliers, which could be the first step for some sort of cooperation between producers, necessary for a stronger position in front of buyers.

Market and chain fragmentation can also result in a high number of intermediaries with complex consequences on price levels. This causes a high variability of equilibrium prices that can be found between and within production and distribution areas, depending on local and seasonal levels of supply and consumption. This fragmentation normally favours economic actors with more information and choice possibilities: in other words, large wholesalers.

In this framework, the level of prices in ex-vessel markets is completely independent from structured objectives and from fishers' considerations on costs and profit maximization. Fishers are price-takers and the prices depend on short-term, unforeseen, fluctuation in demand and supply. Actually, local ex-vessel markets (where developed) do not seem able to provide a more defined and informed structure to fish market.

They probably mostly benefit to large wholesalers who can more easily manage larger quantities and choose between market places where prices are lower.

In conclusion, depending on fish species and structural characteristics of fishing regions, we can find very differentiated situations, where prices can be decided in local markets (i.e. minor species, isolated markets dominated by small buyers, such as fishmonger and restaurateurs), regional/national markets (i.e. important species, well-structured networks of ex-vessel markets, not relevant import-export) or international markets (i.e. species included in the global market, with high import-export flows). In the same market place, the price of one important species can be decided by the international equilibrium between demand and supply, while the prices of a minor species can be decided by local fluctuations.

Actually, fishers' strategies must be chosen and adapted depending on the market situation. Considering the characteristics of small-scale fisheries, solutions must be found, in most cases, out of the ordinary market channels. Indeed, ordinary channels generally do not fit (but exceptions do exist) some of the peculiarities of small-scale fisheries such as multi-specificity, small and inconstant quantities, less known and valued species, or strong seasonality. Opportunities should exist, considering the high dependency on import in most of EU and Mediterranean countries but, on one hand, producers have to meet the expectations of today's consumers, and on the other hand, the power relationship with players downstream in the chain should be rebalanced via the structuring action of initiatives based on collective bargaining.

We will discuss of collective actions in the next section, while we will focus here on initiatives intended to meet changing needs and expectations of consumers: in other words, adding value to their production. Generally speaking, small-scale fisheries products are currently not adequately valued in local markets, and fishers' communities have not the right means to develop marketing tools. Actually, what is sold on the market is represented by more than the fish itself. In reality, the product consists in a serie of elements which contribute to its sale (i.e. availability, volume, quality, packaging, image, price, etc.). In a more and more globalised market, where trade barriers are reduced due to liberalization policies, competition between enterprises become very strong for products that are not sufficiently characterized by specific attributes, as the fresh fish normally is. Consumer demand, on the contrary, is becoming more and more differentiated within a large range of specific products that have different origins, processing states, labellings or even packagings, while safety is the only common characteristic that has to be guaranteed. Therefore, product diversification, as introduced in the previous section, is often a strategy for adding value to the product. Another strategy to reduce transaction costs and increase the added value is to directly sell to the consumer or to the retailer bypassing the intermediaries.

Food safety and quality cannot be bargained in order to offer lower prices. In all countries, the production of foodstuffs is regulated by a body of standards and legislation aimed at protecting consumers. In EU, basic regulation is known as the hygiene package (Reg. 178/2002, 852/2004, 853/2004, 854/2004). Regulation (EC) 852/2004 mentions that food businesses (except the primary producer) must set up a permanent procedure based on the Hazard Analysis and Critical Control Points (HACCP) principles, which is a method to identify, evaluate and control health risks. Although, in some circumstances, a certain degree of flexibility is allowed in small food businesses and these procedures are generally very problematic, expensive and time demanding for single fishers.

Product differentiation

Several methods are available to differentiate a product in order to meet the specific needs of the consumers, including innovation and processing (internalization of supply chain stages), improving the appearance and packaging of products, and labelling.

Innovation and processing are very easy to understand but it can mean many different things, such as improvement of existing products (e.g. elimination of certain disadvantages of fresh products, such as smell and perishability), development of new products or recovery of traditional products (including the promotion of minor species, especially seasonal species), and exploitation of by-products (as seen in the previous section). This process can entail the development of a processing step which was previously not realized by producers who were simple sellers of fresh products. In this case, in addition to innovation, there is the advantage (but also the burden) of shortening the supply chain (if processing was previously realized by other economic operators).

Several examples of this kind can be found around Europe: Le Brin d'Océan is an artisanal cannery launched by the wife of a French fisherman, where traditional products such as fish soup and *pâtés* are realized, as well as new tastes such as a *pâté*-like preparation from the liver of monkfish, or curried cuttlefish in its own ink and in a tomato sauce. In this specific case, direct sales account for 10 percent of her revenue, while the bulk of the production is sold to around 100 specialized shops (delicatessens, wine stores, etc.) (Farnet, 2011b). In Galicia, 27 barnacle gatherers created a company called Mar de Silleiro Ltd, developing the idea of preserving barnacles by introducing new processed products into the market, mainly using the smaller and less valuable ones. They created a partnership with a local cannery hiring the cannery's production line for one day per week; the sale is realized through a website with an on-line shop. As the first years for the new enterprise are critical in terms of ensuring a successful introduction of the product into the market, the company has actively participated in key exhibitions, such as the Forum Gastronómico in Girona, the Salón Internacional de Gourmets in Madrid and the Feria Internacional de Galicia 2011 in Silleda (Farnet, 2011b).

A simple change in the packaging of products can be a winning strategy too, like the vacuum-packing of mussels in pure, salt water, which allows (compared with traditional vacuum systems) that mussels remain closed, do not lose their moisture or proteins, and be less sensitive to variations in temperature.

Investment in a plant or workspace that complies with the legal standards is expensive for a single fisherman, thus producers could decide to share the workplace, each business remaining responsible for its own production. One step forward, the activity could be managed by a cooperative of fishers.

Labelling

Among the possible viable strategies for differentiation and enhancement of fish production, there is the implementation of brand policies. This is a marketing tool for the qualification and differentiation of businesses and products, as well as a communication means between businesses and consumers.

The realization of a brand involves a series of benefits. A first set of expected benefits regards the trade mark as a tool for the organization of the supply chain and the management of relations between operators (e.g. security of supply, quality assurance of incoming goods, development of direct vertical relationships, greater transparency of information, etc.). The brand is also an instrument of differentiation (i.e. competitive advantage, ease of market access, greater remuneration); in particular, the commitments undertaken by the operators allow a collective reputation and benefit (at least theoretically) a price premium. Finally, labels permit an identification of a product with the territory and may decrease the risk of sanitary problems. The collective reputation is the result of the quality procedures of each operator participating in the collective mark.

On the other hand, an adherence to the label entails a series of commitments, long procedures, specificities rules, and compliance with constraining procedures for

traceability and certification. Communication strategies are also difficult and expensive to develop. Actually, all this could result problematic, expensive and time consuming for small-scale fisheries, especially when adequate education is missing. Moreover, there are cases where the brand has been developed with a top-down approach, as the result of institutional initiatives rather than private initiatives. Another risk is that labelling be developed without a careful marketing research, resulting in a brand not responding to demand.

Four major forms of labelling can be discerned: official quality marks, linked to origin or organoleptic properties, collective brands, private, independent brands, environmental labels. Let see some example.

The EU acknowledges three official quality marks: protected designation of origin (PDO), protected geographical indication (PGI) and traditional specialty guaranteed (TSG). Aquaculture production, for which the link to the territory is easy to verify, and traditional processed products are better suited to these quality markings than fresh fish products. Unfortunately, labelling procedures are often undertaken in a top-down approach without involving producers in setting them up or in ensuring that they really correspond to a motivation on the part of producers or a market opportunity. The result of these processes is that the level of production of the existing PDOs and PGIs is low, or even zero (Farnet, 2011b).

The "Cornish sardines" is an example of PGI label developing common standards for catching, processing and marketing Cornish sardines. Fish are essentially "caught to order" with the fishers speaking to the processor before going to sea. In this way, supply is matched to demand and prices fluctuate less and stay at viable levels for both the fishers and the processors (Farnet, 2011b).

Collective brands are regional brands, which rely on a commitment to enhance the value of local products. Compared to official quality marks, collective brands are less known and appreciated by consumers but are easier to obtain and with more elastic procedures. However, as in the previous case, it is important that the initiative follow a bottom-up approach, otherwise it is probably destined to fail considering that costs, logistic and bureaucratic burdens are not insignificant for small producers and small organizations.

The Association of Handline Fishers from the tip of Brittany (France) experienced heavy losses when the value of the European seabass (*Dicentrarchus labrax*) dwindled by 30 percent in the early nineties, mainly because of the sudden growth of competition from farmed seabass. A collective process was developed to communicate the value and quality of the catch setting up of a traceability scheme. In 1993, 120 skipper-owners from four local fisheries committees teamed up to launch a collective brand, based around the tagging of line caught seabass with a "fish ID tag". This unique ID tag enabled customers to identify the origin of the fish, how it was caught and even the fishers who caught it, through a system of searchable database. Within a few months, the product differentiation had triggered an increase in the market value of line caught seabass, doubling its sale price and repositioning it as a "high end" product (Farnet, 2011b).

Independent brands are a simple way to identify a specific producer, building a quality reputation, without external standards to satisfy and difficult collaboration with other producers. However, this reputation is usually difficult to create. Fresh fish is difficult to sell under a specific brand name because some sort of differentiation is necessary. On the other hand, branded processed products can be successfully traded. Traditional and high quality products can be distributed through specialized shops (e.g. wine cellars, local/rural products shops, etc.) and delicatessen outlets.

Finally, fishers can apply for eco-labels certifying the sustainability of the fishery, based on the FAO guidelines. The most widely-known labels are Marine Stewardship Council (MSC) and Friends of the Sea (FOS). Actually, these labels are not very

widespread in the Mediterranean, but interesting examples do exist. Several Italian firms, for example Zarotti, Delicious Rizzoli, Coop, Vanelli, got the FOS label for anchovies and sardines caught in Croatia and Morocco. These products are then processed and sold in cans or jars. Cooperative MerjaZerga, Morocco, got the same label for fresh hake. Striped Venus clams (*Chamelea gallin*a) harvested in Turkey also have a FOS certification.

With regard to the several options available for fishers, some interesting differences have to be noted between northern and southern countries of the EU. Indeed, Nordic countries tend more to develop ecolabels of international origin, often regarded as "seals" of quality, whereas in countries like France or Spain, the local initiatives for the adoption of labels in cooperation between different actors are particularly numerous and varied. This is due to the presence of numerous areas of production and consumption which coexist, but also to a consumption culture strongly attached to the "local" character of the production. Probably, this last option is also the most indicated for small-scale fisheries, considering that international labels may entail high costs and long, inflexible procedures. On the other hand, collective brands are ideal to value local products and create synergies between small enterprises.

At the international scale, the states should work together to introduce border procedures and trade regulations that support regional trade in products from small-scale fisheries and that are consistent with the rules and with the mandate of the World Trade Organization (WTO), and all parties should recognize that small-scale fisheries should not be marginalized in markets as a result of ecolabelling and certification schemes. An enabling environment for small-scale fishing communities to develop their own area-specific labelling schemes should be provided (FAO, 2013).

Distribution channel

Classification of distribution methods can be based on the length of the supply chain.

The shortest form is obviously direct sale. This includes sales at the place of production or landing, as well as sales at markets, mobile sales or sales in the producer's shop. Sales can be realized in the same town of landing or in close inland towns, where prices are probably higher. Products of small-scale fisheries should be particularly appreciated by consumers if they are duly informed of the freshness of the product (i.e. nutritional value) and of the traditional and non-intensive fishing technique (i.e. ethical value). This activity can be associated to a processing step, such as smoking or cooking, but in this case, safety and hygiene legislative limitations may be higher. Canned products are also particularly suitable for long distance selling, either by e-mails, or via an internet site. While direct sales cut out the middleman between the producer and the final consumer, it requires a sizeable investment in manpower, particularly in terms of time dedicated to selling activities. In the fisheries sector, this activity is traditionally undertaken by the wives of the producers (Farnet, 2011b). Direct selling by fishers in the ports often increases the tourist appeal of these areas (a case of multifunctionality, or positive externality), and can be part of a wider integrated territorial development initiative.

A little longer supply chain includes selling to a retailer (e.g. fishmonger, specialized shop or supermarket) or a tourist operator (e.g. restaurant, hotel). In both cases of a direct sale and of a short chain, selling products in the area where they have been produced (the "KM 0" concept) is becoming more and more appreciated by consumers. This concept gathers the ideas of freshness and of tradition to an ecologic feeling, linked to the awareness that without transport there is less emission of greenhouse gases. Seasonality of products, which is normally a problem for distribution through large retailers, as well as the presence of small quantities of many different species, should be converted into strength and become a basic characteristic of freshness, tradition, quality and sustainable fishery. In the Minho-Lima area (Portugal), a "Km 0" branding

initiative has been launched, strengthening links between restaurants, chefs, fishers and other primary producers in the area and enhancing their market opportunities[7] (Farnet good practices).

Present-day means of communication enable small boats to communicate their catch prior to their return to port, allowing downstream players to anticipate the availability of fish. It requires the boats to be equipped with the appropriate technology. In Germany (Baltic Sea coast active region), fishers send details of their catch and their estimated landing time using their mobile phones, via SMS to a specific website while at sea. Customers (consumers and restaurants) can then see where, when and which fish will be available for sale directly from the boat when it comes to port, and the prices achieved are higher compared to wholesale (Farnet good practices). Lonxanet Directo SL is a direct sales company that focus on the marketing of the Galician seafood coming from artisanal fisheries and partially owned by six *cofradias*, entities which are both shareholders of the company and providers of the seafood it markets. The tool developed by Lonxanet is a web- and phone-based marketplace, integrating marketing and logistic services and enabling the *cofradias* to sell directly to restaurants (more than 360) and other final consumers (Farnet, 2011b).

In summary, as previously noted, short distribution channels should be considered as the best option to value small-scale fisheries products. Exceptions can exist in the case of resources that are both abundant and high valued by international markets (export is therefore the final destination). However, in most of the cases, productions of small-scale fisheries are either scarce (thus large wholesalers and retailers are not interested) or low valued (thus margins for fishers are very small). This situation should lead fishers to focus on niche (in the case of scarce productions) or traditional (for larger productions) consumers which, in both cases, are able to appreciate the local character of production.

Innovative measures to enhance production and market: capacity-building and institutional strengthening

Individual or collective strategies can allow enhancing both production and market, as seen in the examples of previous sections. In many cases, individual strategies are non-feasible. Rational and sustainable management of fish stocks cannot be an individual strategy. At the same time, pooling the supply is the only way of increasing clout in negotiation with buyers. This is quite necessary in the fishing industry, particularly for small-scale enterprises, where the production flow of each boat is generally low and discontinuous, where the product is highly perishable and cannot be either standardized or differentiated. Aggregation and cooperation are then required to reach an adequate volume and an adequate control on supply, and thus allow cost reduction, supply chain synergies, product differentiation and sales policy that will ensure a more profitable placement of local products.

Different forms of cooperation can be strategic for fishers to address management and marketing issues and to improve their quality of life. Horizontal and vertical cooperation forms can be considered, as well as broader partnerships with public authorities, civic society and enterprises.

Business cooperation is the collaboration between juridically and economically independent companies in order to raise the common competitiveness. Such strategies have general objectives such as lower costs and higher efficiency, meet more easily customer expectations, generate synergies in order to pool resources and to share

[7] To attract the initial interest of the public and other regions, a launch event was organized, bringing together local producers and famous chefs as well as Spanish and French delegations of catering professionals to discover the products and learn how to prepare them. Six other events of this kind, two gourmet itineraries and a presence in the local and online media are amongst the tools being developed by the project to attract visitors and professionals.

strength and know-how, or gain stability and sustainability of market. From a juridical and technical perspective, forms of cooperation include: joint ventures, cooperatives, consortia, service agreements, etc. Each of these forms has its own typical characteristics with pros and cons, and should be considered carefully depending on business elements. Furthermore, these cooperation forms can be characterized by differences in the geographical extension, in the duration and in the field of cooperation (i.e. R&D, distribution, purchasing, marketing, production).

Horizontal cooperation

Horizontal integration is the term generally used when an enterprise increases its market share by taking over a similar company. On the other hand, horizontal cooperation entails that partners having the same position gather their strength to gain benefits. In fisheries, there are very traditional forms of cooperation and some historical ones, such as *cofradias* in Spain. Sometimes, different structures are coexisting in one country with networks and juridical forms of cooperation including cooperatives, associations or federations, where new forms, born under national and international proposals, are overlapping the traditional forms and can create, in some circumstances, duplications and conflicts. This is the case of Producer Organizations, a form required by the EU in its market organization framework and that, in some countries (especially in the Mediterranean), has not been well inserted in the previous cooperation structure. Actually, a map of the cooperation forms existing in the Mediterranean and Black Sea is required.

As said, cooperation in fisheries should be essential for an efficient allocation of the production: this would permit an optimal management of resources and, at the same time, an optimal negotiation with buyers. Unfortunately, this is rarely the case due to several causes such as uncertainty in resource potential, difficult relations regarding the management of free access resources (i.e. different objectives of the members, different discounting preferences, and free-rider behaviours), lack of control, and high coordination costs. Italian cooperatives, for example, mainly have the objective of managing auctions and provision of services such as aid for fiscal and administrative practices, warehousing, and fuel supply. Purification procedures are also a cooperative task where clams are fished. Theoretically, a member of a cooperative should give his catches to the cooperative which is responsible for commercializing and selling the fish, and share the total income between all members. Actually, every fisherman sells directly his product without receiving any facility from the cooperative.

With the exception of clam consortia, Italian associations do not have any management role regarding resources, and have a very limited control on distribution channels. It is to be hoped that associations/cooperatives have, at least, a role in finding new market opportunities for their members, informing them of alternatives and advising them on quality procedures, certifications and labelling strategies.

The Italian example seems to indicate that the responsibilities of a self-management or of a co-management of resources can be easier committed to fishers' associations if the latter also entail some sort of property rights. In the case of clams, these are TURFs. Other examples that should be better analyzed and that could provide a framework for the development of territorial rights and self/co-management initiatives in the Mediterranean and the Black Sea are given by *cofradias* in Spain and *prud'hommies* in France. Both *cofradias* and *prud'hommies* are management authorities concerning small-scale fisheries, which must coexist with other sets of association networks and management regimes dealing with large-scale fisheries (Spagnolo, 2012). Several worldwide studies indicate that traditional communities have been able to self-manage efficiently common resources, including fisheries, through historical and accepted institutions (Ostrom, 1990; Ostrom *et al.*, 1994). On the other hand, the efficiency

of these institutions decreases or collapses when new external users (e.g. industrial fleets) profit from resources, i.e. when traditional (communal) property rights are not recognized by national authorities. In this case, restoring original rights and institutions can be difficult, and a new co-management approach must be developed.

Vertical cooperation in the supply chain

Vertical integration is the process in which several steps in the production and/or distribution of a product or service are controlled by a single company or entity. As previously seen in some examples, vertical cooperation can actually be one solution for fishers who intend to process and/or sale their product directly to final consumers. On the other hand, vertical cooperation is a strategy in which companies from different supply stages are working together to gain benefit. This can be advantageous because cost reduction and efficiency potential are stronger in processes than in products. Compared to an integration strategy, vertical cooperation does not require any capital investments and permits easy exit options. However, fishers can be trapped in a dependency relationship if they are associated to a strong partner. Large supermarkets, for examples, impose many terms and conditions: precise specifications have to be followed concerning the quality and the traceability of products and deliveries have to be regular, whether in terms of quantity or quality for each species. Moreover, the payment arrangements are complex, the profit margins for suppliers are low, and the payment periods are long. At the same time, producers are required to contribute to promotional campaigns for their products.

Because of these reasons, it is difficult for small-scale fishers to have equilibrated vertical agreements without a previous horizontal cooperation strategy. The collaboration between fishers associations, processors and/or distributors can allow the achievement of supply quantities and quality standards needed for a brand or label strategy, which should be profitable for all partners. It is important that all partners clearly share the same objectives and that a participative action plan is prepared in order to have stable and transparent relations.

In these initiatives, traceability is essential to guarantee the quality and the origin of the product (at both geographic and enterprise levels). Thus, it is important to establish control procedures in all stages of the supply chain and sanctions for trespassers.

In some countries, large vertical cooperation initiatives can benefit from specific public aids (for example *"contratti di filiera"* in Italy): these opportunities are important for building large networks at regional or national level thanks to investments in production, transformation and distribution stages, including quality control procedures, promotion, technical assistance, R&D. These frameworks allow preparing large development strategies that can have stronger impacts on fisheries compared to small and local initiatives.

Interbranch organizations (IBOs) are also an EU initiative to promote vertical collaboration throughout the fisheries sector. These IBOs are established under Regulation (EC) 104/2000 on the common organization of the markets. These organizations must represent a significant share of the production and trade, but must not be themselves engaged in activities related to production, processing or marketing of fishery products. Their objectives should be: improving knowledge and transparency of production and of market, helping a better coordination of the way in which fishery products are placed on the market (market studies), studying and developping techniques to optimize the operation of the market, drawing up standard contracts which are compatible with Community rules, developing methods and instruments and organizing training schemes to improve product quality, and promoting fishery products. Actually, the functioning and activity degree of these relatively new inter-branch organizations is not well known.

A form of vertical integration to be mentioned concerns the chain Ristorazione Self Service "Al Pesce Azzurro" of Fano (Italy). It is an initiative of the fishers cooperative that aimed at improving and enhancing all the activities of the fishing fleet of Fano by promoting knowledge, gastronomy and sale of small pelagic species. It is a form of successful coordination managed by fishers and linking the production phase and the direct consumption through the catch, preparation and processing of dishes according to local tradition.

Other forms of partnership

One of the most interesting initiatives of the last European Fisheries Fund (EFF) has probably been Priority Axis 4 focusing on the sustainable development of fisheries areas, similar to the Leader area-based approach for the development of rural areas. The key principles of this approach are driven by the diversity of fisheries areas and situations that exist throughout the EU as well as the principle of subsidiarity, empowering local people to become the drivers of local development (Farnet, 2010). Its design and implementation has been thought to be as decentralized as possible, preferably coordinated by a partnership of local actors from the public, private and community sectors that have come together to form a fisheries local action group (FLAG).

In other words, local actors interested in Axis 4 of EFF are required to create a local group to deliver the measures, i.e. a local partnership involving "public and private partners from the various local relevant socio-economic sectors", named FLAG. FLAGs are charged with developing and implementing an integrated local development strategy for a coherent territory, based on a bottom-up approach. Such partnership should involve to share ownership, develop a shared sense of place, and find common ground through which solutions could be found, by addressing not only one sector but the entire area and its needs by acting in an integrated way. Depending on territorial situation, partnerships may be led by the private sector (e.g. fishing), the public sector or the civic society. Every form has its own pros and cons, and actions are clearly driven by the objectives of the leader entity. Strategies can then be addressed not only to improve the competitiveness of the private sector, but also to entail investments in infrastructures, animation, training, culture, as well as local jobs, the environment and community facilities. We have, in other words, turned back to talk about quality of life of fishers communities.

CONCLUSIONS

In the Mediterranean basin, coastal areas appear very different in terms of history, culture, natural conditions, population density, settlements, economic structure and human resources within which specific interventions and adaptations are required, united, however, by the creation of new foundations for economic and social life. We can identify the areas where there are part-time small-scale fisheries and the possibility of integration of income, marginal areas with difficult production conditions but with an interesting and undervalued natural and cultural heritage, and finally depopulated areas in decline and incapable of regeneration of the social fabric and the reorganization of production. Anyway, in some Mediterranean areas, the spread of the culture and fishing tradition is considered strategic to enhance the quality of life of the local communities and to create professional and economic opportunities by capitalizing on the specificities of the coastal area. To develop coastal areas, it is necessary to think to an integrated plan which supports the establishment of networks including the economic actors of all marine and maritime activities. In this framework, small-scale fisheries may play a crucial role for the indirect linkages to the socio-economic environment, including in areas where the direct contribution to economy is weak.

Firstly, these fisheries represent the predominant, or exclusive, possibility of employment for marginalized sectors of the population. Secondly, small-scale fisheries have important (often neglected) connections with other pre-harvest and post-harvest activities, including building and repairing of boats and gear, port services, trade, wholesale, retail, processing and restaurants. Touristic services are, in particular, directly and indirectly linked to small-scale fisheries, for the direct supply of fish products and for the indirect attraction on visitors. Thus, small-scale fisheries may represent a key node for the creation of added value in coastal areas and, as seen, the same fishers can take advantage of a larger share of this value chain through diversification, transformation, direct sale, and cooperation.

The role of information sharing and knowledge transfer is of particular importance: the availability of correct and consistent information is a key element to define the policies of development needed to ensure economic viability and sustainability of natural resources. An effective system of information and acquisition of data and activities is necessary for the development of rational and sustainable small-scale fisheries in an integrated approach around the Mediterranean and Black Sea. A lot of information on various aspects of small-scale fisheries often escape, are difficult to obtain, or are dispersed among different institutions and organizations at the regional, provincial or local level. Actually, if the structural and technical attributes of small-scale fisheries are difficult to census due to the high variability linked to multi-specificity and multi-gear characteristics, the elements associated with distribution channels, marketing tools, value chain, cooperation and quality of life issues are even harder to survey. A better understanding of what is currently happening in the basin is fundamental for an efficient and a coherent development policy in a multilevel governance and interregional coordination.

We believe that an increased responsibility of fishers' organizations in co-management objectives (also through new forms of territorial rights) is an important step for a sustainable development of small-scale fisheries. However, this technical-productive approach will be probably insufficient to guarantee the economic competitiveness of small enterprises without common marketing strategies, and forms of vertical and horizontal cooperation.

Given the fragmentation of the upstream sector and the imbalance of bargaining power between large marketing firms and fisheries operators, the role of cooperatives and fishers' associations assumes a greater importance, not only as a form of concentration of supply, but rather as an institution that can support individual producers in the process of adaptation and promotion of fishery products, but also in the process through the mechanisms of coordination of supply chain, implementation of the quality system and labelling.

Finally, local strategies for an integrated development of coastal areas should imply the active participation of partnerships, including public and private actors. Fishers must be key actors in this process, and an empowering strategy is necessary to develop their propositional potential in economic and social themes. A bottom-up approach takes the needs of both men and women into consideration and is participatory with regard to needs assessments, design, implementation and monitoring. But, on the other hand, development of coastal areas cannot be exclusively left to local initiatives.

In fact, on a broader perspective (FAO, 2013), small-scale fishing communities need access to the full spectrum of financial, social and institutional services as well as resources to sustain their livelihoods, and public organizations should support an investment in human resource development such as health, education, literacy and other skills training. The scale and the priorities of this state intervention may change considerably depending on the location (i.e. northern vs. southern coast of Mediterranean, urban vs. marginalized areas), but public institutions should ensure that small-scale fishing communities have access to essential public services, starting from

decent housing, sanitation, potable water and electricity. It should also be guaranteed that small-scale fishers and fishworkers are covered by unemployment insurance and social security schemes with benefits equal to other professional groups in the country.

In order to coordinate institutional (i.e. national and international) development strategies and local initiatives, public interventions should provide an adequate extension and advisory services for supporting small-scale fisheries governance and development. Therefore, the development and the support of small-scale fisheries, even if following different legislative paths and conceptual frameworks along the Mediterranean and Black Sea coasts, should follow a common operational approach to converge towards shared goals and solutions, in order to guarantee successful local strategies in the coastal areas of the Mediterranean and Black Sea.

A common development policy for small-scale fisheries that sees the participation of all countries in the Mediterranean Basin would surely and concretely facilitate overcoming difficulties and would strengthen the support tools within the different coastal areas of the Mediterranean.

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FULL PAPERS

Small-scale fisheries in the Emilia-Romagna region: structural, social and market issues

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INTRODUCTION AND OBJECTIVES

SSFs play an important role in the regional fishing industry of Emilia-Romagna, an Adriatic region located in the north-east of Italy. However, when comparing regional data with national averages, some peculiarities do emerge. To gain a deeper understanding of the situation of small-scale fisheries in the region, a survey has been performed through by interviewing a sample of fishers. This study is also focused on the added value issue. In fact, local fish products have low prices on the market; for this very reason, the regional public authority has been interested in creating a collective brand involving all stakeholders in the supply chain. The perspectives from the fishers and other parties regarding the potential offered by such a brand are discussed in this paper.

Looking at official data (Irepa[1]), we can see that the number of small-scale fisheries boats represents 59 percent of total vessels, while gross tonnage constitutes 11 percent. The share of small-scale fisheries is also relevant with respect to employment. In fact, SSFs account for about 55 percent of the fishing days, with 40 percent of the total regional crew. On the other hand, as far as production is concerned, SSFs provide around 9 percent of the regional catch and 20 percent of the revenues.

A comparison with national data has highlighted some important differences. Firstly, the relevance of the SSFs is slightly lower in Emilia-Romagna than in the other regions, where SSF boats represent 67 percent of the fleet; the same percentage is found in the total number of days at sea; finally, SSF crew represents 49 percent of the total at the national level. These gross figures hide other interesting characteristics of SSFs in Emilia-Romagna. In particular, they show one of the lowest levels of average employees on board (1,2 versus an Italian average of 1,6) and the lowest level of average days spent at sea (86 versus an Italian average of 134).

TABLE 1
Main indicators for small-scale fisheries in Emilia-Romagna

SSF indicators	Per vessel (E.R.)	Total (E.R.)	Share of SSF in E. Romagna	Share of SSF in Italy
Vessels		439	59%	67%
GT	2.4	1 064	11%	10%
Days at sea	80-120	35 513	55%	67%
Crew	1.2	525	40%	49%
Catches (t)	3.7	1 552	9%	17%
Revenue (000€)	25.3	10 500	20%	27%

[1] IREPA. Online database. http://www.irepa.org/en/sistan.html

As a general rule, one could say that southern regions have larger crews and more average days at sea compared to northern regions. These differences can be linked to climatic conditions which hamper fishing activity in the north or to the characteristics of the Adriatic Sea that is a semi-enclosed sea. On the other hand, SSFs average crews and days at sea in Emilia-Romagna are even lower in regions such as Veneto and Friuli Venezia Giulia that are northwards. If the regional trend of average days at sea is analyzed, we can see that this has constantly and quickly reduced since 2010, when days at sea were 198 (110 in 2004, 117 in 2009). This can be partly explained by the contemporaneous drop in some of the most important resources caught by SSFs, in particular cuttlefish and spottail mantis squillid.

Unit values of landings (i.e. landing in value / landings in volume) are also quite low compared to the average values in Italy: 6,76€/kg vs. 8,10€/kg. This can be easily explained by the high share in landings of species having a relatively low value, especially sea snails and spottail mantis squillid.

As a consequence of these figures, the average revenue per vessel is a little lower in Emilia-Romagna (around 25-30 000€) compared to the national average. On the other hand, due to the low number of days at sea, the revenue per day is higher than the national average (300€ vs. 250€).

SOCIAL AND STRUCTURAL CHARACTERISTICS OF SSFS IN EMILIA-ROMAGNA

A deeper analysis of SSFs in Emilia-Romagna has been performed by interviewing a sample of 20 fishers. The interviews have addressed several issues, including social characteristics, economic performance and marketing strategies.

As expected, the survey has shown that most targeted species are marine snail, cuttlefish, sole and spottail mantis squillid. Catches can vary substantially year by year depending on environmental conditions and on the state of resources.

Among social and structural aspects, the most interesting results indicate that 84 percent of enterprises are private enterprises and 79 percent of the crews are composed of only one person; in 95 percent of the cases the crew coincides with the entrepreneur or a relative. In other words, there is an almost complete coincidence between entrepreneur, ship owner, captain, worker and seller. The average age is about 44 years, and the enterprise age is about 12 years. Interviews show that the main reason for fishers to this choose work is "sea passion" rather than revenue perspectives or familiar tradition; about half of the fishers have relatives involved in some fishing activity, but few of them have carried on a familiar enterprise. Investments, at least in the pre-crisis period, have been quite common, taking advantage of public incentives.

According to the interviews, the number of days at sea can vary significantly from one year to another and has decreased considerably in the past five years. Seasonality is important and the hours worked in the high season (August) are more than three times higher than in the low season (February). Beyond climatic considerations related to better fishing conditions in summer, it is worth highlighting that in this season the demand is higher due to the presence of many tourists. Furthermore, in August, trawling is forbidden, and SSFs have therefore less competition both at sea and on the markets where prices are higher than usual. However, summer does not necessarily coincide with the most productive season. Catches of sea snails, which in some ports represent more than half of the catches, mainly occur in winter and at the beginning of spring.

Due to the low number of days at sea, it is not surprising that several fishers have declared to be involved in other economic activities, mainly tourism. Almost all small-scale entrepreneurs are associated in cooperatives. However, cooperative services are mainly used for administrative and bureaucratic procedures, while other services such as material provision (e.g. fuel, ice) and trade services are considered to be secondary.

Sixty-four percent of the production is sold to local wholesalers, 23 percent is directly sold to consumers from the boat, and 12 percent is sold in auction markets.

Going beyond average figures, it must be highlighted that SSFs are not homogenous in Emilia-Romagna, and it is possible to identify clusters of enterprises that are characterized by similar behaviors; however, the small number of fishers included in the sample does not allow performing a rigorous and definitive classification. The geographic position of departure ports is an important element of discrimination; sea snails, for example, are almost exclusively fished by boats landing in the southern ports of the region.

The economic performance can vary significantly due to resource abundance fluctuations; increases in fuel prices also affect profits. When the state of the resource is good, allowing more days at sea, return on invested capital can result quite high for the most efficient enterprises (more than 10 percent). Our analysis indicates that the best economic results are obtained by enterprises with more than one crew component, which are more specialized in one or two target species only; in fact, specialization seems to reduce costs and to increase work productivity.

PERCEPTION AND PERSPECTIVES OF COLLECTIVE BRANDS

The Emilia-Romagna public authority has in the past launched an initiative aiming to create a collective brand. This idea was considered as the most suitable tool for pursuing several strategic objectives, such as:

- Adding value to fish products through diversification;
- Promoting the application of EU directives on food safety and forestalling market globalization consequences;
- Protecting consumers (guaranteeing food safety); and
- Promoting synergies between supply chain stage stakeholders: producers (including aquaculture), auction markets, wholesalers, processors, retailers, restaurateurs.

According to this vision, the brand has to be owned by the regional authority and granted to the enterprises that demand it. The regional authority's role is to ensure the brand quality and the respect of specification. The main peculiarity is that the brand can be demanded by and granted to several stakeholders of the supply chain including producers (fisheries and aquaculture), traders/processors, and retailers/restaurateurs. This is required if the quality and traceability of the product has to be guaranteed to consumers, especially in the case of fresh products without packaging that are sold from local fishmongers, or products that are sold by local restaurants. In order to do this, specific procedural guidelines have been prepared for every species and every supply stage.

As a following step of our analysis we have interviewed fishers (not exclusively from SSFs) about their opinion and perception on this collective brand proposed by the Emilia-Romagna region. Their opinion has been compared with that of other stakeholders who should be involved in the collective brand. Everybody had been previously informed about the regulations in connection with the brand and the procedures needed to demand it and be part of the consortium.

A first set of questions focused on the main quality features that should be highlighted in a differentiation strategy, considering consumers preferences. Fishers answered that products safety and freshness were the most important features, as a guarantee that procedural guidelines (specification) are complied with, as well as the origin of the product. On the other hand, less important features include fish size, conservation and nutritional value. It is interesting to note that this opinion is only marginally shared by the other stakeholders of the supply chain. In particular, everybody seems to believe that origin, safety and freshness are key features; in contrast, wholesalers and retailers consider that the guarantee that procedural guidelines are complied with is less

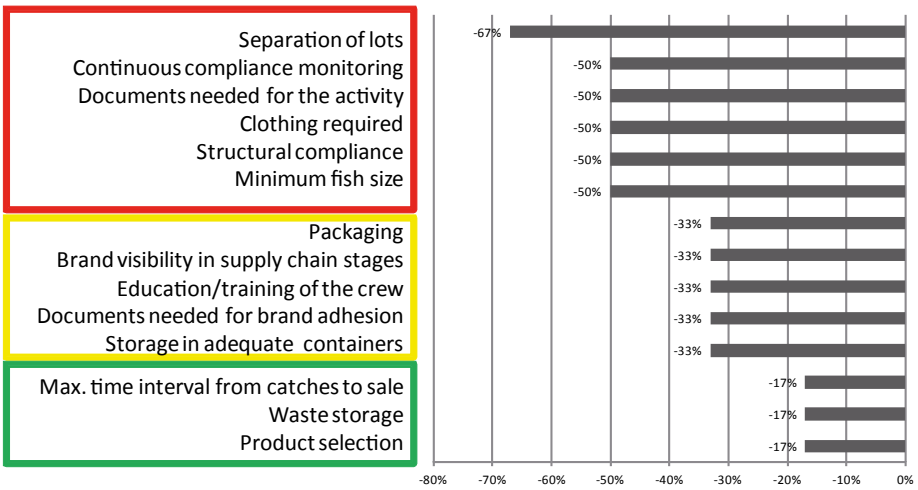
important than an easy conservation. Retailers also include nutritional value among important attributes.

Fishers seem to be aware of potential brand benefits. They clearly identify two of the objectives set by the regional authority, which are: i) providing a tool for product differentiation, and ii) simplification of relationships with buyers. The first objective entails a competitive advantage and higher prices due to an increased collective reputation; the second objective entails the development of privileged vertical relations which should ensure the quality and the volumes of exchange.

On the other hand, fishers are also aware of the commitments that the brand involves. In particular, the implementation of guidelines implies many investments to adapt equipments and productive processes, train workers, ensure controls and quality certification, etc. A second consequence of these is a lower flexibility in management choices and strategic decisions.

In other words, brand adhesion is the result of complex considerations including both short run (e.g. immediate investments, easy relationships with buyers) and long run (e.g. limited flexibility, collective reputation) economic interests. If short run commitments are particularly severe, fishers can have little incentive to ask for the brand and join the consortium. It is probably our case. Actually, when informed about the commitments involved with the brand, fishers have listed a long series of issues that could be more or less problematic for them, given their current behavior and their equipment. Among the most important issues, the following are worth mentioning: separation of lots, continuous monitoring, preparation of documents, clothing requirements, structural compliance and minimum fish size. Other issues are also perceived as problematic but are considered less severe given the current situation (or they are considered problematic only by part of the fishers).

FIGURE 1
Fishers perception of commitments (percent gap from current situation compared to commitment hypothesis)



It is clear that if benefits are not perceived as being sufficiently high to compensate for commitments (especially short-run commitments), fishers might not join the consortium. This is not the only cause that prompts doubts towards the brand. Even if fishers do not consider that the commitments are particularly demanding compared with the benefits to be obtained, they have to face the free-riding suspect. How will the other stakeholders involved in the collective brand behave, including other fishers and downstream stakeholders (processors, retailers, restaurant managers)? The same concern is clearly shared by everybody who should join the consortium. Free-riding

means that while someone pays and is forced to comply with brand specifications, some other only pretend to respect specifications and take advantage of collective benefits generated by the work of others (e.g. good reputation, higher prices). This uncertainty can lead to high costs for monitoring and disincentives to investments and participation. The behavior of free-riders can at last cause a loss of product quality and damage the consortium. Monitoring is essential to ensure the respect of specification, but suspects can continue to discourage the consortium formation. Other fears can be linked to the perception and response of consumers: will they really appreciate the brand repaying it with a premium price? Theoretically yes, but this premium price should be sufficiently high and fast to compensate short run commitments. Promotional activity is necessary to communicate about the quality of the brand, but the communication strategy can be difficult if the involved parties do not agree on the most important aspects to highlight.

All these problems and fears can easily explain why an idea that looks very good on paper is difficult to implement in the real word. Actually, in the case of the collective brand proposed by the regional authority of Emilia-Romagna, the project has not moved forward a lot after this feasibility study. Probably, one should question if the idea was really shared by the economic stakeholders and if this was not another case of top-down initiatives.

CONCLUSIONS

SSFs in Emilia-Romagna show peculiar characteristics compared to the national average. In particular, they include very small crews and a reduced number of days at sea. The historical propensity of regional coastal communities towards touristic activities could be an indirect cause of this situation. From the one hand, touristic propensity can transform SSFs in a part-time activity, especially now that potential economic revenues from touristic activities are much higher than potential economic revenues from fisheries. On the other hand, tourism can encourage SSFs, especially in August when large-scale fisheries are prohibited. In this framework, different groups of fishers have been created in Emilia-Romagna, more or less focusing on SSFs as their main income activity.

Successively, a concrete tool for the differentiation of regional fish products has been analyzed. The regional authority has seriously proposed the creation of a collective brand involving all the stakeholders of the fish supply chain. Procedural guidelines have been studied and prepared for several products and for all supply chain stages. Unfortunately, the process does not seem destined to success. The feasibility study shows that several problems and fears prevent good results of the initiative: the main problem for fishers is probably the high impact of short run commitments, which appear too severe compared to expected benefits; furthermore, expected benefits are considered as uncertain due to free-riding behaviors, unknown consumer response and unclear promotional strategies. Without a core of partners determined to join the consortium, it will be impossible to guarantee the minimum volume of product that is considered necessary for its functioning.

Viability of small-scale fisheries in Datça-Bozburun special environmental protection area, (Eastern Mediterranean), Turkey

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ABSTRACT

Although small-scale fisheries play an important role along the coasts of Turkey where employment opportunities are limited, so far they have been poorly investigated from the economic perspective. In the present study, we focused on the small-scale fisheries sector where it dominates overall fisheries in order to help decision makers to develop appropriate management measures. We analyzed the viability of small-scale fisheries in the Datça-Bozburun Special Environmental Protection Area (SEPA), (Eastern Mediterranean), Turkey, from an economic and social point of view. The analysis was performed using a set of some socio-economic indicators. The field study was carried out in the ten fishing ports and three fishery cooperatives of the SEPA from 13 November 2010 to 27 July 2011. The main data was gathered from face-to-face interviews with the managers of all fishery cooperatives and a total of 211 fishermen, all of whom were vessel owners (80 percent of all vessel owners).

Findings proved that 41 percent of the fishermen in the area live solely on fishing. Fishermen with at least a secondary income besides fishing add up to 59 percent. Most of the fishermen (42 percent) work in the tourism sector as a secondary job, following free trade (28 percent), agriculture (24 percent) and civil service or pension (6 percent). Among the fishermen interviewed, 94 percent stated that they are not hopeful about the future of fisheries, 39 percent stated that they are thinking about quitting and 80 percent did not want their children to do this job. Fisheries in the region are difficult to sustain economically. In terms of net profits, only 21 vessels have stated positive economical results (only 10 percent of the fishermen reach net profits). This ratio reaches 22 percent in Bozburun, where fishing power and sustenance from fishing are highest. When only running costs are considered; 143 out of 211 boats have positive economic results (i.e. difference between total fishing income and running costs). In fact, it is an important economic indicator that 68 boats fail to even meet their running costs. This situation may at first be taken as a sign of how difficult their conditions are; however, one can reach a more rational conclusion considering that 47 of these fishermen have other incomes. Consequently, it is obvious that the majority (69 percent) of the fishermen failing to meet their running costs are pushed to do fishing as a part time job.

The current economic status of small-scale fisheries is signaling against sustainable fisheries. We observe that traditional management measures in the area are insufficient in terms of protecting resources and regarding the fishermen. It is suggested that the buy-back programme recently implemented by the Turkish authority for fishing vessels larger than 12 meters should also cover the small-scale fishing fleets (boats less than 12 meters). This management tool might be helpful to decrease fishing effort and fishing pressure in small-scale fishery and result in efficiency in fisheries by increasing profitability and fishing incomes. However, more comprehensive management strategies which consider biological, ecological, social and economical dimensions of fisheries should be adopted in order to ensure long term sustainability in fisheries.

It is imperative that socio-economic results obtained in the study assist managers and form the basis of information required to prepare management plans and establish sustainable fisheries.

1. INTRODUCTION

Protection and sustainable use of living marine resources are considered a primary subject by coastal countries and international constitutions. In general, fisheries management focuses on the protection of fishery resources so that a sustainable exploitation is possible. However, according to King (1995), although historically the main objective of fisheries management has been the conservation of fish stocks, in modern fisheries management this limited aim has been extended to address additional economic, social and environmental objectives such as fishers' welfare, economic efficiency, the allocation of resources, and environmental protection. Therefore, as a prerequisite of an effective fisheries management, in addition to biological and ecological sides, the socio-economical aspects of fisheries should be assessed and followed. This led coastal countries and some international organizations to collect data related to fisheries management since the sustainability of fisheries depends on a regular and systematic data collection and on evaluating those data to build comprehensive policies and run management plans through persistent enforcement (Cunnigham and Bostock, 2005). However, collecting data to ensure a long-term economical, social, environmental and biological sustainability of fisheries and conducting useful studies for decision-makers are not easy tasks for every coastal country or region.

It is not realistic to argue that there are regional or national data collection units in Turkish fisheries, required by fisheries management, and that work regularly on reliable methods and defined intervals. This situation also applies to the chosen area of study, Datça-Bozburun Peninsula, which is also a Marine Protected Area.

Scientific studies on fisheries management conducted on the Datça-Bozburun SEPA are quite limited, and the numbers of those that study the socio-economical aspects of fisheries among them are quite scarce. The only data and sources of information to contribute to the fisheries management in the area are a project on the determination of the biodiversity of marine and coastal areas by Okuş *et al.* (2004), and a master thesis on the socio-economic conditions, organizational tendencies and problems of Aegean fisherwomen by Göncüoğlu (2008), followed by an article by Göncüoğlu and Ünal (2011). At any rate, studies on Turkish fisheries management generally concentrate on subjects such as selectivity of fishing gear, species-focused weight-size relations, artificial reefs, fishing technologies, biodiversity and fisheries biology. Although in recent years there is an increase in the number of studies on the socio-economic condition of Turkish fisheries (Ünal and Hossucu., 1996; Ünal, 2003; Ünal, 2004; Ünal *et al.*, 2009; Ünal and Franquesa., 2010; Göncüoğlu and Ünal, 2011), these studies and interested researches are rather rare when compared to those advising on management. In the light of the current situation, one can argue that the social and economical dimensions, which are considered as an important component of fisheries management, and related data monitoring activities, are falling short.

Therefore, this study focuses on these missing components of fisheries management. Datça-Bozburun Peninsula, which had formerly been studied for its marine diversity, is now approached from the socio-economic point of view. In this study, in order to enquire if the fisheries are economically sustainable, survey forms have been designed, field studies have been planned, meetings have been organized, face-to-face interviews have been made with fishermen.

This study is a first-off attempt in terms of the region it covers and the results it achieves. It contains vital information on both fisheries and integrated coastal zone management.

The results of this study will further prove useful when improvements are considered in the future, such as the creation of fisheries management plans in Datça-Bozburun Peninsula or the establishment of a buy-back programme for 10 meter-long or smaller vessels (similar to that is currently in effect for 10 meters or longer vessels).

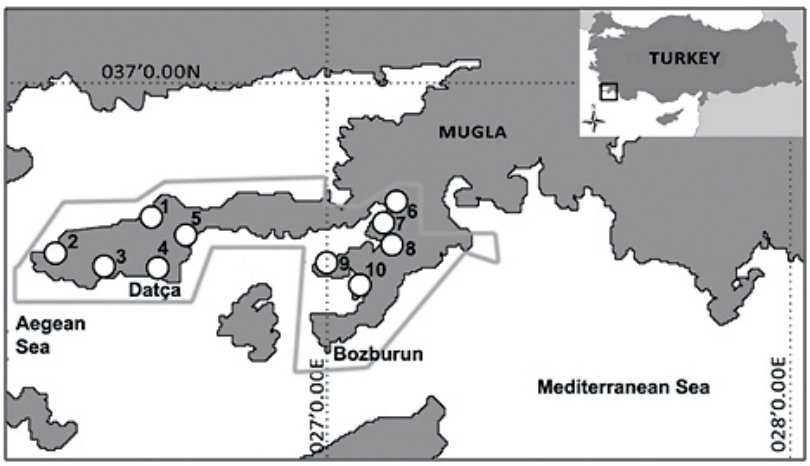
2. MATERIAL AND METHOD

2.1 Study area

Datça-Bozburun SEPA, one of the Mediterranean oligotrophic regions is considered one of the most important protection areas of Turkey for its archeological richness and biodiversity, allowing the survival of 35 species under the IUCN protection list (Okuş *et al*., 2004).

The main sources of income for the Datça-Bozburun SEPA are tourism, agriculture and small-scale fisheries with vessels smaller than 12 meters in length using traditional gear. There are 3 fishery cooperatives within the area of study. Fishermen who are cooperative stakeholders use small-scale gear such as longlines and gillnets on 8±1m long wooden fishing boats. None of the cooperatives carries marketing (auction, retail, etc.) activities.

FIGURE 1
Fishing districts and villages studied in SEPA, Turkey



(Datça-Bozburun Special Environmental Protection Area (SEPA); 1: Karaköy, 2: Knidos, 3: Palamutbükü, 4: Hayıtbükü, 5: Datça, 6: Hisarönü, 7: Orhaniye, 8: Selimiye, 9: Bozburun, 10: Sögüt)

Among target species of the small-scale fisheries in the study area are *Epinephelus aeneus*, *Epinephelus alexandrinus*, *Penaeus kerathurus, Epinephelus guaza*, *Sparus aurata*, *Pagellus erythrinus*, *Dentex dentex*, *Mullus barbatus, Upaneus molluccensis*, *Mullus surmuletus*, *Merluccius merluccius, Boops boops*, *Mugil* spp., *Octopus vulgaris, Sadra sarda, Siganus rivulatus,* and *Siganus luridus.*

Altough target species in the peninsula are typical to the eastern Mediterranean, *Lagocephalus sceleratus,* firstly recorded in the Mediterranean in 2005, and some puffer fish species invading the ecosystem have started to trouble the fishermen. Also, as reported by EastMed (2010), the population of rabbitfish (*Siganus rivulatus* and *Siganus luridus)* species of Red Sea origin, which entered the Mediterranean through the Suez Canal in 1924, has increased dramatically, as well as other economic lessepisian species in recent years.

2.2 Data collection

The field study was carried out in the Datça-Bozburun SEPA, in two peninsulas (Datça and Bozburun), from 13 November 2010 to 27 July 2011. During the study, Datça, Karaköy, Palamutbükü, Knidos, Hayıtbükü, Selimiye, Hisarönü, Orhaniye, Bozburun and Söğüt-Taşlıca fishing villages and ports were visited. Furthermore, data obtained from three fishery cooperatives located in the Datça peninsula were reviewed. However, as Ünal and Franquesa (2010) also reported, since the primary information and data on socio-economics of fisheries were not collected on a regular basis, nor were updated information provided by the relevant authorities in Turkey, the main data presented in this report were gathered from personal interviews.

Face to face interviews were performed with the heads of all fishery cooperatives and a total of 211 regional fishermen, all of whom were vessel owners, (80 percent of all fishermen including both cooperative members and non-members in the study area).

2.3 Data analysis and assessment

Data assessment was made in two separate groups according to fishermen settlements, the Datça peninsula and Bozburun peninsula. In addition to these two groups, results are also presented as a whole for the Datça-Bozburun SEPA.

We followed the same methodology used in an FAO Fisheries Technical Paper by Tietze *et al.* (2001) and an article by Ünal and Franquesa (2010) to evaluate the viability of small-scale fishing operations as a commercial activity. Total costs were introduced into the study; running costs (fuel, lubricating oil, ice, bait, food and supplies for the crew), vessel costs (vessel and gear repair/maintenance expenses and vessel insurance), labour costs (wages) and capital costs (costs that fishermen do not pay in cash, such as opportunity costs and depreciation). The imputed interest rate (real interest rate) is used to calculate the opportunity cost in this study as the rate difference between government bonds and inflation (Davidse *et al.,* 1993; Salz, 2000).

The methodology suggested by Franquesa *et al.* (2001) and modified by Ünal and Franquesa (2010) was used to calculate the socio-economic indicators.

At the time of this study, the effective exchange rate for 1 USD and 1 Euro was 1.56 and 2.21 Turkish Lira (TL) respectively as the official rate of the Central Bank of the Republic of Turkey.

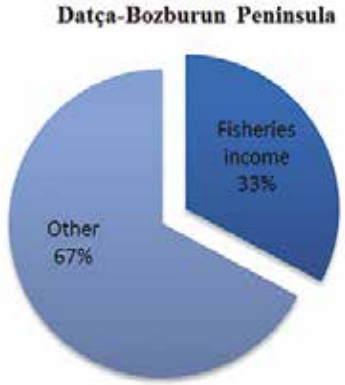
3. RESULTS

3.1 Socio-demographic and economic features of the Datça-Bozburun SEPA fishery

A total of 264 fishing boats and around 490-500 fishermen were recorded in the Datça-Bozburun SEPA. In addition, there are around 100 active fisherwomen. 65 percent of the fishermen in the Datça-Bozburun SEPA define fishing as their primary source of income. 54 percent of the Datça peninsula fishermen and 69 percent of the Bozburun fishermen state that their real job is fishing. According to the survey results, fishermen in the Datça-Bozburun SEPA make their living from fishing by 33 percent and from tourism (restaurant-owners, ship cooks, etc.) and agricultre (olive and tomato

cultivating) by 67 percent (Figure 2). This result reveals that fishermen have other sources of income than solely fishing or that there are part-time fishermen in the area. However, there are differences among the results of the fishing villages that were analyzed. Fishermen with the lowest fishing income rate within total income are found to be in Datça-Centrum (27 percent), followed by Karaköy (31 percent) and Selimiye (31 percent), Bozburun (32 percent), Palamutbükü-Hayıtbükü (36 percent), Hisarönü-Orhaniye (38 percent), Söğüt (39 percent) and Knidos (40 percent).

FIGURE 2
Rate of fishing income with respect to total income for Datça- Bozburun SEPA fishermen



For 41 percent of the Datça-Bozburun SEPA fishermen, the only income is fishing. Selimiye and Bozburun are the two foremost areas where fishing is the only income by 46 percent and 49 percent, respectively. In contrast, Knidos and Palamutbükü are the last in terms of depending solely on fishing. Only 17 percent of Knidos fishermen state that their only income is from fishing; this rate reaches 29 percent for Palamutbükü fishermen (Table 1).

The majority of fishermen having at least one extra job (42 percent) have incomes from tourism, followed by self-employment (29 percent), agriculture (24 percent) and public service or pension (6 percent).

When compared in terms of fishing as the only income, Bozburun Peninsula (43 percent) is followed by Datça Peninsula (35 percent). The Datça-Bozburun SEPA fishermen are dependant on fishing only by 41 percent, distributed as 77 percent (Bozburun Peninsula) and 23 percent (Datça Peninsula). In other words, 77 percent of the 86 fishermen who have no other income than fishing live in Bozburun.

The age of interviewed fishermen ranged from 26 to 82, with an average age of 48±11 and an average literacy level 6±2 years. Average household population of fishermen is 4±2, each fisherman provides for about 2±1 dependants. They have high levels of marital status (92 percent married), homeownership (95 percent have their own house) and social security (87 percent have some sort of social security) (Table 1). The age distribution of fishermen (Figure 3) favor middle age and over (by 81 percent), with more than 60 percent of the fishermen who are over 46 years old.

FIGURE 3
Age distribution of Datça-Bozburun SEPA fishermen

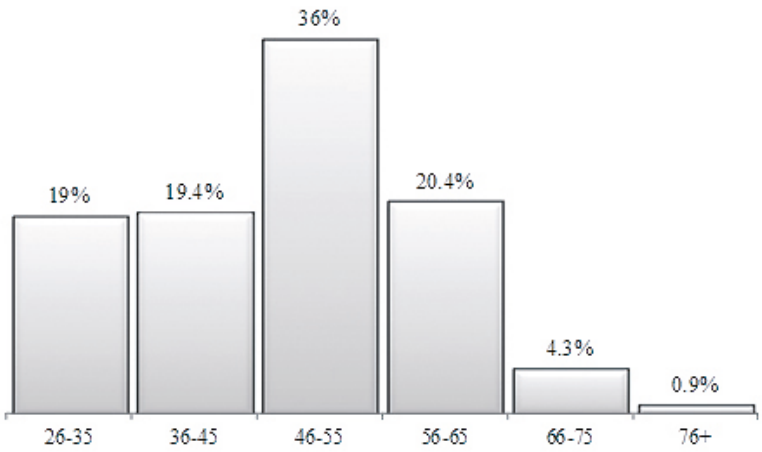


TABLE 1
Socioeconomic and demographic features of Datça-Bozburun SEPA fishermen

	Datça n=19	Palamut/ Hayıtbükü n=17	Karaköy n=15	Knidos n=6	Datça Peninsula n=57	Hisarönü-Orhaniye n=10	Selimiye n=48	Bozburun Peninsula n=59	Söğüt n=37	Bozburun Peninsula n=154	Datça-Bozburun N=211
Avg. Age of fishermen (years)	50±15	49±12	48±10	52±8	49±12	48±12	44±12	51±11	46±9	47±11	48±11
Avg. Experience of fishermen (years)	25±11	24±11	27±10	26±3	25±10	23±12	22±12	26±11	21±8	23±11	24±11
Avg. Education of fishermen (years)	7±3	7±3	5±2	7±3	6±3	5±2	6±2	5±2	5±2	5±2	6±2
Number of dependants	2±1	2±1	3±2	3±2	2±2	2±1	2±1	2±1	2±1	2±1	2±1
Marriage Rate (%)	89	82	80	100	86	90	92	95	100	95	92
Depend solely on fishing (%)	37	29	47	17	35	40	46	49	30	43	41
Having social security (%)	89	94	67	83	84	100	79	92	89	88	87

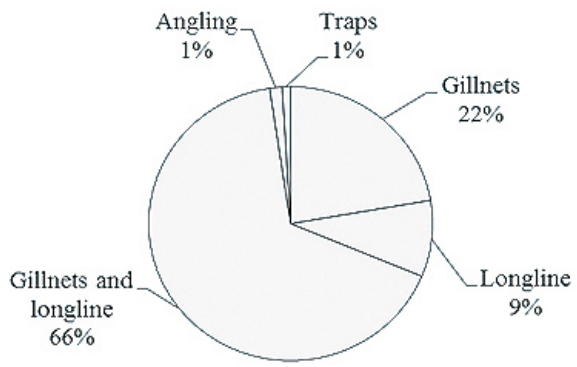
3.2 Fishing fleet and gear

The average length of fishing boats is 8±1m, average age is 15±7 years and average horse power is 19±16. Vessels have an average of 2±1 crews with 165±74 days at sea per year (Table 2).

TABLE 2
Technical properties and operational data of Datça-Bozburun SEPA fishing fleets

Region	Age of vessel (years) (mean±std)	Length of vessel (m) (mean±std)	Power of engine (HP) (mean±std)	Number of crew (mean±std)	Days at the sea per year (mean±std)
Datça	13±8	8±1	23±23	2±1	175±88
Palamutbükü-Hayıtbükü	19±10	7±1	10±2	2±1	183±68
Karaköy	19±10	8±1	27±36	2±0	175±69
Knidos	15±8	7±1	18±10	1±1	201±42
Datça Peninsula	17±9	7±1	20±23	2±1	180±72
Hisarönü-Orhaniye	15±6	7±1	15±8	1±0	158±79
Selimiye	12±6	8±1	19±12	1±0	167±79
Bozburun	14±7	8±1	20±12	2±0	143±54
Söğüt	15±8	8±1	18±15	1±1	167±88
Bozburun Peninsula	14±7	8±1	19±13	1±1	158±73
Datça-Bozburun SEPA	15±7	8±1	19±16	2±1	165±74

FIGURE 4
Distribution of fishing gear use among Datça-Bozburun SEPA fishermen



9 percent of Datça-Bozburun SEPA fishermen who are cooperative members use longlines only. 22 percent use gillnets while 66 percent use both interchangeably. 1 percent use handlines and 1 percent use basket (Figure 4).

3.3 Professional satisfaction

Among the fishermen interviewed, the majority are pessimistic about the future of fisheries. Almost all of the fishermen (94 percent) stated that they are pessimistic, as 39 percent consider quitting and 80 percent do not want their children to do the job (Table 3).

TABLE 3
Opinions of Datça-Bozburun SEPA fishermen about the job and the future of fishing

Region	Consider quitting fishing (%)	Want their children to do the job (%)	Pessimistic about the future of fisheries (%)
Datça	26	47	79
Palamutbükü- Hayıtbükü	29	24	94
Karaköy	13	27	93
Knidos	33	0	100
Datça Peninsula	25	30	89
Hisarönü-Orhaniye	60	10	100
Selimiye	46	15	94
Bozburun	44	17	100
Söğüt	41	19	92
Bozburun Peninsula	45	16	97
Datça-Bozburun SEPA	39	20	94

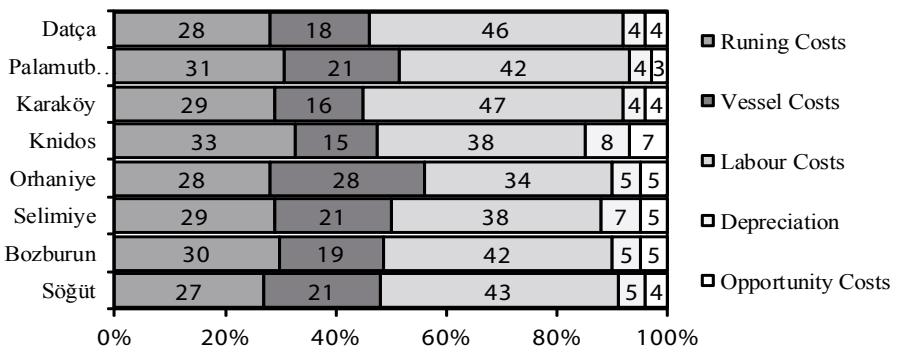
Almost half of the fishermen (41 percent) started fishing as a family job, 36 percent do it for their passion for the sea, and 22 percent do the job because of economical obligation.

4. ECONOMIC ACTIVITY RESULTS

The most significant costs for Datça-Bozburun SEPA fishermen are labour costs that vessel owners pay to the crew members they employ (42 percent), followed by vessel costs (29 percent), running costs (20 percent), depreciation (5 percent) and capital cost (4 percent).

When the cost distribution per region is examined, some minor differences are observed, along with significant similarities between regions. In this respect, labour costs consitute the biggest difference in total costs between Hisarönü-Orhaniye (34 percent) and Karaköy (47 percent), while vessel costs are 15 percent in Knidos and 28 percent in Hisarönü-Orhaniye. However, the difference regarding running costs is smaller. The rate of running costs of Söğüt fishermen in total costs is 27 percent, while it reaches 33 percent for Knidos fishermen (Figure 5).

FIGURE 5
Regional distribution of total costs of Datça-Bozburun SEPA fishermen



Economic activity results for Datça-Bozburun SEPA fishing vessels reveal that the fisheries in the area are difficult to sustain. When net profits are considered, only 21 vessels (13 vessels in Bozburun, 4 vessels in Söğut, 1 vessel in Selimiye, 1 vessel in Palamutbükü-Hayıtbükü and 2 vessels in Datça) result in positive economic activity.

The results of economic analyses show that only 10 percent of the Datça-Bozburun SEPA fishermen achieve net profits while the rest are economically damaged. With these figures at hand, even attempting to calculate an economical performance

(net profit/total income) for the fisheries in the region was unnecessary. Only 22 percent of fishermen achieve net profits in Bozburun, where the fishing effort is stronger and the dependancy on fishing is higher. When calculation was made according to running costs only, i.e, when only the difference between the total income and running costs are considered, only 143 vessels yield positive results. It is a noteworthy economic indicator that 68 vessels in Datça-Bozburun SEPA cannot even afford running costs.

The regional comparison of the average values of total costs, total fishing income and total operational incomes are in favour of Bozburun peninsula. Datça peninsula has higher total costs and lower total fishing income and total operational income. The region with the highest average operational income is Bozburun, followed by Knidos and Söğüt. Bozburun also leads in total fishing income (Table 4).

Increasing fishing costs and decreasing catch per unit effort discourage fishermen to employ crew from outside and they prefer to go fishing alone or with a family member. Almost half (49 percent) of the fishermen interviewed in the Datça-Bozburun SEPA employ a crew. Crew members are mostly family members (spouse, children, father, etc.) by 89 percent. When we look at all fishing regions, in the Datça centre, 53 percent of the fishermen employ a crew, from which 80 percent are family members. In Palamutbükü-Hayıtbükü, 47 percent employ a crew, with 75 percent consisting of family members. In Karaköy, 80 percent employ a crew with 67 percent family members. In Knidos, 33 percent employ a crew that is exclusively composed of family members. In Hisarönü-Orhaniye, only 30 percent employ a crew with 33 percent consisting of spouses or children. In Selimiye, one out of 3 fishermen has a crew, from which 88 percent is composed of children or wives. In Bozburun, the rate of employing crew is 61 percent and all the fishermen choose their crew among their children or wives. In Söğüt, almost half of the fishermen (46 percent) employ a crew, composed at 88 percent of family members. The majority of fishermen (68 percent) prefer to work with their wives.

TABLE 4
Economic activity results for Datça-Bozburun SEPA fishery

Mean Economic Results per vessel/year (in USD)	Datça n=19	Palamutbükü-Hayıtbükü n=17	Karaköy n=15	Knidos n=6	Datça Peninsula n=57	Hisarönü-Orhaniye n=10	Selimiye n=48	Bozburun n=59	Söğüt n=37	Bozburun Peninsula n=154	Datça-Bozburun SEPA N=211
Total Revenue-fishing income	5 596	4 708	3 539	3 628	4 582	2 892	3 667	6 675	4 220	4 902	4 816
Running costs	3 089	4 127	2 893	3 286	3 003	2 138	2 346	2 423	2 300	2 351	2 527
Vessel Costs	1 937	1 932	1 584	1 493	1 796	2 088	1 677	1 525	1 803	1 676	1 708
Labor costs	5 030	3 914	4 733	3 732	4 448	3 150	3 049	3 434	3 622	3 308	3 636
Depreciation	450	347	375	657	434	340	526	402	396	437	436
Opportunity Costs	411	326	369	653	400	352	404	384	347	379	384
Total costs	10 916	9 422	9 822	9 939	10 079	7 513	8 003	8 189	8 467	8 151	8 672
Operational income*	3 898	3 867	1 461	4 908	3 173	1 350	2 689	5 448	4 142	4 124	3 884

*Operational incomes are calculated by subtracting running costs from total fishing income. Since only 21 vessels show positive results, no average values are shown.

The lowest per-vessel running costs are in Hisarönü-Orhaniye (14±6.6 USD/day/vessel) where the fishing grounds are also relatively closer. Datça and Bozburun, however, are the two regions where daily running costs are highest.

The average number of crew per year, including the captain, has been calculated as 2±1 with an average of 165±74 days at sea per vessel and per year. There are also days when the fishermen return with no catch. Even so, 68 percent of the vessels recorded returned positive operational incomes. The average values calculated only among the vessels returning positive operational incomes show that Bozburun has the

best average (35±27 USD/day/vessel). However, 19 percent of Bozburun fishermen failed to cover their running costs and are therefore excluded from average calculation. Although Table 5 shows that Bozburun fishermen are followed by Knidos fishermen with 26 USD/day/vessel, the results are only for a single vessel. Since other vessels interviewed in Knidos are part-timers, they are even unable to cover their running costs. Results of Karaköy (7.3±7.3 USD/day/vessel) and Selimiye (7.3±5.3 USD/day/vessel) fishermen are similar, marking the lowest operational incomes. All these results on operational incomes should be evaluated in conjunction with the vessels showing positive and negative operational incomes in their respective settlements. According to this, 5 (26 percent) of the 19 vessels examined in Datça, 7 (41 percent) of 17 vessels in Palamutbükü-Hayıtbükü, 4 (27 percent) of 15 vessels in Karaköy, 5 (83 percent) of 6 vessels in Knidos, 3 (30 percent) of 10 vessels in Hisarönü-Orhaniye, 17 (35 percent) of 48 vessels in Selimiye, 11 (19 percent) of 59 vessels in Bozburun and lastly 16 (43 percent) of 37 vessels in Söğüt are unable to cover their daily running costs with their daily catch amounts or the income they earn from their daily sales. The most efficient vessels are in Bozburun, followed by Selimiye and Datça.

TABLE 5
Some socio-economic indicators in Datça-Bozburun SEPA fishery

Ecnomomic Activities (Mean values)	Datça n=19	Palamutbükü-Hayıtbükü n=17	Karaköy n=15	Knidos n=6	Datça Peninsula n=57	Hisarönü-Orhaniye n=10	Selimiye n=48	Bozburun n=59	Söğüt n=37	Bozburun Peninsula n=154	Datça-Bozburun SEPA N=211
Labor productivity**	2 967	2 666	2 013	3 161	2 812	2 718	3 242	4 262	2 821	3 497	3 312
Total Capital**	17 046	13 404	15 320	27 128	16 603	14 636	16 765	15 947	14 371	15 738	15 972
Capacity efficiency of vessel length**	726	495	455	484	608	396	460	805	508	599	602
Vessel Efficiency*	5 596	4 708	3 538	3 628	4 583	2 892	3 667	6 675	4 220	4 902	4 815
Engine Efficiency **	317	367	261	238	329	247	231	416	306	321	322
Daily catch income **	27	17	20	18	22	18	20	44	21	29	28
Daily Running costs**	19	15	18	16	17	13	15	19	16	16	17
Operation income**	19	9	7	25	14	7	13	33	17	22	21

*Per year, ** Per day.

Finding relatively higher engine power efficiency values in regions like Palamutbükü-Hayıtbükü where vessels have lower engine power (10±2 HP) is expectable. Bozburun has the highest average for engine power efficiency, with vessels of 20±12 HP engines. Additionally, in Karaköy (27±36 HP) and Datça (23±23 HP), where average engine power values are higher, engine power efficiency is also higher than in other regions (Table 2). Engine power efficiency depends also, aside from the power of the engine used, on other factors such as the distance of the fishing ground, catch amount and high fish prices.

In terms of daily catch value per vessel, Knidos (18.6±10.6 USD) and Hisarönü-Bozburun (28±10 TL=15.6 USD) have similar results. Likewise Karaköy (31±14 TL=17.2 USD) and Selimiye (31±21TL=17.2 USD) have close values whereas the vessels in Söğüt have an average of 33±26 TL (18.3 USD) catch value. We found the highest average per-day catch value in Bozburun (68±43 TL=37.8 USD) and in Datça (42±36 TL=23.3 USD), and the lowest in Palamutbükü-Hayıtbükü (26±14 TL=14.4 USD).

5. DISCUSSION AND CONCLUSIONS

Small-scale fisheries are in jeopardy in many countries, partly because scientists and decision-makers are failing to pay enough consideration (Ünal and Franquesa, 2010). FAO (2002) reports that 5.8 million fishermen earn less than 1 USD per day and Berkes *et al.* (2001) argues that small-scale fisheries are poorly managed worldwide and that most of the coastal fisheries are suffering from overfishing. However, the protection and sustainability of small-scale fisheries using rather traditional methods and gear is vital for many people living in the coastal areas. Sustainable fisheries are directly linked to the survival and economic welfare of fishermen societies (Ünal and Franquesa, 2010).

This study, conducted within the Datça-Bozburun SEPA, analyses fisheries socio-economically and enquires whether the fisheries and fishermen in the area are able to survive economically.

Almost all of the fishermen in the Datça-Bozburun SEPA are pessimistic about the future of fisheries and half of them are seriously thinking of quitting fishing as a profession. According to Ünal and Franquesa (2010), daily catch values per vessel show similarities among Akyaka (34 USD), Akçapınar (15.7 USD) and Marmaris (22.6 USD). Moreover, Ünal and Franquesa (2010) report 22.5 USD per vessel day productivity for vessels working full-time in Foça, and 10.3 USD for Karaburun where recreational fishing is mostly practiced. However, 25 years ago, Berkes (1986) reported that the daily catch value for a small-scale vessel in Turkey was 40 USD. These comparisons cannot be made in terms of catch amounts because the current system makes almost impossible to gather data. However, in light of the present findings, we are able to achieve relatively reliable information in line with the previous studies conveying the difficulty of the situation of small-scale fisheries and traditional fishermen. The most important livelihood of fishermen who are in difficult conditions depends on fishing.

When Ünal and Franquesa (2010) compare the related results regarding labour efficiency in the Datça-Bozburun SEPA fisheries, one can notice that these results are lower than those in Akyaka, but higher than in Akçapınar and Marmaris. Engine power efficiency values have similarities with Akçapınar and Akyaka in Gökova as well as Marmaris fisheries. This comparison shows that the best values are in Akyaka, followed by the Datça-Bozburun SEPA.

All cost items of Datça peninsula fishermen, excluding depreciation, appear to be higher than those of Bozburun fishermen. These results are closely related to the fact that Bozburun fishermen consider fishing as a source of income. All average costs excluding depreciation are higher in Datça Peninsula, while total catch values and total operational incomes are lower. When combined with some other findings, these results may become meaningful, as the Bozburun fishermen consider fisheries as the only source of income and earn their living mostly from fishing, unlike in other regions where fishing is done part time or as a hobby.

Economic analysis results of Datça-Bozburun fishing vessels show that fisheries in the peninsula are difficult to sustain economically. In terms of net profits, only 21 vessels (13 in Bozburun, 4 in Söğüt, 1 in Selimiye, 1 in Palamutbükü-Hayıtbükü and 2 in Datça) have stated positive economical results. These results show that only 10 percent of the fishermen in the entire Datça-Bozburun peninsula can reach net profits and the rest have made loss. This ratio is 22 percent for Bozburun, where fishing power and sustenance from fishing are highest. When only running costs are considered, 143 of 211 boats have positive results. In fact, it is an important economic indicator that 68 boats fail to even meet their running costs. This situation may at first be taken as a sign of how difficult their conditions are. However, one can reach a more rational conclusion when considering that 47 of these fishermen have other incomes. Consequently, it is obvious that most (69 percent) of the fishermen failing to meet their running costs do fishing as a part-time job.

Comparison on average regional total costs, total catch value and total operational income indicates an advantage for the Bozburun peninsula. Total costs are higher in the Datça peninsula fisheries while total catch value and total operational income are lower. These results are harmonious with the fact that Bozburun fishermen regard fisheries as the source of income.

Current economic status of small-scale fisheries in the Datça-Bozburun peninsula is signaling against sustainable fisheries. These results may seem promising when compared to the FAO (2002) report, indicating that 5.8 million of small-scale fishermen earn less than 1 USD per day. However, such comparison is neither realistic nor reflects the situation of the fishermen in the region. On the contrary, it should be explained how fisheries can survive under these conditions and a solution (or solutions) should be offered to overcome these problems which are seemingly impossible to solve.

There may be some reasons why and how fishermen are able to continue despite these negative economic activity results:

- Most fishermen see fishing as a part-time job or a hobby, and they have additional incomes
- Fishermen consider daily running costs rather than total costs, and they do not calculate labour costs for themselves or their family members, thus continue as long as they can meet the most variable cost which is fuel

Creating alternative job opportunities, apart from fishing but still related to fisheries, can be offered as a solution. Just like in this study, other studies conducted in the Aegean coasts of Turkey reveal that fisheries are calling for help both in terms of biology and economy (Ünal, 2005; Kınacıgil *et al.,* 2008; Ünal, 2010). This situation requires to explore alternative job opportunities and to find out whether the fishermen consider quitting the job in many regions.

As a result, it is imperative that fisheries in the peninsula should be monitored economically as well as ecologically and biologically. Carrying out a research on whether fishing is economically viable is necessary in terms of fisheries management. Results obtained here would be convenient for managers and decision makers and form the source of information required to incorporate into management plans and establishing sustainable fisheries.

ACKNOWLEDGEMENTS

We would like to extend our gratitude to the board members of the fishery cooperatives and all fishermen who shared their knowledge during field study. Our further thanks are extended to the strengthening of the system of marine and coastal protected areas of Turkey that has been carried out jointly with the Ministry of Environment and Urbanization – General Directory for the protection of natural assets including their Muğla Provincial Directorate and the United Nations Development Programme – Turkey for their local staff help and financial support. Last but not least, we also thank to Ministry of Food, Agriculture and Livestock – General Directorate of Fisheries and Aquaculture for their support to ease the implementation of the study.

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ABSTRACTS

Oral contributions

ECOTOURISM POTENTIAL IN THE ARTISANAL FISHERIES SECTOR ALONG THE LEBANESE COAST (DOCUMENT PRODUCED FOR THE UNITED NATIONS DEVELOPMENT PROGRAMME IN LEBANON)

Manal Nader, Manale Abou Dagher and Shadi El Indary

Fishing in Lebanon is an ancient practice using artisanal techniques that are still widespread among coastal communities. Fishermen are among the poorest groups of the Lebanese society since their livelihood is widely and directly dependent on natural coastal and marine resources. Those resources are under severe pressure threatening the livelihoods of fishers and their families. This report examines the potential for diversification of the activities of the artisanal fisheries sector to improve the livelihood of fisher communities and conserve coastal and marine natural resources, with special emphasis on ecotourism. Three sets of activities with their subsets are proposed with a detailed description of each of them. Each set is also supported by a related success story in addition to an estimated budget, timeframe and season for implementation. Set 1 recommends the establishment of a "National fishermen's week" that includes fishing and rowing tournaments, a seafood festival, women activities, and a traditional boat building and painting competition. Set 2 proposes launching guided fishing and diving trips, camps and lodges where it is suggested to the fishermen communities to establish an official system for guided fishing and diving trips for visitors, host interested tourists in their lodges to provide them with an authentic artisanal fishing experience, and to create camps and camping sites for the same purpose. Set 3 foresees the promotion of cultural activities through the creation of a fisheries museum, the holding of a traditional music and theatre festival as well as a photography and painting competition. Joining forces between fishermen cooperatives, syndicates, non-governmental organizations, municipalities and other public institutions will contribute to creating new socio-economic opportunities for the fishermen and improve the livelihood of one of the poorest communities in the Lebanese society while sustaining natural coastal and marine resources. Fisheries ecotourism activities once launched and properly managed can be self-sustaining from the funds generated by the events in addition to the funds provided by sponsors and advertisements that are attracted by similar initiatives. In addition, collaboration with similar actions in Lebanon and the region is highly encouraged to attract not only local but also regional tourists.

A COMPARISON OF SMALL-SCALE FISHERIES ECONOMIC CONSTRAINTS IN THE EASTERN MEDITERRANEAN

Dario Pinello and Mark Dimech

Small-scale fisheries are present in all the Mediterranean countries with a general similarity in their technical characteristics and fishing behavior. However, the structure of the input factors (harvesting costs) and the average value of its output (ex-vessel price) vary remarkably. Although the fisheries are small-scale, some economic constraints vary considerably among countries. The comparison of the input and output factors among the different countries reveals the role they play and the trade-offs with the existing general economic situation of the country. A qualitative risk assessment has

been carried out in order to understand if such constraints could be a major problem in the future and to give an indication if any management measures could be undertaken. This paper adds to the understanding of the harvesting costs structure and of the constraints that cost items represent. The data used was derived from socio-economic surveys which are currently being conducted within the framework of the FAO EastMed project and include data from Egypt, Gaza strip, Lebanon and Turkey. As a comparison with a Mediterranean European country, data from small-scale fisheries in Italy was also used. The data has been collected using a simple random survey where the sample unit was the licensed fishing vessel. The same standard methodology to collect and estimate the same economic variables made the subregional comparison highly valuable. Our results show that fuel represents the main constraint for the fleet operating in Gaza and in Lebanon, while labour is the main constraint for the Egyptian small-scale fleet. In Italy, a key role is played by the capital costs as well as the fuel cost, while Lebanon incurs in the highest commercial costs. Taking into account the volume of fuel consumed, it appears that in Egypt the subsidies on fuel are distorting the economic performance of vessels, making them highly vulnerable to possible changes in the subsidies policy. Labour was also compared against the national minimum wage across countries in order to determine how the small-scale segment is performing from the view point of working fishers. Finally, a specific analysis of outputs was done in order to compare ex-vessel prices with the purchasing power of consumers.

PROJET DE CRÉATION D'UNE ORGANISATION DE PRODUCTEURS DE PÊCHE ARTISANALE DANS LE GOLFE DU LION, MÉDITERRANÉE FRANÇAISE

Frédérick Reste and Bertrand Cazalet

Le projet GOLION s'inscrit autour de l'idée de transition qui touche actuellement la pêche professionnelle dans la région Languedoc-Roussillon, en France. Cette situation est marquée par l'effondrement des segments chalutiers, lamparos et thonier-senneurs (industriels et semi-industriels) qui ont représenté pendant plusieurs décennies l'essentiel des débarquements de poissons bleus (sardines, anchois, maquereaux, thonidés, etc.) et dans une moindre mesure de poissons blancs (merlu, merlan, lotte, dorades, etc.). Cette situation engendre un rééquilibrage des débarquements au profit des pêches artisanales, ou petits métiers, et la nécessité de faire évoluer les mécanismes de commercialisations longtemps dominés par une approche historique purement quantitative. Le projet GOLION souhaite porter cette réflexion pour aboutir à des propositions/solutions concrètes en faveur de ce segment et de son développement durable. Les attentes des professionnels en matière de commercialisation sont très fortes, tout comme la demande sociale et économique autour de la valorisation des produits du petit métier (faibles volumes, fortes diversités, hautes qualités sanitaires et gustatives). Le projet GOLION se penche sur la faisabilité et la création d'une organisation de producteurs exclusivement tournée vers la commercialisation et la valorisation des produits de la pêche au petit métier. Selon Lefebvre *et al.* (2004), les organisations de producteurs (OP) sont «créées par des pêcheurs[…] s'associant librement afin de mettre en œuvre des mesures garantissant les meilleures conditions de mise sur le marché de leurs produits […] la reconnaissance d'OP est nécessaire quant à l'octroi de nombreuses aides financières ainsi qu'à l'obtention de l'extension des règles de discipline». La création, le fonctionnement et le contrôle des OP sont encadrés par le droit européen et le droit français en tant qu'organes «de régulation du marché des produits de la pêche». Dans une zone déterminée, les OP sont constituées par «les sociétés commerciales, les groupements d'intérêt économique ou les associations régies par la loi du 1er juillet 1901 relative au contrat d'association, constitués de producteurs, ou les associations de telles organisations peuvent être reconnus par le ministre

chargé des pêches maritimes comme organisations de producteurs conformément aux dispositions des règlements de l'Union européenne». La reconnaissance en tant qu'OP nécessite donc un travail préparatoire dense (conditionnalité, représentativité au sein de la filière) afin d'obtenir un agrément national porteur de droits et d'obligations (cahiers des charges) relativement contraignants. Outre ses «finalités d'amélioration des conditions de vente», une OP porte également des ambitions complémentaires dans le but de pérenniser l'activité de ses membres: 1) adapter la production aux marchés (quantité et qualité); 2) assurer la transparence et la traçabilité de la filière; 3) promouvoir des méthodes de production respectueuses de l'environnement. Ces différents objectifs sont tous très importants et s'inscrivent dans la réalisation du projet GOLION. En effet, la pêche aux petits métiers est majoritairement considérée comme étant la plus durable car porteuse des pratiques et techniques les moins impactantes sur le milieu et ses ressources. La réforme de la Politique commune des pêches (PCP) qui doit entrer en vigueur début 2014 (négociations finales en cours) a d'ailleurs reconnu ce particularisme et souhaite désormais favoriser un plus fort soutien à ce segment. Sur ces bases, la présentation proposée se penchera sur les objectifs et les conditions de constitution d'une structure juridique, institutionnelle et économique susceptible d'être reconnue de façon effective (au terme du projet) en tant qu'OP petits métiers par les autorités nationales et de l'UE.

HIGH ADDED VALUE PROCESSED SEAFOOD FROM LOW DEMAND FISH SPECIES (*THUNNUS ALALUNGA, BOOP BOOPS* ETC.) IN THE ISLAND OF KALYMNOS, GREECE[1]

Nikos Stamatis and Constantina Riga

The island of Kalymnos is located on the eastern side of the Aegean Sea with 1600 inhabitants. Kalymnos is known and billed as the "Sponge-divers" island. Sponge diving has long been a common occupation on Kalymnos and sponges were the main source of income of local people, bringing wealth to the island and making it famous throughout the Mediterranean. A disease during the mid 1980s hit the eastern Mediterranean, destroying a great number of sponges and damaging as a result the sponge-fishing industry. Although a recovery seems to appear in the sponge population, the production is still low. However, since the area is mainly covered by high mountains, the only sources for the local economy come from fisheries and tourism. Nowadays, there are around 1 000 fishing vessels and the fishermen are considered as the most efficient among the Greek fishermen. Although species like *Thunnus alalunga* or *Boop boops* are abundant, they do not have big market demand. Considering the high nutritional value of these species, there has been a request from the local community to the EastMed project to provide support in training fishermen wives on processing methods in order to improve the welfare not only of the family but also of the community. The courses included lectures related to fish conservation in ice and freezing, processing (marinating, drying, smoking, salting) and canning, preparation of surimi products, quality control based on chemical, microbiological and organoleptic criteria, traditional and new techniques for packaging and canning, as well as marketing of the fish and EC regulations. The trainees also had the opportunity to do field practice in sterilizing, drying, salting and smoking techniques. The necessary processing equipment was submitted through the project. The trainees processed *Thunnus alalunga* which is caught in big quantities by the local fishermen using only local ingredients. The activity was very welcomed by the local community and became public through the local media. As a follow-up of the activity, the fishermen wives

[1] Presented also as a poster.

established a cooperative which: 1) acquired a VAT number from the Ministry of Finance which will enable fish products marketing; and 2) submitted a proposal to the Ministry of Agriculture asking support for the further development of infrastructures for the processing laboratory with the aim to improve product quality while enhancing different production lines. At the same time, fishermen wives on occasions such as local fiestas or festivals prepared their products for direct consumption in an effort to make them more widely known by the public.

FLAGS AND SMALL-SCALE FISHERIES VALUE CHAINS IN THE MEDITERRANEAN

Gilles Van de Walle

The fourth axis of the European Fisheries Funds presents a new approach in the way the European Union supports its fisheries sector. This axis is devoted to the sustainable development of fisheries areas through a territorial approach. It dwells very much on the experience of the LEADER initiative which has successfully been used under the European Agricultural Rural Development Fund (EARDF) to support the diversification of rural areas over the past 20 years. By shifting the focus of the support on the territory and the community away from the traditional sectoral approach, this method paves the way for the integration of the fisheries sector into the wider economic context and helps reducing the socioeconomic dependency of the area from a single activity. At the heart of Axis 4 are the fisheries local action groups (or FLAGs in short). These are partnerships, made up of both private and public actors which are set up at local level to assist in the sustainable development of fisheries areas. Small-scale fishermen are natural partners of FLAGs due to the local nature and the small size of most supported projects. FLAGs have been very active over the years to support small-scale fishermen find their place within the value chain through capacity building, creating linkages with other actors of local development, providing financial and technical support but as well by empowering small-scale fishermen in local or wider governance processes.

FISHINMED: CROSS-BORDER COOPERATION TO PROMOTE THE SUSTAINABILITY OF THE SMALL-SCALE FISHING COMMUNITIES IN THE MEDITERRANEAN AREA

Massimo Zuccaro, Gennaro Russo, Damiano Petruzzella, Massimo Rocchitta, Hechmi Missaoui, Nagdi Zeinab, Dahej Mokdad, Felice Bonanno and George Tserpes

The FishInMed project (Mediterranean network of sustainable small-scale fishing communities, 2011–2014) is a cross-border cooperation project funded by the ENPI CBCMED Programme and implemented by public administrations and research institutions of Puglia, Sicily and Sardinia (Italy), Greece, Tunisa, Egypt and Lebanon. The FishInMed project aims to support the social and economic development of small fisheries communities by promoting the diversification of economic activities and the integrated enhancement of coastal territories. Within the framework of the project, a "Mediterranean network" (Euro-Mediterranean observatory) has been established as an instrument of dialogue between public and private institutions at the Mediterranean level. It defines common strategies for the social and economic development of small fishing communities and sets up a local technical support system aimed at promoting multi-activity among fishermen and increasing their income. At the territorial level, the action of the observatory is guaranteed by working groups (composed of fisheries sector stakeholders: fishermen associations and cooperatives, fisheries local action groups, marine protected areas, etc.) which are a key factor as well as an instrument

of participation to involve the main local actors and guarantee the local application of the development strategy. In order to address the course of the research, the Euro-Mediterranean observatory would like to share and apply a common methodology to assess the socio-economic features of the Mediterranean small-scale fisheries communities. It is based on the application of a statistical methodology (principal component analysis) which classifies the communities into homogeneous areas with the same characteristics and oriented to the diversification of economic activities. The purpose is to characterize the multi-activity demand, expressed by the enterprises in small-scale fishing communities and the existing income-integrating opportunities for fishing enterprises in the same areas, with special reference to the fisheries communities highly suitable for multi-activity. Currently, the working groups are working to highlight the critical aspects of the national and regional regulations which hinder the development of multi-activity among fisheries communities. The purpose is to draw up regulatory proposals to improve the enforcement of the diversification of economic activities in the target territories. The regulatory proposals will be formulated on the basis of best practices on integrated development of the coastal territories that are found at the international level and selected in a database, which has been available as a result of the project. The FishInMed project will also foresee the establishment of a local technical support system, represented by a network of "local desks", which will provide fishing operators with a direct assistance (front-office principle) to appropriately orient them towards alternative choices that are complementary to their primary activity. The assistance services will be aimed at addressing all technical, administrative, legal and other problems that the operators might encounter in the planning of their own entrepreneurial multi-activities.

Posters

THE MODEL OF THE YAKAKENT LOCAL FISHERIES UNDER THE RISK OF SUSTAINABILITY

Meltem Yilmaz and Sümer Çakir

The aim of this study was to find out the way of sustainability of fisheries in Yakakent, a small town in the middle Black Sea. The fishery sector is mostly dependent on the seasonal fish production rate, which is a risk for sectoral stakeholders such as the port fisheries, the Yakakent fish cooperative and their members, the small-scale fish industry and fishery families. All the stakeholders are going to face seasonal fishing scales which are directly affecting the economic and social development of Yakakent as a small local fish suburb. In this study, the main problem of the local fisheries has been studied and the solutions have been produced. Small-scale fisheries should work with the Yakakent fishery cooperative to find out the way towards the sustainability of their economic status. On the other hand, the cooperative should develop a non governmental organization for local fisheries stakeholders to benefit from the global market competition. The cooperative should improve its organizational structure for the development of strategies in order to survive and sustain the fishery sector in Yakakent.

Thematic Session V

Setting up a regional platform to promote the implementation of the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication

Source: Ligurian gozzi ©Maciej Łopatka.

BACKGROUND DOCUMENT

Setting up a regional platform to promote the implementation of the *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication* (the "SSF Guidelines")

Lena Westlund

Countries/States

The words "countries" and "States" appearing in the text refers to countries, territories and areas without distinction.

INTRODUCTION

Background

In the Mediterranean and the Black Sea, as in the rest of the world, small-scale fisheries are important in providing livelihoods and nutritious food. The recommendation by the twenty-ninth session of the FAO Committee on Fisheries (COFI) in 2011 to develop an international instrument in the form of voluntary guidelines to complement the 1995 Code of Conduct for Responsible Fisheries (CCRF) to support small-scale fisheries was based on the recognition of the subsector's important role for food security, poverty alleviation and sustainable development. The draft *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication* (SSF Guidelines) are global in scope but with a special focus on the needs of developing countries.

The final text of the SSF Guidelines is currently being negotiated[1]. However, while the approval of the instrument itself is of critical importance, the real challenge lies in its implementation: the SSF Guidelines will only become effective if their provisions are put into practice. For this, concerted efforts and strong collaboration by all parties across the world will be required.

The Mediterranean and Black Sea region is vast and rich in diversity. Likewise, the small-scale fisheries of the region are also highly diverse and span a variety of fishing methods, products, markets, and cultural, social and economic settings. When considering the implementation of the SSF Guidelines and developing strategies for their application – anticipating their finalisation and endorsement by COFI in 2014 – regional and local characteristics and specificities have to be taken into consideration at the same time as global solidarity and respect of universal principles are promoted.

This regional symposium on sustainable small-scale fisheries in the Mediterranean and Black Sea, organised by the General Fisheries Commission for the Mediterranean (GFCM) and the FAO, provides an excellent opportunity to discuss how a regional

[1] See below for a more detailed description of the SSF Guidelines development process. The SSF Guidelines were endorsed at the thirty-first session of COFI in June 2014.

platform of strategies and actions for implementing the SSF Guidelines can be promoted and supported.

Purpose and structure of the thematic session V and of this document

The objective of the thematic session V – *Setting up a regional platform to promote the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication* – is to discuss how the SSF Guidelines can be implemented in the region, what processes and institutional structures will be needed and what the roles of different actors may be. It is hoped that the session and its discussions will contribute to promoting collaboration and communication among partners and stakeholders – within the region and globally. It is also expected that, through the sharing of experiences and knowledge, the session will provide inputs into the development of implementation strategies and a global assistance programme, which have also been requested by FAO COFI.

This brief background document aims to provide information on the SSF Guidelines development process and their contents. It also aspires to describe the rationale and context of the four topics that will be discussed in the session, i.e. the challenges and opportunities encountered by small-scale fisheries, why a human-rights based approach to development should be adopted, the importance of social and economic development, and the need for capacity development, including the strengthening of collective action and organisational structures.

THE SSF GUIDELINES

Development process

The important role of small-scale fisheries in food security and nutrition, poverty eradication, equitable development and sustainable resource utilization has been increasingly recognized during the last couple of decades. In FAO, small-scale fisheries have been a stand-alone item on the COFI agenda since 2003 but the subsector was already beginning to receive increased attention earlier. The CCRF acknowledges the importance of small-scale fisheries and makes reference, among other things, to the need to protect the rights of small-scale fishers and fishworkers to secure livelihoods and access to fishery resources (Art. 6.16, FAO, 1995).

In 2005, technical guidelines in support of the implementation of the CCRF were issued on the contribution of small-scale fisheries to poverty alleviation and food security (FAO, 2005). In 2008, there was a global small-scale fisheries conference in Bangkok, Thailand[2]. The conference was followed by several regional consultations organized by FAO in 2010, involving both the civil society organization (CSO) community and governments, to assess how the small-scale fisheries agenda could be moved forward[3]. The process led to the recommendation for an international instrument by FAO COFI in 2011 addressing small-scale fisheries in a holistic manner. This voluntary instrument would complement the CCRF with the understanding that, although the CCRF covers small-scale fisheries, there was a need to address the subsector more comprehensively.

The COFI recommendation spurred an intensive consultation process at national, regional and international levels, engaging more than 4000 stakeholders and bringing out key issues to be covered in the SSF Guidelines. Most of these consultations, carried out across the world, were led by the CSO community and others were organised in

[2] The conference "Securing Sustainable Small-Scale Fisheries: Bringing together responsible fisheries and social development" was organized by FAO in collaboration with the Southeast Asian Fisheries Development Center (SEAFDEC) and the Government of Thailand on 13–17 October 2008.

[3] Regional consultative workshops on "Securing Sustainable Small-Scale Fisheries: Bringing together responsible fisheries and social development in Asia-Pacific, Africa and Latin America-Caribbean"

close collaboration with FAO projects and partners. In the Mediterranean and Black Sea region, the FAO SSF Guidelines Secretariat participated in the national events organised in Morocco and Tunisia in June 2011 and in a CSO organised workshop in Denmark in March 2012 that also involved fishers and fishworkers from the south of Europe. In October 2012, there was a workshop organised by the Slow Fish International initiative at the Terra Madre world meeting in Turin, Italy. A consultative meeting for the Near East and North Africa region was held in Oman in March 2012.

A draft SSF Guidelines text was prepared early 2013 and is currently being negotiated by a FAO intergovernmental Technical Consultation. A first session was held on 20–24 May 2013 and a second one on 3–7 February 2014. The aim is to have a negotiated text of the SSF Guidelines finalised and endorsed by the thirty-first session of COFI in June 2014.

Purpose and contents

The SSF Guidelines are intended to support the visibility, recognition and enhancement of the already important role of small-scale fisheries and to contribute to global and national efforts towards the eradication of hunger and poverty. They apply to small-scale fisheries in all contexts, to all actors – men and women – throughout the value chain, are global in scope but with a specific focus on the needs of developing countries.

The consultations clearly indicated the importance of applying a human rights-based approach to the governance and development of the small-scale fisheries subsector and to take all three pillars of sustainability - environmental, economic and social – into account. The consultations also pointed to the importance of empowering small-scale fishing communities to take part in decision-making processes and allow them to be responsible for their own development. Moreover, the need for secure access to key resources – in particular to fishery resources and land – and hence ensuring tenure rights was also emphasized.

Accordingly, the SSF Guidelines are based on international human rights standards, responsible fisheries governance and sustainable development according to the Rio+20 outcome document ''The future we want''. The SSF Guidelines are closely linked to the *Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security* (the "Tenure Guidelines"), endorsed by the Committee on World Food Security in 2012. The *Voluntary Guidelines on the Progressive Realization of the Right to Adequate Food in the Context of National Food Security* (the "Right to Food Guidelines") are another important international instrument. This instrument was adopted by FAO member states in 2004 and considers economic, cultural and social rights as an integral part of the work of food and agriculture agencies.

On this basis, the SSF Guidelines outline an important number of key guiding principles that will underpin their implementation: i.e. human rights and dignity; respect of cultures; non-discrimination; gender equality and equity; equity and equality; consultation and participation; rule of law; transparency; accountability; economic, social and environmental sustainability; holistic and integrated approaches; social responsibility; feasibility and social and economic viability.

With regard to the subject matter contents, the SSF Guidelines address:

Five main thematic areas:

- Governance of tenure in small-scale fisheries and resource management;
- Social development, employment and decent work;
- Value chains, post-harvest and trade;
- Gender equality (cross-cutting), and
- Disaster risks and climate change (cross-cutting).

Four areas related to creating an enabling environment and supporting implementation:

- Policy coherence, institutional coordination and collaboration;
- Information, research and communication;
- Capacity development, and
- Implementation support and monitoring.

More information on the SSF Guidelines and related instruments

The SSF Guidelines drafts, reports and information on the consultation process and related workshops are available at www.fao.org/fishery/ssf/guidelines/en. Many other meetings and consultations also provided insights into what will be required in terms of future work. Reports from the CSO-led consultations can be found at: https://sites.google.com/site/smallscalefisheries/events.
The web page for FAO's work on the Right to Food Guidelines is www.fao.org/righttofood/right-to-food-home/en/ and the Tenure Guidelines are available at www.fao.org/nr/tenure/voluntary-guidelines/en/. There is also a preliminary version of a technical guide for implementing improved tenure governance in fisheries: www.fao.org/docrep/018/i3420e/i3420e.pdf.

The importance of implementation

The SSF Guidelines will only be effective if they are widely accepted by different interest groups, including, among others, governments, CSOs, NGOs and academia, and systematically applied in accordance with the guiding principles established therein. In response to this challenge, COFI noted at its thirtieth session the need to develop implementation strategies for the SSF Guidelines at various levels, including related policy reforms, and recalled that the twenty-ninth session of COFI had also agreed to the establishment and implementation of a global assistance programme which would support this process.

During the consultation process underpinning the drafting of the instrument, implementation was already considered and the two processes have been seen as parallel and overlapping. The consultations have led to an increased awareness of small-scale fisheries and, in some instances, appear to have influenced policy and contributed to a better involvement of small-scale fishing community representatives and CSOs in policy processes. Still, once the SSF Guidelines have been finalized and endorsed, increased and concerted efforts will be needed to ensure their implementation at all levels.

Two international workshops, organized by FAO in Rome, have provided some recommendations with regard to the SSF Guidelines implementation and future work:

The Workshop on "International Guidelines for Securing Sustainable Small-Scale Fisheries", held in February 2012, noted the need for an integrated approach. The preparation and implementation of the SSF Guidelines should not be seen as separate events but as an integral part of other initiatives. There is a need to build bridges between different stakeholder visions – within the fisheries sector as well as outside – to ensure coherence. Partnerships will be essential in this context and implementation will require concerted efforts and organizational development and strengthening of capacities at all levels.

A workshop on "Strengthening Organizations and Collective Action in Fisheries: a way forward in implementing the International Guidelines for Securing Sustainable Small-Scale Fisheries", held in March 2013, explored the roles of different types of fisheries collective action and cooperative organizations and proposed elements for a capacity development strategy to strengthen organizations and collective action in

small-scale fisheries. A number of different types of collective action and cooperative organizational forms were explored. These included customary community-based organizations, cooperatives and societies, and advocacy groups and networks. The workshop recognized that organizations provide a platform through which small-scale fisheries stakeholders exercise their right to organize, participate in the development and decision-making processes and influence the fisheries management outcomes.

In September 2013, a meeting was organized by the FAO subregional office in Tunisia in collaboration with local partners to discuss the strengthening of small-scale fisheries organizations in North African countries. The meeting was attended by participants from Algeria, Libya, Morocco, Mauritania and Tunisia and it showed the interest of stakeholders to develop capacity to be able to position themselves at the national, regional and international levels and to identify common regional objectives[4].

SESSION DISCUSSIONS

Challenges and opportunities for the small-scale fisheries sector in the Mediterranean and Black Sea

The decision to create an international instrument in support of small-scale fisheries and the contents of the SSF Guidelines reflect an acknowledgement of the challenges they face. At the same time, the opportunities the subsector represents are recognised and there is hope that the contribution of small-scale fisheries to food and nutrition security, poverty alleviation and sustainable development can be increased by giving the subsector the right support.

While there are regional, national and local differences, there are basic key challenges of small-scale fisheries that seem to be of global relevance[5]. These include the vulnerability context, in part explained by a dependence on exploiting a limited natural resource and the inherent unpredictability of the fishing profession but also due to the often remote locations of fishing communities with limited access to social services – aggravating problems of ill-health (including prevalence of HIV/AIDS) and low levels of education. Weak organizational structures make it difficult to have a say in decision-making and development processes. Small-scale fishing communities are often the weaker party in competition and conflicts with industrial fishing operations and with other sectors such as tourism, aquaculture, agriculture, energy, industry and infrastructure.

Pollution, environmental degradation and overexploitation of resources are other key concerns faced by fishing communities. Many small-scale fisheries are effectively unregulated and poorly monitored, especially in developing countries and inland waters. Customary practices for allocation and sharing of resource benefits that generally used to be in place in small-scale fisheries have often been eroded because of centralised fisheries management systems, technology development and demographic changes.

While women also participate in the fisheries workforce, they are often more disadvantaged and vulnerable than men, as many forms of social, political and economic marginalisation are gender specific. The work done by women, which includes reproductive, household and community services, in addition to economic activities more directly related to fisheries, is often valued lower than that of men. Women in small-scale fisheries may hence face somewhat different challenges than their male counterparts and due consideration must be given to gender roles.

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[4] A presentation on the outcomes of this meeting will be given during the session V – see also below.

[5] This section is based on an information paper prepared for the twenty-ninth session of COFI in 2011: *Good practices in the governance of small-scale fisheries: sharing of experiences and lessons learned in responsible fisheries for social and economic development* (COFI/2011/8).

Poverty and social inequalities are also two of the main causes behind child labour in the fisheries sector. Child labour in different forms exists in particular in the informal sector and children engage in both fishing (mainly boys) and post-harvest (predominantly girls) activities. Many fishing communities are located in areas that are prone to natural disasters. Where land and water meet is one of the most environmentally dynamic environments that exist and it is often the hostility of these areas that provides opportunities for the poor. Climate variability and change are leading to generally more frequent extreme weather events and natural disaster hazards.

While the list of challenges in the small-scale fisheries sector is long, there are also many opportunities. Progress has been made with regard to enhancing the understanding of the complexity of poverty, its vulnerability context and the range of coping strategies applied by fishing communities to address threats and sustain livelihoods. There is recognition that poor people's own perception of the sources of their vulnerability needs to be respected. Developments in the governance arena in many parts of the world include decentralisation of resource management responsibilities and the introduction of co-management arrangements. There is also an increased recognition of the need to link fisheries management with social and economic development, and to adopt a holistic view of fishing rights and human rights.

Against the general context described above, it is suggested that the discussions of the Thematic Session V focus on regional, national and local specificities and characteristics:

- What are the key challenges for small-scale fisheries in the region? Are there national and local differences that would need to be considered in the implementation of the SSF Guidelines?
- What key opportunities and strengths exist? What best practices are available in the region that should be shared and that could be replicated – regionally and globally?

Human-rights based approach: Current situation and needs in terms of access to basic economic, social and cultural rights

The human-rights based approach (HRBA)[6] builds on a set of universally agreed values, standards and principles. Human rights encompass civil and political rights, economic social and cultural rights, and collective or solidarity rights. They include legally-mandated rights to decent working conditions, gender equality, children's rights and the rights of migrants and other potentially vulnerable groups. The HRBA brings in legal tools and institutions and strongly promotes the empowerment of people.

However, when using the term "rights" in a fisheries context, it has tended to imply fishing rights as part of rights based fisheries management. It is only recently that the discourse has evolved to a human rights perspective and the right to secure and just livelihoods, including social and economic rights as well as rights to related resources (such as land). Linking fishing rights and human rights reflects a move towards an approach more in line with the reality of the diverse livelihoods of small-scale fishing communities and the complexity of poverty.

To implement the SSF Guidelines applying a HRBA, an enabling environment is required, including appropriate policy priorities. The importance of participation and empowerment, including legal empowerment and the rule of law, should be stressed as well as the need to explicitly focus on vulnerable and marginalized groups. Applying a HRBA has consequences on how to address different situations, also when the focus is on resource management. For example, in a context of overfishing where there is a

[6] This section draws on a keynote presentation by Mr Rolf Willmann on "A human rights based approach in small-scale fisheries – a quest for development as freedom" given at the MARE Academic Conference: People and the Sea VII, Amsterdam, the Netherlands, June 2013.

need to reduce fishing effort to allow resources to recover, the right to social security has a particular importance. Social security can be vitally important in a transition phase where small-scale fishers and fishworkers would otherwise suffer from a loss of income when reforming a fishery with a view to ensure the sustainability of the fishery resources. The importance of considering both men and women – often having different professional roles – should be stressed and gender based discrimination must be avoided.

For the discussion of thematic session V in relation to the HRBA, the following questions could be raised:

- What examples of successful application of a HRBA are there in the Mediterranean and Black Sea region?
- Are there regional specific challenges for applying HBRA?
- What good practices exist with regard to the promotion of gender equality?

Social and economic development of fishers, fishworkers and fishing communities: enhancing the sustainability of small-scale fisheries, including the post-harvest sector, and their contribution to food security and poverty alleviation

Within the context of recognizing the need for a wider framework based on human rights, the importance of a secure access to resources and tenure rights should be stressed. Not being able to count on certain basic resources increases vulnerability and small-scale fishing communities need to be entrusted with stewardship for the resources they rely on for their livelihoods. However, it also has to be recognized that introducing self-governance community-based arrangements in a poverty context may pose problems because of other preoccupations and a related lack of incentives as well as insufficient capacity on behalf of small-scale fishing communities. Unless the more pressing concerns of individuals and communities are dealt with in parallel with resource and fisheries management issues, poor people may have great difficulties engaging in the process.

The root causes to poverty hence need to be addressed by strengthening the political and economic rights of the small-scale fisheries actors, promoting empowerment and capacity-building. Fishing communities should have access to health, education and other social services. Their resilience needs to be increased – in general and with regard to natural disasters and climate change consequences in particular. It requires a focus on reducing vulnerabilities and promoting responsible fishing practices together with addressing social and economic development needs. While some experience exists from such integration of resource governance and social development, tools and methods still need to be developed in order that environmental, resource and community rights and sustainability are considered concurrently.

The thematic session V may focus on the following:

- What are the key social and economic development issues for small-scale fisheries in the region?
- What examples of good practices exist – in fisheries or other sectors – with regard to holistic and integrated approaches that can inform SSF Guidelines implementation?

National experiences of collective action and organizations (e.g. fishers cooperatives and associations): needs for organizational strengthening, including through capacity development and the creation of regional and subregional associations

Fisher and fishworker organizations have an important role to play in development processes. Strengthening local organizational structures help people to be represented and take part in decision-making processes. There is a need to work with communities

to enhance their organizational capacity, building on existing structures and strengths. The focus should be on enabling individuals and institutions to effectively use their newly acquired capacity to address their priority needs.

The FAO workshop in March 2013 noted the importance of supporting knowledge mobilization, leadership capabilities (of men and women), research partnerships and the use of effective communication tools (making use of new technologies and social media). Platforms and networks for experience sharing and collaboration were mentioned in relation to the need to strengthen existing organizations and ensuring that the necessary institutional structures and capacity are in place to secure sustainable small-scale fisheries. The need for empowerment through an organizational development and a collective action appears to be a key element of SSF Guidelines implementation.

The regional meeting in Tunisia held in September 2013 (mentioned above) noted the need to support fisheries organizations and to establish a regional platform.

The thematic session V may seek to tease out what the needs are more specifically in this regard in the Mediterranean and Black Sea region:

- What regional organizations and networks already exist that could be built on for the implementation of the SSF Guidelines?
- What are the most important gaps with regard to collective action and associations?

CONCLUSIONS AND SALIENT ISSUES

The draft SSF Guidelines offer a great opportunity to support small-scale fisheries by representing a comprehensive and holistic framework for policy and action. Their implementation will however require concerted efforts by all, including political will and resources. Governments, CSOs and NGOs, research institutions and all other stakeholders are called upon to support this process. The provisions of the SSF Guidelines should become an integral part of regional, national and local policies, strategies and action plans, and human and financial resources should be put forward for this purpose.

The SSF Guidelines implementation process must be transparent and participatory. Special efforts should be made to also include the poor and marginalised in decision-making. Collaboration, communication and sharing of experiences and knowledge should characterise the actions undertaken.

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FULL PAPERS

The Mediterranean Platform of Artisanal Fishers: a contribution of the artisanal fishing sector towards sustainability

Mediterranean Platform of Artisanal Fishers
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ABSTRACT

This article describes the creation and function of the Mediterranean Platform of Artisanal Fishers (MedArtNet) as a novel example of organization and collective action of small-scale artisanal fishermen in the regional scope of the Mediterranean. We describe the motivations that led to its formation, its philosophy and the objectives pursued, as well as the results and benefits obtained since its inception in 2011. With a vision of a situation where small-scale artisanal fishermen are involved in and jointly responsible for building a fairer and more sustainable world, where they are valued and recognized by society as guardians of the Mediterranean Sea, MedArtnet aims to contribute to making artisanal and small-scale fishing a dignified, sustainable and self-sufficient livelihood with prospects for the future. Artisanal and small-scale fishermen –owners of valuable traditional ecological knowledge and a sense of responsibility that had been stolen- are positioned as agents of change towards sustainability and as essential actors in the co-management of resources and ecosystems in the Mediterranean Sea. Finally, the article briefly analyses the difficulties encountered and suggests the challenges that would strengthen capabilities for the consolidation of the network, propitiating – in the end – a Mediterranean Sea where fishing is more sustainable in all its dimensions, while contributing to ensuring food security and poverty alleviation in this area. Overall, MedArtNet could represent a basic tool for the implementation in the Mediterranean Sea of the SSF Guidelines promoted by the FAO, as it is a proactive network of fishermen that exemplifies, through the professional performance of its members, a commitment to sustainable fisheries.

INTRODUCTION – THE SITUATION OF ARTISANAL FISHING IN THE MEDITERRANEAN

According to European Commission data[7], small-scale artisanal fishing in the European Union accounts for almost 80 percent of fishing boats, although in terms of fishing catches it accounts for a much smaller proportion. Furthermore, 50 percent of small-scale artisanal fishing takes place in the Mediterranean. These figures show the

[7] Facts and figures about Small-scale Coastal Fisheries. Directorate General for Fisheries and Maritime Affairs, 2010.

great importance of artisanal fishing in the Mediterranean, where it plays a vital role in the sustenance of the coastal communities in these countries, constituting a source of nutritive food and essential employment.

However, despite all these values, the feasibility of artisanal fishing as a production system is under serious threat. Many fishermen have been forced to abandon artisanal fishing before time and there is very little generational replacement, if any. Fishing communities have become poorer, and the sector has been relegated to a marginal role, while in some places emigration is seen as the only economic alternative.

The guilds, *Prud'hommies* and other organizations existing in the fishing sector have not been able to come up with an effective and sufficient solution to the problems in small-scale artisanal fishing. Atomization in the sector (both locally and all over Europe) is an enormous difficulty when it comes to constructing the same dialogue with the public authorities to solve the problems. Opposing interests, the lack of representation and a local vision of the world are just some of the hurdles that have so far stood in the way of common sector solutions.

Faced with this situation, some fishermen and some fishing organizations decided to join together to build up a process of representation for artisanal fishing on the local, national, regional and European levels. This group worked simultaneously on a process to find practical solutions to the problems of the sector within a framework of sustainable development. This involved setting up real commitments and developing initiatives to build a future for fishing with targets of sustainability. "*The situation will not change if you do not change*".

REASONS FOR SETTING UP MEDARTNET

The shared feeling among these fishermen from different parts in the Mediterranean, with common work area, values and visions about the future of fishing, led them to set up MedArtNet platform. MedArtNet is a significant and original example of organization and collective action for artisanal fishermen in the European Mediterranean.

Setting up this platform involved its members as entrepreneurs in a process of transformation. The targets and content of the platform were built on the basis of a common commitment by all its members. The targets show where they want to go, the values show the way to get there and the commitment defines loyalty to these values and targets.

The target is the sustainability of the Mediterranean Sea in its economic, social and environmental dimensions – not from a rhetorical approach but with direct action. Defining models for fishing management that revolve around the general interest and the common good as opposed to private interests is one of the firmest commitments of this group. It means a more balanced distribution of fishing resources and often implies voluntary limitations in the use thereof. It constitutes a formula that implicitly regulates fishing and avoids drawing up strategies focused on maximization. MedArtNet, as the instigator of a process of change, is convinced that moving in this direction will favour all fishermen in the Mediterranean. This project will enable us to reverse the current situation and return dignity and feasibility to the artisanal fishing sector.

PHILOSOPHY OF THE NETWORK: VISION, MISSION AND STRATEGIC OBJECTIVES

MedArtNet's vision is one of a world in which artisanal fishermen in the Mediterranean Sea can exercise their profession as a dignified, sustainable, self-supporting means of living with perspectives for the future, guaranteeing future generations the chance to keep on doing what their parents and grandparents did. A reality in which artisanal

fishermen take part and are jointly responsible for building a fairer and more sustainable world, and in which they are recognized and valued by society as the custodians or guardians of the Mediterranean Sea.

The mission is to promote, foment and defend responsible and sustainable artisanal fishing in the Mediterranean as a dynamic element of the coastal communities in the Mediterranean. It will place artisanal fishermen, who possess valuable traditional ecological knowledge, as agents of the change towards sustainability and as the main players in the joint management of the resources and ecosystems of the Mediterranean Sea. This mission consists in six main strategic objectives:

- **Representation and participation in the decision-making process, promotion of co-management**

Obtain the representation and participation of artisanal and small-scale fishermen before the local, national, regional and European public authorities. Promote and develop a change in the model of fishing management, based on the joint management of fishing as a more efficient and fairer model, which favours joint responsibility and responsible governance with the other players involved.

- **Developing a sustainable activity in all its dimensions (economic, social and environmental)**

Promote and develop initiatives to recover fishing stocks and the marine world in general in the different communities. The promotion of MPAs and joint running of management plans are examples of such initiatives. The purpose thereof is to work together with the scientific community and implement common actions in the Mediterranean to ensure that the activity follows real sustainability parameters.

- **Social recognition**

The idea is for artisanal fishing to be recognized as a respectable trade and way of life, artisanal fishermen to be seen as bearers of a rich and ancestral cultural heritage that should be preserved and promoted.

- **Recognition of local ecological knowledge**

Fishermen demand recognition of their empirical and local knowledge of the marine world and fishing resources (local ecological knowledge) so they can share it with scientists, politicians and society in general. Handed down from one generation to another, this knowledge is particularly valuable immaterial heritage, but it is also fragile. Complementing scientific knowledge, it can help improvement of the marine world and therefore improve the management thereof.

- **Fair trade committed to the sea**

MedArtNet wants the economic value of fishing to be as close as possible to fishermen's needs, in such a way that they can live from sustainable fishing. They therefore promote and implement initiatives to enhance, differentiate, certify and trade more fairly the products of artisanal fishing in their respective communities.

- **Dissemination, awareness and cooperation**

They wish to transmit their philosophy to all their fellow professional fishermen and to civil society in general, carrying out initiatives for awareness, dissemination and cooperation, while at the same time sharing experiences and good practices with other fellow fishermen in the Mediterranean. The platform is therefore like a pool of solutions and a forum for information, knowledge, new ideas, opportunities and initiatives on the Internet. Finally, they collaborate in the creation of similar entities in other regions and countries, both within and without the EU, and encourage online relationships and work among them.

FROM PHILOSOPHY TO ACTION – RESULTS OBTAINED SO FAR

Despite the limited means available, we have managed to build the basis for the Mediterranean platform of artisanal fishermen, with clear tangible results in all six targets. We could highlight the following:

The great landmark achieved in this work period is without doubt the excellent developments in the representation of MedArtNet in national and international political forums. MedArtNet has been present in political discussion forums with the different public authorities (mainly the European Parliament) and has defined positions and contributions depending on the political calendar of the moment. It managed to organize a round table discussion in the European Parliament itself with considerable attendance and repercussion. The voice of artisanal fishermen has been heard thanks to the work of MedArtNet, especially in the CFP reform process, and the ground has been prepared for the same thing to happen in the upcoming CFGM. The direct message of artisanal fishermen has been well received by the authorities.

In the field of fishing management, in April 2012 a co-management plan for the Mediterranean sand eel (*Gymnamodytes cicerelus*) fishing ground was established in Catalonia (Spain). In this management plan, drawn up with the participation of all users of the resource, it was possible to reduce the capture and significantly improve the price of the product (and therefore the profit for the fleet).

In Greece and France, there are different processes for creating co-managed MPA, which are at different stages, and where the artisanal fishing sector – among the members of MedArtNet – plays an active role in design and implementation.

MedArtNet has been invited to collaborate and support various different calls for scientific projects, such as the Cyclops project (to develop a public optical observatory for the coast and the ocean); the Stacomed project ("*Stabilité des communautés de pêcheurs en Méditerranée*"); the Cosmos project (Cytometry and optical sensors for the surveillance of the ocean systems) and the ENPI project, for the implementation of the European Marine Directive in the Mediterranean basin.

Direct trade strategies for artisanal fishing products have been set up with cooperatives and catering companies in Catalonia (Spain), fostering fair trade in a commitment to the sea, with high profits for the artisanal fishermen who promote it.

MedArtNet has taken part in numerous events as a presenter, with the aim to disseminate, make people aware and cooperate with other fishing communities and the civil society in general. We could highlight the participation in the workshop entitled "Atelier sous-r*égional de* renforcement des organisations professionnelles de la pêche artisanale dans les pays de l'Afrique du Nord" (Bizerte, Tunisia), where the MedArtNet model was presented in order to collaborate in the setting up of similar entities in countries of North Africa.

DIFFICULTIES AND CHALLENGES

Despite the huge progress made by the entity, we are aware of the difficulties it has to face both in internal organisation and in the European social, political and economic context.

The internal difficulties are mainly related to communication among members. There are four different languages (Italian, French, Spanish and Greek). The role of the network communicator is to take care of this language problem by translating the messages and documents generated.

Another barrier is the economic one. Sometimes fishermen cannot devote all the time they would like to the network and they have to renounce to participate in important events because of the impact on their domestic economy. Likewise, these economic problems make it difficult to hold personal meetings with members, which would favour collective reflection as the ideal way of making decisions. This obstacle is partially overcome by strategic coordination, optimising attendance at events and intensifying communication by e-mail and telephone.

Another significant obstacle is a marked difference in digital literacy among members. By using coordination, we are trying to promote and encourage the use of digital tools and we have planned a digital literacy training course.

Among the difficulties in the European socio-political and economic context, one consists in obtaining greater legitimacy and social support for the network. In this regard, we are working on the promotion of a more intense external communication with the rest of the fishing sector in each country to raise awareness, transfer the MedArtNet model and encourage involvement.

Another external constraint is the (legitimate) presence of other organizations in the fishing industry whose interests collide with those of MedArtnet. Faced with this difficulty, which is obvious, we are reinforcing MedArtnet's discourse in terms of commitment to sustainability, coherence in action and dialogue with other organizations in order to generate credibility in society.

It is obvious that network members are making personal efforts in their economy and time. It is only with this proactive attitude that it will be possible to consolidate the network. We have also received help from an NGO to start up the process, without whose support the challenges would be even more difficult to overcome. Obtaining improvement and stability in the economic resources available for the ongoing process of consolidation for the network and targets is therefore one of the main challenges we are facing.

OPPORTUNITIES

As a whole, MedArtNet could be a fundamental tool, a lever to implement the SSF Guidelines in the Mediterranean. This is because it is a proactive network of fishermen which exemplifies commitment to sustainable fishing through the professional efforts of its members.

In summary, MedArtNet wishes to contribute to the construction of a new culture in the fishing sector in relation to the authorities, fishing resources and society in general. We would like to bring about a future in which the Mediterranean Sea is respected and treated better by users who depend on it. The Mediterranean should once again be the sea that can contribute to guaranteeing food for its peoples and provide services to mitigate poverty, such as small-scale artisanal fishing.

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Supporting fisherwomen in small-scale fisheries in Turkey

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ABSTRACT
This article aims to promote the only two projects on fisherwomen in Turkey and in the southern Aegean region of the country, showing the social, economic and cultural circumstances affecting them, their problems along with the expectations and shortcomings that prevent the continuity of their existence in the profession. In the scope of the study, information and findings were gathered from both personal in-depth conversations and interviews with shareholders and focus groups during fisherwomen-oriented nationwide projects run by NGOs along the southern Aegean coasts – namely the Gökova special environmental protection area (SEPA) in 2012 and the Datca-Bozburun SEPA in 2013. Collected quantitative and qualitative data were utilized to reveal the living conditions of fisherwomen and to evaluate and analyze how gender-driven processes influence the lives of women. The results of the study showed that no project aiming at fisherwomen had been conducted until 2012 and despite women did carry out any and all duties before, during and after fishing, they had been neglected and disregarded in pertinent policies, resulting in their fading existence, reluctance to continue and disinclination to professional organization. This study proposes the collection of gender-based data to assure the position of fisherwomen both in the fisheries industry and related policies.

INTRODUCTION
In a research conducted among 86 countries, FAO reports that 5.4 million women were working in the fisheries and cultivation sectors in 2008, constituting 12 percent of the total workforce (FAO, 2012). According to another report published by the European Union Commission on women in the EU fishery industry (MacAlister *et al.*, 2002), among EU member countries Greece ranks first in the employment of women in fishing with 7 percent; Spain, another Mediterranean country, ranks first in employing women in the fishery industry nationwide (including catching, aquaculture, processing, marketing-distribution, management) with 43 percent. While in other countries there are many written and visual publications (FAO, 2001), Turkey lacks any official data and statistics related to fisherwomen and their presence has not been acknowledged although in the Southern Aegean region, fisherwomen exist in artisanal fisheries in the small-scale fisheries sector. In Turkey, there is only one international study on fisherwomen (Göncüoğlu and Ünal, 2011).

Until 2012, there was no project on fisherwomen in Turkey. Although this article is titled "Supporting fisherwomen in small-scale fisheries in Turkey", it encompasses in fact the southern Aegean region of Turkey where the majority of fisherwomen live.

This article aims to promote two projects on fisherwomen in Turkey and in the Southern Aegean region, studying the social, economic and cultural circumstances affecting them, their problems, expectations and shortcomings that prevent the continuity of their existence in the profession.

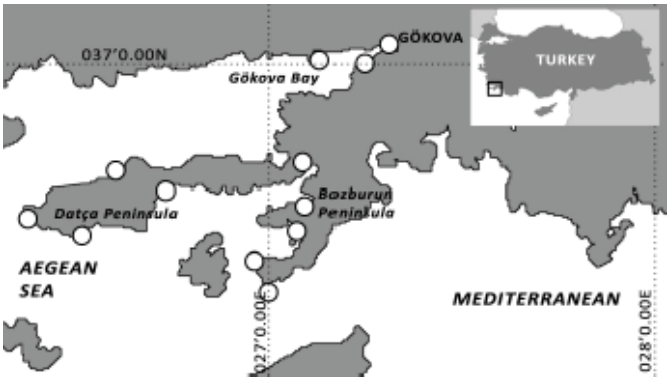
STUDY AREA

The Gökova Bay and Datça-Bozburun peninsula fisher villages are settlements that have not been much affected by migration (due to the fact that the region is a protected area), and they are quite limited in terms of educational, cultural and healthcare services. Local people avoid establishing interactions to a great extent with newcomers. Therefore, these are places where the locals know each other and maintain old relations. Everybody knowing each other, it also brings forth a social structure where people watch each other both in the positive and negative sense. In this rigid cultural hierarchy, women are burdened with gender-based duties and responsibilities (Figure 1). Gender relations are established and managed not only by the relationship between men and women, but largely by a whole social setup including relatives, neighbors and all others which women are a part of.

FIGURE 1
Southern Aegean fisherwoman and her family in Ekincik Bay (H.Göncüoğlu)

In Gökova Bay and Datça- Bozburun peninsula (Figure 2), there are families who have been fishing for three generations. In summer, fisher families immigrate to other regions for fishing. According to Ünal (2011), there are a total of 264 fishing vessels and around 490-500 fishermen in the Datça-Bozburun peninsula, from which about 100 are women. A fisherwoman in Gökova Bay has been fishing alone for 32 years, another in the Datça-Bozburun peninsula has been fishing alone for 35 years.

FIGURE 2
Study area



There are many projects, studies and reports on Gökova Bay fisheries, fishermen and coastal zone management (Kıraç *et al.*, 2012). Possibly, since the decisions on the use of the resources are made by men, these studies do not cover fisherwomen in particular.

Similarly, although there are notable studies on the fisheries and biodiversity in the Datça-Bozburun peninsula where fisherwomen are numerous, none of these studies target fisherwomen.

PROJECTS ON FISHERWOMEN

There are only two projects on the fisherwomen of the Aegean coast of Turkey: the "Fisherwomen of the Aegean: Gökova Bay" project, completed in 2012 and the "Fisherwomen of the Aegean: Datça-Bozburun peninsula", still ongoing at the time of writing (Table 1).

TABLE 1
Projects details on fisherwomen (2012, 2013)

Name of project	Fisherwomen of the Aegean Sea: Gökova Bay (Ege'nin Kadın Balıkçıları: Gökova Körfezi)	Fisherwomen of the Aegean Sea: Datça-Bozburun Peninsula (Ege'nin Kadın Balıkçıları: Datça-Bozburun Yarımadası)
Date	March 2012 – August 2012	February 2013 – March 2014
Budget	60 000 USD	57 000 USD
Supporters	Personal support by Ayşegül Dinçkök Underwater Research Society	Mediterranean Conservation Society, SGP (The Small Grants Programme) COMDEKS, National System of Marine Protected Areas Vehbi Koç Foundation.
Objective	To help acknowledge that fisheries, generally known in Turkey as men's job, are also done by women. To assess the needs of the active fisherwomen of Gokova Bay and help them continue the job.	Support the existence of fisherwomen in Datça-Bozburun Peninsula SEPA where they play a key role in the traditional and economic sustainability of artisanal fisheries. Share the basic problems of marine protected areas and their solutions with public.
Target group	21 fisherwomen	70 fisherwomen
Activities	Educational support: Fisherwomen in Turkey and in the world; Importance of organization in fisheries: fishery cooperatives; Ecosystem-based fisheries; Safety at sea and first-aid trainings. Equipment support: Safety equipment, apparel, longline sets. 6 traditional Turkish Gold coins for each fisherwoman. Monetary support for fishery cooperatives that have women members.	Educational support: Fisherwomen in Turkey and in the world; Importance of organization in fisheries: fishery cooperatives and how to manage fisheries; Do we know the marine ecosystem? What to consider when fishing? Puffer fish: dangers and injuries; Safety at sea and first-aid trainings; Turkish Grameen Microcredit Finance Applications; Introduction of the Italian fisherwomen's cooperative, La Pesca Rosa; Problems of local fishermen; why fisherwomen are important? Equipment support: Apparel, longline sets. Documentary on fisherwomen. Microcredit application draft. 1 traditional Turkish Gold coin for each fisherwoman. Certificate of attendance for each fisherwoman.

WHAT DO WE KNOW ABOUT FISHERWOMEN?

The two projects reached a total of 91 fisherwomen actively working on board. The project on Datça-Bozburun fisherwomen is still continuing. There is also a MA thesis on the same region (Göncüoğlu, 2008). All information gathered so far and the data at hand suggest the following considerations.

Small-scale artisanal fisherwomen continue fishing throughout the year. In the Bozburun peninsula, fisherwomen however work seasonally; they load their primary needs on their vessels and set to sea with their children and husbands to work in another region.

Fisherwomen establish social networks to share information and keep solidarity in places like cooperative buildings and yards, ports and daily neighbor visits.

In the study area, there are two fisherwomen working by themselves; others work with their husbands. The majority of fisherwomen are over 40 years old. They work on 6–12 m long vessels of 9–125 HP engine power, with an average 197 days (5,6 months) at sea. 87.5 percent of them report that the income is shared within the family, while 10.4 percent of them state that it is getting shares (a portion of the income from sales). Gears used are either gillnets, longlines or both. The average level of education is 5 years (Göncüoğlu and Ünal, 2011). Only the fisherwomen in the Datça-Bozburun peninsula are engaged in marketing activities.

There is no fisherwomen organization on professional or social level. The percentage of women among all members of the fishery cooperatives in the southern Aegean region is extremely low (only 1 percent) (Göncüoğlu and Ünal, 2011). The foremost factor of this phenomenon is the gender-based approach, in which women consider cooperatives as men's premises.

If most fisherwomen were introduced to the job after they were married, there are however fisher families who started fishing under the leadership of women. Fisherwomen did not have other jobs and make all investments on the sea. Among them are those whose children were drowned at sea, or those who chose not to have children due to harsh working conditions. They continue to do this job despite all the difficulties such as: the lack of comfort (even toilets on the boat); having to leave their children at home very early in the morning; having to live in the vessel for 3 or 4 months in the summer season; having to raise their children on the boat; or having to continue fishing even when they are pregnant.

When talking about their lives, fisherwomen seem to be happy with this job; so much that they are passionately connected with the sea, left all their troubles at land and felt independent. However, if they are dedicated to the job, there is also a decrease in the number of fisherwomen owing to the facts that they are disregarded by the public and authorities, and the young generation has no interest in the job.

Women are trying to survive through subsistence fisheries, earning their living by selling their catch. Sometimes, two or more families may have to live in the same house or share a common budget due to economic constraints. A communal life with close relations brings forth opportunities like benefiting from the pensions of in-laws shelter or food when not working. This large patriarchal family constitutes a basic institution where the woman can depend on during hard times. Alternatively, fisherwomen work as housekeepers at homes or hotels where men generally repair boats or work in daily boat trips as crew members or cooks. Since catch income is decreasing drastically, most fishermen and fisherwomen are indebted to middlemen.

Although fisherwomen are happy with the job, they are not optimistic about the future of fishing. They consider that fishing is an unpredictable job lacking a fixed income, and therefore advise their children to look for steady jobs and keep fishing rather as a hobby.

Women have been working at the sea for many years, but it is through these projects that they have been supported for the first time.

The most important problem for fisherwomen seems to be the insufficient support from the government. Other issues are decreasing fish stocks due to overfishing, illegal fishing, cutbacks in marketing (middlemen), and the bad image of being a fisher.

CONCLUSION

A fisherwoman is not only a biologically fertile figure, she is also a productive key player who both contributes to the income and keeps her family together. Fisherwomen both in the Gökova Bay and Datça-Bozburun peninsula work with passion although they are facing various difficulties mostly rooting from gender-based attitudes, meanwhile taking care of their homes and children.

Overfishing and illegal fishing have consequences such as low fishing income, which directly affects fisherwomen, who are both directly and indirectly related to the sector although they are the least responsible group for these adversities, since management plans are always made by men and women are always excluded, nor are they adequately represented in organizations such as fishery cooperatives, being professionally disregarded in almost all situations. Women's presence as key players for the protection, monitoring and management of the area should not be overlooked.

It is essential, therefore, to both sustain fisherwomen's presence in the job and improve their conditions by introducing changes to related policies. Efforts of NGOs are invaluable in this respect as well as those of governmental bodies like Ministry of Food and Agriculture, General Directorate of Fisheries and Aquaculture, Ministry of Family and Social Policies and Turkish Statistical Institute.

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ABSTRACTS

Oral contributions

OVERVIEW OF SMALL-SCALE FISHERIES IN THE MEDITERRANEAN EU COUNTRIES

Rosa Caggiano

The purpose of this speech is, first of all, to identify a definition of SSFs beyond the official one (12 m overall vessel length excluding towed gear) and then taking into consideration all the various characteristics in the Mediterranean EU countries since this kind of fishery is prevalent in the European fishery fleets in the basin. SSFs should be sustained by means of a "preferential channel" that would foster economic and political support for this sector. The problem, however, is that small-scale fishery activities are the most multifaceted. This sector therefore deserves careful assessment, calibrated policies, actions to be designed individually for each different area, having been penalized by the restrictive policies applied to EU fisheries in the past as a result of the lack of such specific consideration.

FAO-ARTFIMED: AN EXPERIENCE BASED ON EAF TO PROMOTE THE SUSTAINABILITY OF THE RESOURCES THAT COMBINES SMALL-SCALE FISHERIES MANAGEMENT AND SOCIAL DEVELOPMENT

Juan Antonio Camiñas, Matthieu Bernardon, Mohamed Malouli and Hamadi Elaiba

The FAO ArtFiMed project (Sustainable Development of Artisanal Mediterranean Fisheries in Morocco and Tunisia, 2008–2011) is a pilot project funded by Spain, implemented under CopeMed II and coordinated by FAO. ArtFiMed promotes basic concepts of the EAF improving livelihoods and integration of SSF communities for their social and economic development. This project has been carried out in three different fishing sites in Morocco and Tunisia, under the EAF Guidelines of FAO, with the participation and involvement of the fishing communities, from the identification of priorities to the assessment of results. ArtFiMed has developed a replicable methodology to address, from the local to the national and regional levels, the main issues concerning SSF communities in the Mediterranean region. With a holistic approach to sustainability and development, the project promoted co-management and participatory mechanisms, supporting the creation of alternative livelihoods, promoting social and gender equality and equity, based on training to develop expertise and human capacity. A community-based monitoring system for the fisheries activity was developed as a first step of a co-management process. This approach contributed to reinforce the local organization of fishers and to initiate internal discussions on the participation of SSF communities in the national decision-making process for fisheries management. The communities' involvement was also considered to raise awareness at a national and regional scale on the importance of the role played by the artisanal sector in producing social, economic and biological reference data for fisheries management. The support of ArtFiMed to the creation of artisanal fishworkers organizations contributed to reduce conflicts by facilitating dialogue and participation in the

co-management process awarding right and responsibility for the governance of the coastal ecosystems on which they depend. The improvement of security and working conditions and alternative livelihoods to small-scale fishing activities contributed to address poverty and reduce the vulnerability of the target communities.

PRÉSENTATION DES PRINCIPAUX RÉSULTATS DE L'ATELIER SOUS-RÉGIONAL DE RENFORCEMENT DES ORGANISATIONS PROFESSIONNELLES DE LA PÊCHE ARTISANALE DANS LES PAYS DE L'AFRIQUE DU NORD (BIZERTE, TUNISIE, 24-26 SEPTEMBRE 2013)

Yassine Skandrani

Les résultats attendus de la rencontre étaient les suivants: échanger sur les expériences de chaque pays concernant les organisations de pêcheurs artisans et comparer leur participation à la prise de décision; faire un diagnostic actualisé des faiblesses des organisations de pêche artisanale et des solutions adaptées; informer et sensibiliser sur les efforts et les activités internationales de gestion des pêches artisanales, notamment les directives des CCPR, SSF et les autres instruments internationaux; examiner et finaliser un plan d'action commun pour le renforcement des capacités des organisations et leur participation effective à la bonne gouvernance des pêches artisanales; élaborer des propositions concrètes pour créer une plateforme de pêche artisanale en Afrique du Nord; démarrer un processus de mise en place de cette plateforme permettant d'accompagner le développement durable de la pêche artisanale et des pêcheurs eux-mêmes.

PRÉSENTATION DES DIRECTIVES PAD

Cherif Toueilib

Cette communication abordera la gestion et le développement des pêches artisanales dans la sous-région SNE, dans le contexte des lignes directrices en faveur d'une gouvernance responsable des pêches artisanales. Après un aperçu de la situation des pêches artisanales, les principes et les impacts positifs de l'application des lignes de conduite pour une pêche artisanale durable seront examinés, tant pour ce qui est de la gestion durable des ressources halieutiques et de leur environnement qu'en ce qui concerne les communautés de pêcheurs artisans. L'accent sera placé sur les aspects suivants: la gouvernance et le respect des pratiques responsables dans les pêches; les caractéristiques et l'application de la gouvernance responsable des pêches artisanales et, enfin, l'approche axée sur les droits de l'homme en matière d'aménagement des pêches artisanales.

HUMAN RIGHTS AND LEGAL EMPOWERMENT IN SMALL-SCALE FISHERIES

Carlos Fuentevilla, Rolf Willmann, Nicole Franz, Lena Westlund, Margret Vidar and Thomas McInerney

A human rights-based approach (HRBA) to development is based on the premise that human rights are not only of intrinsic value, but also of instrumental value. HRBA promotes social transformation by empowering people to exercise their voice and agency to influence processes of change. In recent years, many international instruments negotiated within FAO, promote a human rights approach to development. These include the *Voluntary Guidelines on the progressive realization of the right to adequate food in the context of national food security*, the *Voluntary Guidelines for Responsible Governance of Tenure of Land, Fisheries and Forestry in the Context of National Food Security* and the *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication* (SSF Guidelines).

In small-scale fisheries, a variety of human rights issues are prevalent that prevent the sector from achieving its full contribution to food security and secure livelihoods. Among these are issues of political economy, social exclusion, gender equality, violation of the rights of vulnerable populations, legal pluralism, sustainable resource management, and access to resources. In many cases, these issues may overlap with each other and prevent, in the short and long term, security and sustainability in the fishery.

A core first step to implement a human rights-based approach in fisheries is the application of the PANTHER principles: participation, accountability, non-discrimination, transparency, human dignity, empowerment and rule of law/recourse. In fisheries, this may include (in PANTHER order) for example: stakeholder representation in decision-making bodies, clear provisions on institutional roles and responsibilities, attention to indigenous peoples, women or other vulnerable groups, clarity in quota/allocation or management decision measures, decent working conditions, knowledge of rights and responsibilities and general and specific education and access to courts and fair, equitable justice.

The rights of fishers have begun to be accepted by the international community, and violations of human rights have been argued and defeated by fishers and their communities to maintain and strengthen their livelihoods. The improvement of the security of fishers through the full recognition and achievement of their human rights results in more secure livelihoods and greater long-term sustainability of the aquatic resources.

Posters

VERS UNE PÊCHE ARTISANALE DURABLE: ASSOCIER LA PÊCHE RESPONSABLE AU DÉVELOPPEMENT SOCIAL

ArtFiMed/CopeMed

Ce poster présente de manière synthétique les objectifs, les approches, les bénéficiaires et les principaux résultats du projet ArtFiMed. Financé par l'Agence espagnole de coopération internationale pour le développement (AECID), le projet régional «Développement durable de la pêche artisanale méditerranéenne au Maroc et en Tunisie» (ArtFiMed) a éte exécuté entre février 2008 et juillet 2011, par le Département des pêches et de l'aquaculture de l'Organisation des Nations Unies pour l'Alimentation et l'Agriculture (FAO), en coordination avec le projet CopeMed.

Les sites de mise en œuvre du projet sont :

- Dikky, dans la province de Tanger au Maroc, situé aux alentours du détroit de Gibraltar où plus de 300 pêcheurs utilisent uniquement des engins à hameçons et ciblent des espèces de haute valeur commerciale, dont le thon rouge.
- Ghannouch, petit village proche de Gabès en Tunisie, où les pêcheurs utilisent différents types de filets et capturent une grande variété d'espèces dont la seiche.
- El Akarit, dans le Golfe de Gabès en Tunisie, où ce sont principalement des femmes qui, à marée basse, pratiquent la pêche des palourdes sur la zone intertidale.

APPENDIXES

Appendix 1 – Opening speeches

MR FRANCO BIAGI

Adviser at the Directorate General for Maritime Affairs and Fisheries (DG MARE), European Commission

On behalf of Ms Monique Pariat, Director for the Mediterranean and Black Sea, DG MARE, European Commission

Ministers,
Authorities,
GFCM President and Executive Secretary,
Distinguished delegates,
Stakeholders' representatives,
Ladies and gentlemen,

First of all, let me bring you the greetings of my Director, Ms Pariat, who would have been very pleased to be here had it not been for a prior commitment.

As you know, the European Union has recently adopted a new set of rules for the sustainable exploitation and conservation of marine living resources and it is close to adopting the financial framework to support it. The main pillars of the new policy are: restoring and maintaining fish stocks at levels capable of producing maximum sustainable yield (MSY), reducing unwanted by-catches (species and size) through various approaches, including among others a gradual discard ban. The new legislation also mainstreams the environmental dimension into fisheries management (e.g. marine protected areas, protection of sensitive habitats, protected species, phase-out of discards etc.).

The new EU fisheries policy also introduces governance innovations, in that it fosters "decentralised" decision-making and joint "bottom-up" actions by Member States and stakeholders (through the advisory councils). This will in turn facilitate regional and subregional approaches to fisheries management, though still within an EU common framework. A specific advisory council already operates in the Mediterranean and a new one for the Black Sea is being set up. Furthermore, specific partnerships between fisheries players and other local private and public stakeholders, currently known as "fisheries local action groups" (FLAGs), can and will continue to be supported.

In this overall context, the role of the EU small-scale fishing sector can only become more prominent.

Small-scale fisheries (SSF), which for the EU include all vessels smaller than 12 metres overall not using towed gear, already play an important role in the social and cultural fabric of our coastal regions. They are also an essential economic factor, as they account for approximately 80 percent of the EU fishing vessels and 50 percent of total employment in EU fleets.

The profitability of small-scale coastal fleets has been on the rise between 2008 and 2011, thus showing a certain degree of resilience in the face of a tough economic climate. In comparison to other categories of fishing fleets, this subsector generates, in relative terms, the highest gross value added, gross profit and net profit as a percentage of income (62 percent, 20 percent and 8 percent respectively).

It is however worth recalling that the scientific advice from the GFCM-SAC, as well as other national and international scientific advisory bodies (e.g. EU-STECF, FAO regional projects, etc.), stress the worrying status of marine living resources – resources that are also exploited by SSF in the Mediterranean and Black Sea.

And taken together, all the small-scale fishermen – including those operating for subsistence fisheries in some countries – exert quite an important, and not necessarily selective, fishing effort at the local, national or subregional level, with possible negative effects on marine living resources, on their sustainable exploitation and ultimately on the long-term economic revenues of the fishing fleets.

So, small-scale fleets share the collective responsibility for overexploitation and must take measures, such as improving their species/size selectivity and limit the fishing effort, with a view to avoiding the worsening of the fish stocks status or, where the case, allowing the recovery of fish stocks.

One could even argue that precisely because they operate mostly in coastal areas, which have the highest diversity of species and habitats as well as the highest natural productivity, small-scale fishermen must ensure that their own actions are at least as environmentally sound as those of other sea users.

In other words, here too just like everywhere else, we need to strive to obtain the highest possible output over time without overexploiting the resources or in any way undermining the structure and functioning of marine habitats and ecosystems.

In parallel to this, the small-scale sector should improve its own structure and organisation until it acquires sufficient critical mass to take increasingly active part into the decision-making process and to dialogue with the other sea-users. Better organization and training of the sector would also facilitate its involvement into co-management initiatives.

The 2nd conference on "EU Low Impact Fisheries (LIFE)" was held a few days ago (23–24 November, Santiago de Compostela, Spain) with a view to enhancing the role that the small-scale coastal fishermen play in the modern approach to fisheries management and also in relation to the other sea-users.

The marine and maritime sectors of the Mediterranean region carry a large potential for growth and employment. This is as true for traditional industries like shipping, fisheries, aquaculture or tourism as for emerging ones like mineral mining, offshore wind energy or blue biotechnology. At the same time, it is imperative that any new developments occur in a sustainable manner - and this requires adequate planning, monitoring and surveillance.

The European Commission is working on each of these aspects, be it under the EU Integrated Maritime Policy or the Common Fisheries Policy. But it is important that all those sharing the use of the sea, including small-scale fishermen, get involved in these processes and interact with policy-makers and other sea-users on an equal footing.

As mentioned earlier, integrated local development strategies are a valuable tool for coastal areas to promote new employment opportunities within and beyond the fisheries sector. This is highly relevant when it comes to the establishment or management of marine protected areas or to broader maritime spatial planning processes.

The ongoing IMP-MED project, sponsored by the EU under the European neighbourhood policy, has been raising awareness among public administrations responsible for maritime affairs, including those of Maghreb and Machrek countries, on how to elaborate a more integrated vision for the management of our seas particularly in coastal areas.

In the coming year, the IMP-MED will provide specific technical assistance to the partner countries on issues such as coastal zone management, spatial interactions between fishing activities and tourism and so on and so forth.

In this context, the small-scale fisheries will have a relevant role to play. Provided that it has been duly informed and trained, opportunities for diversification will open up to the sector, so that the lower fishing effort can weaken the pressure on overexploited resources and improve the income and economic performances of the small-scale fisheries.

It is worth recalling here that other EU tools, such as the European Market Observatory for Fisheries and Aquaculture Products[1] or the forthcoming European Neighbourhood Instrument[2], can facilitate and support national initiatives and initiatives by coastal States and stakeholders with a regional and subregional perspective.

In conclusion, let me underline how much I welcome GFCM cooperative initiatives with other international partners, such as the memorandum of understandings signed with other key partners or this First Symposium on Sustainable Small-scale Fisheries in the Mediterranean and Black Sea.

And I want to thank the Maltese government for hosting and co-organizing it together with other relevant organizations, namely FAO and its regional projects, WWF, MEDPAN and the CIHEAM.

The GFCM certainly has a big role to play for the small-scale fishing sector, namely for those exploiting resources that are shared between different Members, with a view to ensuring sustainable exploitation on one hand and a level playing field on the other.

It may however also play a relevant advisory role to national administrations of member parties, thanks to its Scientific Advisory Committee and thematic subcommittees.

I am confident that the various discussions that will be carried out in the coming days over the different issues concerning the SSFs (description and monitoring, advisory role vs co-management, SSF and marine protected areas, economic value etc), will be instrumental to the ongoing debate launched by the FAO technical consultation on Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the context of food security and poverty eradication.

Last but not least, let me convey my personal satisfaction and that of the Commission in seeing the GFCM becomes an increasingly proactive actor for sustainable exploitation of the biological richness and ecosystems of the "Med".

This rewards the big efforts made by the European Union, its Member States and all other GFCM parties, including the FAO regional projects, to make the GFCM a reliable and effective multilateral body, able to set the scene in a strategic and complex area like the Mediterranean and the Black Sea.

Thank you for your attention.

[15] EUMOFA, an interactive web-tool to support market transparency, optimise value of production, identify market opportunities etc. http://www.eumofa.eu/

[16] Former ENPI and future ENI, providing EU funding through grants, contracts as well as financial support to the State budgets of partner countries. http://www.enpi-info.eu/ENI; http://www.enpi-info.eu/indexmed.php

HON. LEO BRINCAT

Ministry for Sustainable Development, the Environment and Climate Change, Malta

Honorable Ministers,
Distinguished delegates,
Fishers,
Scientists,
NGOs and stakeholders,

I would like to take the opportunity to welcome you all to Malta, where you will be participating in the First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea.

This is my first occasion in my capacity as Minister for Sustainable Development, the Environment and Climate change to address such a distinguished gathering on fisheries, especially on small-scale fisheries. It is with great pleasure that Malta is hosting the very First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea.

Malta is an island steeped in history and tradition. It is in the heart of the Mediterranean and is surrounded by the clear blue sea, making it an ideal location for this event.

During your port visit next Saturday you will have the chance to view the several different types of boats that grace our shores. Amongst these you will admire the Maltese "*luzzu*" and "*kajjik*", traditional wooden sturdy boats which are stable even in rough weather. Such vessels still embellish the Maltese harbours and shores with their vibrant colours.

As in surrounding countries, fishing in Malta has progressed with time in order to survive the ever increasing challenges faced by the sector. Modern multipurpose vessels made of fiber are replacing the traditional *luzzu*, while the modern fishing equipment which has been introduced is naturally causing a positive evolution in the fishing systems. These changes have encouraged the Maltese fishers to extend their fishing activities further ashore, bringing with them a wider variety of fish for both local and foreign consumption. Swordfish, tuna and comparatively larger fish started finding a place at the fish market alongside the other traditional fish, such as the very locally popular "*lampuka*" (dolphin fish).

Nonetheless, our fishing practices and fleet are still considered as small-scale. The majority of the professional vessels (92 percent) fall under the 12 meter category and more than half of them are of the traditional *luzzu* or *kajjik*, type, mainly operating in coastal waters.

Through experience, Maltese fishing activities have evolved switching from one gear to another during the different seasons throughout the year. During the winter months (December–April), most boats target lucrative demersal species, before reverting to tuna longlining in April. The months between May and August are the peak fishing months for swordfish, followed by the famous lampuki season which starts in mid-August. Apart from securing more income for the fishers themselves, such a system is also sustainable as closed seasons for different species were automatically developed.

The same can be said for the gear used by the Maltese fishers. The most popular gear are the relatively selective hooks and lines (60 percent) with only 20 percent of the vessels being registered with different types of entangling and gillnets. Even though to a lesser extent, pots and traps are still used to target demersal species such as octopus, bogue and picarel. During your visit scheduled next Saturday to Marsaxlokk you might be lucky to notice bogue traps made of cane on our shores, being prepared to be laid down on the bottom of the sea.

Our previous generations understood that a balance with nature had to be set up as their livelihood depended on it. Without knowing they were reaping nature's benefits in a sustainable manner, opting for more selective gear and adopting a seasonal approach, thus giving different types of species the time to recuperate in numbers. Nowadays demands and impacts on natural resources are growing at a fast rate, and thus it is of utmost importance to manage living resources in the best manner possible, also taking into account the surrounding environment of the resource being harvested.

Sustainable fisheries are dependent on knowledge of the living resource itself but also on the activities undertaken and their social, economic and environmental impacts. The role of research is significant in order to enable decision makers to formulate an appropriate policy framework. Similarly this is dependent on the active involvement of all the relevant stakeholders, not only fishers but key players that compete with the sector for coastal and maritime space and resources.

It is with this in mind that Malta is working towards developing a targeted programme to secure funding for sustainable fisheries.

From what I have briefly said and from what you will be hearing during the coming days you can understand the importance of this symposium and its relevance for this small country. It is of paramount importance to dedicate the necessary efforts required such that together we can face the increasing challenges that this sector is battling on a daily basis.

With this said, I would like to wish you a fruitful event and would like to take this opportunity to invite you all for a gala dinner which will be held tomorrow evening at the recently opened National Aquarium.

MR GIAMPAOLO BUONFIGLIO
President of the Regional Advisory Council for the Mediterranean (RAC MED)

Small-scale fisheries in the Mediterranean EU countries has been a central issue in the Common Fisheries Policy for many years and particular attention is also given to this fishery in the reform that is in the process of being finally approved (will enter into force on 1st January 2014). One of the targets that was put to the co-decision makers and the stakeholders for discussion, from the publication of the Green Paper (2009) with which the European Commission began the reform process and also during the long consultation process, was the differentiation between small-scale and industrial fisheries. The latter is generally considered to have a greater impact on resources, a lower social value and, in Europe at least, to be not competitive without public funding.

According to this approach, while all structural support for the industrial fleet should be excluded, small-scale fisheries should be sustained by means of a "preferential channel" that would foster economic and political support for this sector, in order to secure employment and generational change, to safeguard local traditions and culture and to facilitate the start-up of new companies.

The draft European Maritime and Fisheries Fund (EMFF) that is under examination by the "trialogue" of the European Parliament, Council and Commission, contains clear indications of the tendency towards such differentiation. Although the possibility of generic aid to the fleets is taken into account (such as scrapping, temporary cessations), particular attention is reserved for small-scale fisheries that see measures such as training for sustainable young employment programmes, engine replacement and start-up programmes for young fishers.

The consideration given to small-scale fisheries in the CFP finds in the Mediterranean particular conditions, as it is clear that this kind of fishery is prevalent in the European fishery fleets in the basin (generally more than 80 percent, more than 90 percent in Spain, France and Greece) and also due to the socio-economic and cultural wealth of the sector, which is widespread among the coastal communities and is deeply rooted to their economies and traditions.

The debate that developed during the consultation on the reform was therefore particularly intense, and one of the main considerations was the redefinition of small-scale fisheries, which in the *acquis communautaire* is still calculated by taking into account overall vessel length alone (12 m), excluding towed gear; and this before opening a reflection about the opportunity of a specific policy for small-scale fisheries with a differentiation between this policy and the general fisheries policy (industrial fleet, aquaculture, etc.).

During this debate in the Member States, there has been a widespread belief that the correct definition of small-scale fisheries would result from a mix of numerous characteristics and not one simple technical parameter (such as overall length). The problem, however, lies in the multiplicity of different characteristics considered in the various countries and, without an agreement – which was above all due to the opposition to any form of differentiation that would have given preference to small-scale fisheries by all those who risked being excluded by the new definition – the result has been a return to the simple, bare, technical definition used in the past (12 m overall vessel length excluding towed gear).

Anyway, in spite of these difficulties, in the Mediterranean in particular it is interesting to recall the many different characteristics considered in the attempt to reach a more appropriate definition.

These represent specific features relative to all aspects of the sector, that in the various Member States have different weight in national legislation and the search for the lowest common denominator is therefore a complex matter (the 12 m LOA

is not representative of all the Mediterranean SSF fleet, for instance in Spain there are 40 percent and in Italy 20 SSF vessels longer than 12 m). However, these features are the reality of fisheries activities in all the Mediterranean EU ports:

- Fishing gear (gillnets, seine nets, lines, longlines, mechanical and manual dredgers, pots and traps)
- Characteristics of the vessels (length overall, gross tonnage, propulsion);
- Range of fisheries activities from the port and from the coast (6/12 miles)
- Length of fishing trips (within 24 h)
- Vessel owner on board
- Composition and organization of the fishing enterprise (family, cooperative, individual)
- Forms of contract in which part of the earnings from the sale of the fisheries products is divided between crew members
- Product sales (fresh product, local market)

There are then some more general characteristics related to the legal definition of the fisher who is granted a fishing licence (and the way in which this licence is issued). It is clear that the status of "professional fisher" if not solely linked to the predominance in his/her income of sales from fishery activities; this could lead to obvious distortions with thousands of licences and vessels considered as professional but whose owners carry out other main activities.

But without considering the legal aspects, these characteristics together form a kind of genetic code for small-scale fisheries in the Mediterranean EU countries.

This is the framework for the management issues and the problems that are now facing this fishery sector, a sector that is often considered the remedy for all ills, but which is revealing its own critical points due to the fragility and low profitability of the micro and small companies that engage in these activities, their weakness in the marketplace, the density of operators in some areas, the lack of generational change and training, problems for the safety aspects (due to small size and high average vessel age), for the conflicts with other fishing activities and with recreational fisheries as well as the deterioration of the coastal areas, the environmental quality of which is crucial for small-scale fisheries.

These are all critical issues that must be dealt with by means of ad hoc solutions for each single case. This can entail the need for structures on land, increasing the value of the products (for example, by means of the development of direct sales or fishery tourism), modernization of vessels etc. It is clear, however, that some issues (such as the lack of generational change) are wide-ranging and need-specific policies.

It is equally clear, although this sector utilizes highly selective gear and pressure on resources is lower, that it is not without impact. Furthermore its activities are concentrated in the delicate coastal area and therefore greater attention is required. Given this context, the tendency to transfer operators from industrial fisheries to small-scale activities through reconversion policies is a strategy that is extremely limited in terms of management and feasibility.

One thing is clear, among the many kinds of fishery carried out in the Mediterranean, small-scale fishery activities are the most multifaceted. This sector therefore deserves careful assessment, calibrated policies, actions to be designed individually for each different area, having been penalized by restrictive policies applied to EU fisheries in the past as a result of the lack of such specific consideration. It is therefore especially important that the GFCM pays particular attention to this sector, for which RAC MED hopes to develop specific collaborative activities in the near future in the framework of the memorandum of understanding that has been signed in 2012.

MR STEFANO CATAUDELLA

Chairperson of the General Fisheries Commission for the Mediterranean (GFCM)

Excellences,
Distinguished delegates,
Representatives of the FAO,
Executive Secretary of the GFCM,
WWF, MedPAN and CIHEAM,
Ladies and Gentlemen,

It is for me a great honour to be here for this prestigious and unprecedented event. I would like to open the Symposium by extending a warm welcome to all of you on behalf of the General Fisheries Commission for the Mediterranean in the magnificent island of Malta. Let me express first of all my sincere gratitude to the Maltese authorities for generously hosting this event.

The subject of the symposium is one of crucial importance that goes well beyond the interest of policy-makers and experts. Small-scale fisheries are an integral element of the broader framework of sustainable development and its three pillars – namely social, economic and environmental – whose importance was reaffirmed by the international community at the Rio +20 Conference last year. It is in this broader framework that I intend to focus in my intervention.

The GFCM, since the establishment of the Task Force on the modernization of the GFCM legal and institutional framework in 2011, has made considerable efforts to promote a bottom-up, inclusive, participatory and transparent approach. This is because the time has come for "real fisheries", one that is concerned with increasing the production of goods and services through, among others, job creation, food security and incentives for the market. Consequently, it is mandatory to involve a wide array of actors in decision-making fora to seek their inputs and views on various social, economic and environmental issues. As far as the GFCM is concerned, this is the only credible means to promote sustainable development, consistent with the FAO mandate entrusted to the Commission which evolves in light of the needs of countries as well as of the dynamics of the society.

This brings me to share my opinions on small-scale fisheries and on the need for us to establish a clear two-way-ness of relationship in this domain. Coastal communities engaged in small-scale fisheries and all the people related to this sector are possibly the most authentic and basic component of "real fisheries". We should ask ourselves whether we have been getting feedback and original input from these communities and people; or whether we, as supporters to policy-making, have been in fact setting the agenda of the relationship. In other words, are we advocating our own ideas in elaborating policies, leaving them relatively voiceless?

I should like to suggest that, through the medium of the GFCM Symposium, the basis for a deep and intimate knowledge of the small-scale fisheries sector is laid so that we can all think in the future, when it comes to making policy-related decisions, a relationship that both us and the small-scale fisheries sector create together. This understanding must be grounded on a domain-by-domain knowledge of all the components linked to small-scale fisheries, spanning from the socio-economic to the environmental one. In this respect, I am pleased to see that the agenda of the Symposium has been developed around five thematic sessions that will zero in on different matters. All of them are important to achieve sustainable small-scale fisheries in the Mediterranean and the Black Sea. If I may, I would like to underline the social dimension of small-scale fisheries in particular because, as a result of the artisanal trait of the sector, its consideration can also bring to the fore some grey areas, such as IUU fishing, which we know are there and call for the elaboration of effective strategies.

These strategies should be "stakeholder-sensitive" strategies as the incidence of poverty in small-scale fisheries should be duly factored into the equation.

In this and other respects, better knowledge of small-scale fisheries equates to better management. This implies the right of all actors involved in small-scale fisheries, including fishers, administrations, NGOs, civil society and research institutions that have been focusing on this neglected area, to have their voice heard and make their presence felt. At the same time, this implies the duty to ensure sustainable fishing practices. Otherwise, coastal communities engaged in small-scale fisheries and all the people relating to this sector will not be empowered by sustainable development, but they will be rather crushed by the impact of development. After all, the present state of depletion of some marine coastal environments makes a victim of all these actors. The ongoing FAO process relating to the elaboration of guidelines for sustainable small-scale fisheries is therefore a great opportunity for us to make headway. If the Mediterranean and Black Sea region really wants to make the most out of this opportunity, we should all commit to guarantee that the GFCM Symposium proves to be a fruitful meeting for all concerned.

In this regard, our goal should be that of defining through the GFCM policies which are inspired to a common approach to small-scale fisheries. We should bear in mind that, in the GFCM area, living aquatic resources fished and the market where they are sold are the same, especially for prime species, and this common regional character should be considered of strategic relevance in carrying out GFCM's tasks. Irrespective of this very character, the specificities existing in the various GFCM subregions are going to call in due course for tailored policies to be elaborated on a case-by-case basis for the different geographic realities. As challenging as this undertaking could be, I am positive we can leave up to it and deliver good results.

Thank you very much for your kind attention and thanks in particular to the GFCM Secretariat for having worked so hard, in coordination with other co-organizers, in the preparation of this important event.

MR CHRISTOPHE CHASSANDE

Deputy Director, Director for Fisheries and Aquaculture

On behalf of Ms Cécile Bigot, Director for Fisheries and Aquaculture, France

Monsieur le Ministre pour le développement durable, l'environnement et le changement climatique,
Monsieur le Ministre de la Pêche et des ressources halieutiques,
Monsieur le Directeur Général des ressources halieutiques et de l'aquaculture,
Messieurs les Directeurs des pêches et de l'aquaculture,
Mesdames et Messieurs les conseillers et Présidents des organisations partenaires du Symposium,
Monsieur le Secrétaire exécutif,

Je tiens à vous remercier, au nom de Frédéric Cuvillier, Ministre délégué chargé des transports, de la mer et de la pêche, pour cet accueil formidable que vous nous avez réservé au sein de ce magnifique archipel maltais.

Quelle meilleure image d'ailleurs pourrait-on donner à la pêche artisanale qu'en organisant le premier symposium de ce type à Malte? À la croisée des cultures méditerranéennes et devant des impératifs croissants de développement, c'est dans un souci constant de répondre aux besoins des populations locales, Monsieur le Ministre, que vous concevez la pêche artisanale comme un pilier du développement durable.

La France a également choisi de mettre la mer et la pêche au centre de ces problématiques de développement durable.

Avec 1.5 milliards d'euros de chiffre d'affaires et environ 90 000 emplois directs et indirects, le secteur de la pêche française joue un rôle important pour notre économie maritime. Nous disposons ainsi en France d'une diversité en matière de pêcheries, de types de navires, qui fait la richesse de toute notre filière.

Au sein de ce secteur de la pêche, la petite pêche et la pêche côtière française représentent près de 3 650 bateaux en 2012 sur une flottille de près de 4 600 navires en métropole. Soit 80 pour cent des capacités de pêche française, celle-ci pesant un total d'environ 310 000 tonnes annuelles en pêche fraîche.

Pour les rives françaises de Méditerranée, c'est plus de 2 800 emplois de marins embarqués, 370 emplois de mareyeurs, et près de 1 600 emplois dans l'industrie de la transformation, sans parler ensuite des emplois qui en dépendent dans la restauration et le tourisme.

Mais du point de vue français, la Méditerranée, c'est également un sanctuaire. D'abord un sanctuaire à proprement parler pour les mammifères marins, entre rives françaises, monégasques et italiennes notamment, avec le sanctuaire Pélagos. C'est également un sanctuaire tant est riche la biodiversité que cet espace maritime abrite. Sardines, merlus, rougets, y côtoient anguilles, coraux, thons rouge, ou encore dorades coryphènes (célèbre «*lampuka*» en maltais) et force est de constater que tous les stocks ne sont pas exploités aux niveaux durables. Il convient donc de mieux assurer le bien-être de cette activité structurante pour le littoral méditerranéen en veillant, ensemble, à préserver davantage ces ressources halieutiques.

Mais au delà d'un constat commun sur les pêcheries à petite échelle «moins de captures et plus d'emplois», ces pêcheries recouvrent en réalité des activités de production halieutique très hétérogènes. Des efforts de recherche scientifique doivent être entrepris pour mieux décrire et comprendre toute leur variété et leur importance locale. Je me tourne vers la communauté scientifique qui doit se saisir de ces questions pour contribuer à démontrer et à améliorer la durabilité économique, sociale et écologique des pêches artisanales. Je le dis volontairement, nous considérons en France que la notion de pêche artisanale n'est pas réductrice à une question de taille de navire.

La France engage actuellement des efforts importants d'acquisition de données sur ces pêcheries.

Un programme volontaire de géolocalisation des navires de petite pêche se déroule actuellement sur le littoral français. J'encourage les artisans-pêcheurs à faire connaitre leur activité afin que nous puissions mieux les défendre en mettant dans la lumière leurs pratiques de pêche, des pratiques respectueuses de l'environnement marin et pourvoyeuses d'emploi.

J'espère donc que ce symposium, auquel la France a souhaité apporter, pour toutes ces raisons, sa contribution financière, sera un événement majeur pour la rencontre et les échanges entre artisans pêcheurs, scientifiques, gestionnaires d'aires marines protégés et administrations.

J'espère qu'il permettra d'envisager une pleine coopération et l'action, par le biais de la CGPM, en faveur d'enjeux majeurs pour l'avenir de cette activité ancestrale, si symbolique de ce berceau de l'humanité qu'est la Méditerranée et que nous avons le devoir de préserver.

En vous remerciant encore Monsieur le Ministre pour cet accueil ainsi que Monsieur le Secrétaire exécutif pour l'organisation de ce symposium, je vous souhaite à tous, au nom de mon Ministre, une très bonne conférence.

MR BIAGIO DI TERLIZZI

Head of Cooperation Office of the International Centre for Advanced Mediterranean Agronomic Studies in Bari (CIHEAM)

On behalf of Mr Cosimo Lacirignola, Secretary General of CIHEAM International and Director of the Mediterranean Agronomic Institute of Bari

Ladies and Gentlemen,

I would like first of all to thank and welcome: H.E. Leo Brincat, Minister for Sustainable development, Environment and Climate Change of Malta; H.E. Sid Ahmed Ferroukhi, Minister of Fisheries and Marine Resources of Algeria; Prof. Stefano Cataudella, President of the GFCM; Dr Abdellah Srour, Executive Secretary of the CGCM, and all the distinguished guests and participants in this symposium.

I would also like to express my gratitude to the GFCM for inviting CIHEAM to this symposium.

Back in 2008, CIHEAM signed an agreement with the GFCM and a wider collaboration is now going to be finalized in order to create synergies in the Mediterranean for the sustainable exploitation of marine resources.

The opportunity we have, during this meeting attended by the most relevant Institutions of the sector, to express our interest in developing common activities for responsible fisheries in the Mediterranean will certainly pave the way for future cooperation among scientific and institutional actors. Synergy has to be the recipe for the sustainable development of the coastal economic communities.

The CIHEAM (International Centre for Advanced Mediterranean Agronomic Studies) has been established more than fifty years ago to work for training, research and international cooperation in agriculture. In recent years, the subject of fisheries has been developed by the Institute of Zaragoza. The Institute of Bari has then developed and it is being increasingly involved in several cooperation initiatives for social and economic growth directly in the south Mediterranean and Balkan countries, in strong cooperation with the local institutions.

The side events organized, which I consider very useful to enrich the symposium, also include a corner where we present the Bari Institute's main lines of activities and projects developed or ongoing. In this regard, I have to thank the Associazione Magna Grecia of Tricase for the support and effort in promoting initiatives related to diversification and multifunctionality in order to keep sustainable economic and social conditions in their fishermen community. The projects presented are also described in the illustrated material available at our stand. It illustrates the contribution offered to the Mediterranean, the Middle-East and the Balkan communities through supporting actions that could contribute to the social and economic growth, enhancing human resources as an important factor of sustainable development in the Mediterranean, extending and spreading scientific and technological knowledge as a basic factor to improve production techniques, disseminating the culture of international co-operation as a key factor towards socio-economic development and peaceful coexistence of Mediterranean peoples.

The CIHEAM, through the Institutes of Zaragoza and Bari, acts as an instrument of international cooperation, through its network of scientific institutions and sector associations, providing technical assistance and capacity-building in order to foster the institutional relationships between the northern and southern shores of the Mediterranean, to support the operators of the fisheries sector and create conditions to match the wish of the new EU Fishery Policy that aims at starting a dialogue with non EU member countries.

Coastal communities are privileged partners of our actions, through the diversification of their activities to improve their income and livelihood.

The identification of needs and existing territorial potentialities for the Mediterranean and the Black Sea could orient policies for implementing educational and scientific programmes. Lines and actions foreseen within the framework of fisheries multifuncionality that could sustain the social and economic environment will empower fisheries coastal communities. Professional and academic training on socio-economic sustainable actions should be envisaged and targeted to the territorial potentialities

Thus, CIHEAM-Bari will continue to support the institutions of the Mediterranean countries, the fishery associations, the GFCM, enhancing dialogue between the Mediterranean countries through cooperation and training activities centred on the environmental and socio-economic sustainability of the fishery sector.

Our wish is that the cooperation between CIHEAM and GFCM, enlarged to the other institutions operating at the Mediterranean level and present here today, might be carried on in the framework of the new Mediterranean scenario, aiming at common growth and co-development, promoting the modernization of the fishery sector in accordance with criteria of environmental, social and sustainability productivity.

Thank you!

DR IGNACIO ESCOBAR GUERRERO
Director General for Fisheries and Aquaculture, Spain

Excellencies,
Ambassador,
President of the GFCM,
Executive Secretary of the GFCM,
Dear colleagues,
Ladies and gentlemen,

Let me thank the Maltese authorities for the excellent organisation of this meeting and their warm hospitality.

In Spain, we have received with great pleasure the initiative of GFCM to organize a specific symposium on artisanal fisheries. We find it extremely timely in these difficult times of crisis, given the positive impact of artisanal fisheries from a social and economic point of view. On the other hand, the fact that artisanal fisheries are the main player in the Mediterranean fisheries justifies the commitment of GFCM with this part of the sector.

As you well know, Spain has been a long-standing supporter of the activities of the GFCM, notably through the FAO CopeMed regional project. Given the success of the CopeMed programmes, Spain has the intention to continue to give its support not only bilaterally, but also through the European Union institutions. We believe that, only through solid science and extensive data collection, it is possible to manage correctly and sustainably the different stocks and we wish to continue to cooperate with other Mediterranean countries to improve these capabilities.

I would like to make some preliminary considerations that predetermine the way that fisheries take place in this part of the world: the Mediterranean is characterized as a small and closed sea; the fishing effort is exerted by multiple heterogeneous countries; a series of factors not related to the fishing activity, such as weather and the environment, play a major role.

Let me give you a few facts and figures of the scope of the Spanish fisheries in the Mediterranean:

- Slightly over half of the Spanish coastline is Mediterranean, where we fish for demersal, small pelagic and highly migratory species.
- The management objectives that Spain pursues in its Mediterranean fisheries are to reach the maximum sustainable yield for each of the different fisheries through the adoption of management measures such as the creation of marine protected areas, marine reserves, reduction of capacity, fixing of minimum landing sizes, increasing gear selectivity, etc. Furthermore, we are considering the formulation of an effort management system by allocating a number of transferable fishing days per vessel.
- The basis for the adoption of any of such measures is the best available scientific knowledge, which we gather through our national and regional research institutes and universities, together with the European Union regulations and recommendations from the relevant RFMOs.
- The reform of the European Common Fisheries Policy will raise important questions in two areas in particular (MSY management and discard ban) and will demand a closer cooperation among the concerned Member States in the European Union.

The characteristics of the Spanish Mediterranean fisheries sector:

- The abovementioned circumstances have a bearing on the profitability, vessel design and working/living conditions of the professional fishermen.

- We mostly find enterprises of an artisanal nature, in which family plays an important role: the ship owner and fishing master is the same person, the crew is made up of family members, sons take the place of parents when retiring, etc.
- There is low technological capability on board, due to both the size and the price of the equipment. Knowledge of fish location transmitted from father to son. Despite this, we are witnessing a growing investment in engine power and fish finding electronics.
- The fishing pattern consists of short trips, most of them of less than 24 hours and in areas close to the base port.
- The number of crew members per vessel is low, ranging from one to ten depending on the *métier*.
- As for the division of labour on board, there is hardly any specialization, the fishermen being artisans capable of completing all the areas in the production process, without a clear hierarchy.
- The remuneration system is in most cases a share payment, with a fixed percentage (40–50 percent) for the ship owner and the rest in equal shares for the crew members.
- This pattern allows for better working schedules, most of the fishermen not working for longer than one day, meaning between 60 and 80 hours per week. This allows living a balanced family and social life.

And finally a few facts and figures on Spanish Mediterranean fisheries:

- Total income: approximately 400 M€ per year.
- Employment: some 8 700 annual labour units/year, benefiting some 10 500 persons; most of these units are performed at sea and the rest in land.
- Catches: 100 000 tons, with a first sale value of about 800 M€.
- Number of vessels: 2 675, with an average age of 29 years.
- We have been working on a reduction of the fleet which has diminished by 17 percent from 2006 to 2009 and by an additional 16 percent during the period 2009–2012. From January 2013 to December 2017 the target reduction is yet another 20 percent.
- As for the fleet composition, Spain counts with 673 bottom trawlers, with an average overall length of 20 m; 243 purse seiners of an average 18 m and 1 759 small gear and fixed nets, with an average size of 8 m.

I thank you very much for your attention and wish you a very fruitful debate throughout this week.

DR. ANDREINA FENECH FARRUGIA
Acting Director General for Fisheries
Ministry for Sustainable Development, the Environment and Climate Change (MSDEC), Malta

Honorable Ministers,
Distinguished delegates,
Fishers,
Scientists,
NGOs and stakeholders,

I would like to take the opportunity to welcome you to Malta.

Small-scale fisheries are not only important to Malta, but also to the other coastal States in the Mediterranean and the Black sea.

Similar to Malta, small-scale fleets in these countries form an integral part of the fisheries sector, and likewise these are also facing ever increasing challenges. Here I would like to highlight the importance of small-scale fisheries, justifying why every required effort needs to be exerted in order to ensure the sustainability of this sector.

While from an economic point of view, small-scale fisheries may not be considered as important, since their contribution to the gross domestic product might be insignificant, this sector offers a variety of other advantages. These include the lower running costs, lower construction costs, higher versatility, a very rich cultural tradition and last but not least a lower ecological, more selective and sustainable impact compared to industrial practices.

The long history and cultural tradition of small-scale fisheries from the aspects of fishing methods, typical fishing vessels and local fishing villages cannot be passed unmentioned. This has a potential to attract many tourists and I could not for example think of one Maltese person imagining the Marsaxlokk port without its colourful scenario offered by the various "*luzzijiet*" and "*kajjiki*" moored there.

One of the main reasons justifying every effort required in order to safeguard small-scale practices is the fact that the impact of small-scale fisheries is much smaller than that of industrial fisheries. This is mainly due to the use of passive gear as well as the seasonality adopted by such fishers. Most fisheries resources show distinct seasonal cycles of abundance and availability ensuring that fishing is most profitable during certain periods of the year. On the other hand, industrial fisheries tend to target the same resource all year round, resulting in a higher fishing pressure on the same stock leading to unsustainable practices.

It is with keeping the importance of small-scale fisheries in the Mediterranean and Black Sea in mind that I would like to wish you all a successful meeting.

H.E. SID AHMED FERROUKHI

Minister of Fisheries and Marine Resources, Algeria

Excellence, Monsieur le Ministre Leo Brincat, Ministre du développement durable de l'environnement et du changement climatique de Malte,
Messieurs le Président et le Secrétaire exécutif de la CGPM,
Excellences et honorable assistance,

Je voudrais, au début de cette intervention, remercier les responsables de la CGPM pour l'invitation qui m'a été transmise à participer à ce premier Symposium régional sur la pêche artisanale durable en Méditerranée et en mer Noire. Je tiens aussi à remercier et à féliciter, en mon nom personnel et au nom de la délégation qui m'accompagne, le gouvernement maltais pour l'excellente organisation et l'accueil qui m'a été particulièrement réservé depuis mon arrivée à Malte.

Excellence, Mesdames et Messieurs,

Il est toujours difficile d'intervenir devant un auditoire de cette qualité et de conserver ou d'apporter une pertinence et une valeur ajoutée sur le sujet pour lequel nous sommes réunis aujourd'hui.

En vous voyant tous ici, dans cette salle, impatients de débattre, d'échanger, de partager vos expériences, vos connaissances, vos vécus sur: i) l'amélioration des instruments de connaissance de ce qui englobe les réalités actuelles des pêches artisanales dans leur diversité plurielle, ii) les expériences menées dans ce cadre en matière de cogestion des aires et ressources marines et des difficultés possibles qui altèrent l'implication des pêcheurs, iii) l'intégration des pêches artisanales aux marchés et aux chaînes de valeur.

Ceci me donne l'envie, pendant quelques minutes, de vous exposer librement des idées; une réflexion modeste à partir de l'expérience que nous vivons dans le contexte des pêcheries algériennes

Excellence, Mesdames et Messieurs,

Dans le monde, avec 90 pour cent des emplois et 50 pour cent des captures, et encore plus dans la région méditerranéenne avec 80 pour cent de la flottille et 50 pour cent des marins, les pêches artisanales semblent aujourd'hui constituer une évidence statistique (on passe par le même endroit sans remarquer un élément manquant).

On pourrait alors se poser la question suivante: pourquoi avons-nous attendu si longtemps? Pour que le processus actuel mené par la FAO, à travers les directives volontaires pour garantir des pêches artisanales durables, nous permette d'entrevoir la possibilité de: i) reconnaître le rôle qu'elles jouent dans la réduction de la pauvreté, l'amélioration de la sécurité alimentaire et de la croissance économique, ii) convenir des principes et des critères pour l'élaboration des politiques et des stratégies spécifiques aux pêches, iii) tenir compte de la convergence forte entre cette question et celle de l'approche écosystémique des pêches, des principes de participation, d'inclusivité, d'intégration, de durabilité.

Il faut alors concrètement améliorer l'accès aux ressources, aux droits d'aménagement, adapter les réglementations, les systèmes de suivi, gérer en intégrant, adapter les systèmes de protection sociale. En définitive, oser même innover, créer des concepts nouveaux, de nouvelles définitions, de nouvelles règles – concevoir un nouveau paradigme.

Il s'agit surtout à l'avenir de veiller à l'implémentation et la contextualisation de ces principes.

Sommes-nous capables de le faire alors que les pêcheurs artisans étaient jusque-là peu visibles ou presque invisibles, considérés comme des catégories résiduelles, non-résilientes à la tertiarisation des filières alimentaires et que nos regards étaient centrés sur la pêche de grande échelle?

Mesdames et Messieurs,

Il faut certainement reconnaitre le paradoxe, au cours des cinquante dernières années, de la quasi-disparition progressive des pêches artisanales au cours du siècle dernier à la faveur des évolutions en matière de puissance de motorisation, de mécanisation des engins des pêches et des instruments de navigation. Oui, les pêches artisanales du XXème siècle ont disparu, mais par contre les pêcheurs artisans sont toujours là, aussi nombreux au Sud, qu'ils continuent à valoriser grâce à des savoir-faire locaux. Leur taille, leur mode de vie leur procurent flexibilité et capacité de s'adapter.

Il faut voir dans ce processus historique de transformation-adaptation une force, des capacités à valoriser et à intégrer les systèmes productifs nationaux.

Pour le cas de l'Algérie, consciente des défis et opportunités qu'offrent les pêches artisanales, plusieurs initiatives ont été lancées, avec la contribution et la participation des organisations professionnelles et des associations, à la faveur de la nouvelle stratégie du secteur. La plus importante d'entre elles concerne le lancement, avec le concours du PNUD, de la FAO et de l'ONUDI, d'un projet de formulation d'une stratégie action ciblant particulièrement les pêches et l'aquaculture artisanales. Il est aussi à relever le dynamisme d'institutions et d'associations professionnelles menant sur le terrain des expériences prometteuses en matière de cogestion des aires marines, à l'image des cas du Parc de Taza et la région d'Azzefoun.

Le secteur de la pêche et des ressources halieutiques compte dans ce cadre s'investir fortement dans ce type d'initiatives, et particulièrement celles qui associent pleinement les pêcheurs artisans à l'aménagement et la gestion de ces aires marines.

Mesdames et Messieurs,

La décision de participer à ce symposium était fondée sur deux croyances principales: l'importance actuelle et future des pêches artisanales dans leur contribution et dans les opportunités qu'elles offrent aux territoires littoraux et continentaux en matière de création de valeur, de croissance et d'emplois, ainsi que l'existence aujourd'hui de matériaux, de capacités au niveau national et régional d'accompagnement de cette dynamique que constituent les instruments et les directives volontaires au niveau international et les expériences accumulées dans les projets de coopération méditerranéenne.

Il est clair qu'il s'agit moins à l'heure actuelle de nous convaincre mutuellement de l'évidence du rôle présent et futur des pêches artisanales que de rechercher les instruments, les moyens, les démarches effectives d'implementation de cette question dans les politiques et stratégies nationales et au niveau de la région de la Méditerranée et de la mer Noire.

Dans cette voie, j'ose vous faire quelques propositions primaires:

- que le premier symposium pour la région ne soit pas le dernier (on partira avec plus de questions que de réponses);
- que la CGPM, en collaboration avec les partenaires, puisse mettre en place rapidement un cadre de coopération permanent dans ce domaine pour la région;
- qu'une Task Force soit mise en place au sein de la FAO-CGPM afin d'appuyer les pays de la région désirant mettre en place les directives volontaires sur les pêches artisanales et de disposer d'une expertise en matière d'assistance dans les divers débats abordés par le symposium;
- de mettre en place une stratégie de mise en valeur du rôle et des opportunités de la pêche artisanale en direction des bailleurs de fonds multilatéraux et des autres parties prenantes.

Je suis encore une fois très heureux d'être parmi vous; on me demande souvent de parler et, pendant quelques jours, je me ferais un plaisir d'écouter les autres le faire, mais je continuerai à me rappeler avant tout que les efforts que nous faisons et portons

maintenant, nous les faisons pour des gens modestes, invisibles, sans paroles, pour leur offrir les opportunités de vivre à travers les pêches artisanales dans un monde qu'ils percevront plus juste, plus équitable, qui reconnaît leur rôle, leur spécificités, et je suis certain que, sous ces conditions, même les poissons seront contents de tomber dans leurs engins sélectifs et les consommateurs satisfaits de consommer des produits de qualité sur le triple plan alimentaire, environnemental et éthique.

MS NICOLE FRANZ
Fishery Planning Officer, FAO Fisheries and Aquaculture Department

On behalf of Mr Árni M. Mathiesen, Assistant Director-General, FAO Fisheries and Aquaculture Department

Ladies and Gentlemen,

On behalf of Mr Arní Mathiesen, Assistant Director-General, FAO Fisheries and Aquaculture Department, it is our pleasure to welcome you to this First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and the Black Sea.

According to the latest estimates, small-scale fisheries employ more than 90 percent of the world's capture fishers. But the Code of Conduct for Responsible Fisheries approved in 1995 does not give the kind of visibility to SSF that matches with their importance for livelihoods, food security and poverty alleviation. However, since 2003, the FAO Committee on Fisheries (COFI) has promoted efforts to improve the profile and the understanding of the challenges and opportunities facing small-scale fishing communities in inland and marine waters.

FAO recognizes the importance of the Mediterranean and the Black Sea and has engaged in this region through a number of important projects since 1996, when CopeMed was launched with the support of Spain. Subsequently, AdriaMed, MedSudMed, EastMed, CopeMed II and ArtFiMed have covered the whole Mediterranean Sea with the support of Italy, Greece, Spain and the European Union. These projects have worked closely with partners and countries to improve the understanding of the small-scale fisheries sector and to support its development. In collaboration with GFCM and supporting the organisation of the Session I of this symposium, they intend to raise awareness on existing issues in the Mediterranean and give more visibility to small-scale fisheries problems in the southern and eastern countries.

FAO also supports the sector through fisheries officers in its regional offices in Cairo and Budapest and its subregional offices in Tunis and in Ankara.

At headquarters, the FAO Fisheries and Aquaculture Department, prompted by COFI, embarked in 2008 on a broad-based consultative process with small-scale fisheries stakeholders including governments and fishworkers' organizations and their supporters. Throughout this process, strong support was expressed for the development of an international instrument in support of small-scale fisheries and, in 2011, COFI recommended the development of international voluntary guidelines to complement the FAO Code of Conduct for Responsible Fisheries as well as other international instruments with similar purposes, in particular those related to human rights, sustainable development and responsible fisheries.

The preparation of these Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the context of Food Security and Poverty Eradication (the "SSF Guidelines") is expected to contribute to policy development at the national and regional levels. Our vision is to see the contribution of small-scale fisheries to sustainable development fully realized, to end the sector's marginalization, to ensure full participation of SSF stakeholders in decision-making and to end poverty and food insecurity. The SSF Guidelines will be an important instrument for small-scale fishers, fishworkers and their communities in the Mediterranean and Black Sea to claim their rights within the framework of a human rights-based approach. In the symposium's Session V, we will explore how the region can benefit from the SSF Guidelines and support their implementation.

This workshop seeks your experience and expertise in finding the best way and means for how FAO and others can contribute towards improving the situation of the sector and we look forward to four days of productive and creative discussion, lively debates and successful recommendations on how to move forward.

I wish you a fruitful workshop and a pleasant stay in Malta.

MS MARIE-CHRISTINE GRILLO
Executive Secretary of ACCOBAMS (Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area), Monaco

Excellences,
Monsieur le Président,
Monsieur le Secrétaire exécutif,
Chers participants, chers amis,

Tout d'abord, je voudrais exprimer mes vifs remerciements aux organisateurs et aux autorités de Malte pour l'organisation de ce symposium, auquel l'ACCOBAMS participe car nous sommes convaincus que la conservation des cétacés ne peut être considérée qu'à travers une approche intégrant, d'une part, les impératifs de la préservation des espèces et, d'autre part, les besoins du développement de la pêche et de la gestion rationnelle des ressources marines vivantes.

L'Accord ACCOBAMS a été créé il y a maintenant 17 ans et il compte aujourd'hui 23 pays de la Méditerranée et de la mer Noire ainsi que le Portugal. Après une première période de mise en place des organes de gouvernance de l'Accord, tels que le Secrétariat et le Comité scientifique, nous nous sommes attelés à établir des liens de collaboration avec les organisations concernées par le milieu marin dans la zone géographique de l'Accord.

La CGPM était la première de ces organisations. Aujourd'hui, nous nous réjouissons de voir que des liens étroits de collaboration entre les Secrétariats de l'ACCOBAMS et de la CGPM sont en place. Sur ce point, nous sommes heureux de vous informer qu'un projet sur la réduction des interactions négatives entre les cétacés et les activités de pêche va être mis en œuvre dès l'année prochaine grâce à un financement de la Fondation MAVA.

La pêche artisanale, objet de notre rencontre ici à Malte, est une activité ancrée dans les traditions des peuples des côtes méditerranéennes ; elle fait partie de notre culture et elle est à la base de plusieurs emplois directs et indirects.

C'est une des formes de pêche les plus à même d'appliquer les principes de la pêche responsable. Dans ses activités, ACCOBAMS accorde beaucoup d'importance à cette pêche et nous menons depuis plusieurs années des initiatives pour minimiser les interactions entre cette pêche et les cétacés; interactions qui sont préjudiciables à la fois aux populations de cétacés et aux pêcheurs.

Évidemment, la situation diffère d'une région à une autre et d'un pays à un autre, mais ces interactions constituent de nos jours une réelle source de préoccupation pour les pêcheurs et pour la conservation des cétacés. L'adoption, lors de la trente-sixième session de la CGPM, d'une recommandation visant à atténuer les prises accidentelles de cétacés dans la zone de la CGPM démontre le degré de maturité de la CGPM et de ses décisions qui sont en phase avec les orientations de la communauté internationale et de ses principales instances internationales en matière de développement durable.

De tels engagements pris par les pays membres de la CGPM rejoignent la volonté des Parties à l'ACCOBAMS quant à la nécessité de concilier les différents types de pêche avec la préservation des espèces menacées.

Nous attendons beaucoup de ce symposium, notamment de la plateforme qui permettra de mieux impliquer toutes les parties prenantes pour faire de la pêche artisanale méditerranéenne une pêche durable respectueuse des différentes composantes de la biodiversité marine et préservant le gagne-pain de milliers de pêcheurs de la région.

L'assistance aux pays de la région constitue un des axes majeurs d'intervention de l'ACCOBAMS et c'est dans ce cadre que nous contribuons à améliorer les capacités nationales, y compris à travers le financement de projets concrets pour les associations et pour les instances scientifiques et techniques gouvernementales.

Je voudrais terminer en confirmant ici le grand intérêt et l'engagement du Secrétariat de l'ACCOBAMS à collaborer avec vous tous et à joindre nos efforts pour plus de concertation et d'harmonisation de nos interventions.

Je vous remercie.

MONSIEUR HECHMI MISSAOUI

Director General for Fisheries and Aquaculture, Tunisia

Messieurs les Ministres,
Mesdames, Messieurs les représentants des pays méditerranéens,
Mesdames et Messieurs les représentants de la FAO, le Président et le Secrétaire exécutif de la CGPM,
Mesdames et Messieurs les représentants des autres parties organisatrices,

Bonjour,

Au nom de Monsieur le Ministre de l'Agriculture de la Tunisie, je voudrais exprimer mes vifs remerciements pour l'invitation qui a été adressée à la Tunisie à prendre part à cette importante manifestation, dans ce beau pays connu pour sa grande hospitalité et ses intenses activités promotrices du développement du secteur agricole et de la pêche durable.

Je tiens également à confirmer le grand intérêt que porte la Tunisie à cette thématique de la pêche artisanale, qui représente une composante vitale dans le secteur de la pêche et qui joue un rôle capital dans la sécurité alimentaire et la lutte contre la pauvreté.

Mesdames et Messieurs,

La FAO estime que 90 pour cent des 38 millions de pêcheurs ou aquaculteurs à travers le monde sont classés comme petits pêcheurs. Par ailleurs, des millions de personnes sont tributaires des produits de la pêche pour satisfaire leurs besoins en protéines animales. Bien que beaucoup de communautés de la pêche artisanale soient vulnérables, il est maintenant largement reconnu que celles-ci contribuent de manière significative à la fourniture de protéines pour les populations et permettent ainsi à plusieurs millions de pêcheurs de gagner leur vie avec enthousiasme et dans la dignité.

À cet égard, nous sommes convaincus que la durabilité des pêches artisanales demeure étroitement tributaire du degré d'application des directives techniques qui visent à renforcer les règles de conduite pour une pêche responsable.

En Tunisie, le secteur de la pêche joue un rôle socio-économique important. Il génère près de 53 000 emplois directs et 30 000 emplois indirects. La main d'œuvre travaillant dans la pêche côtière représente plus de 65 pour cent de la population maritime tunisienne. La pêche côtière ou artisanale utilise plus que 90 pour cent de la flottille (dont 57 pour cent sans moteur et 60 pour cent de jauge brute < 2 tx). En 2012, la production halieutique était estimée à 117 000 tonnes dont 40 pour cent proviennent de la pêche côtière, représentant ainsi une valeur de 292 millions de dollars (près de 30 pour cent provenant de la pêche côtière), tandis que la valeur des exportations a atteint, en 2012, près de 195 millions de dollars (la contribution de la pêche artisanale étant de 50 pour cent).

Par ailleurs la pêche côtière reste le mode de pêche le plus économique à l'échelle nationale, si l'on considère le gain énergétique par rapport aux autres types de pêche, et elle est considérée moins polluante que la pêche industrielle. Le coût de création de postes d'emploi reste donc plus bas par rapport aux autres types de pêche.

Certaines techniques de pêche artisanale sont pratiquées en Tunisie depuis très longtemps (*charfia* dans le golfe de Gabès au sud du pays, bordigue au nord, gargoulettes et pots pour les poulpes à Kerkennah et Jerba). Elles ont un caractère passif, sélectif et non polluant, ce qui favorise ainsi la préservation et la durabilité des ressources halieutiques.

Chers participants,

La Tunisie accorde une place privilégiée au développement de la pêche artisanale en raison de son importance socio-économique. À ce titre, le Ministère a réalisé, en collaboration avec la coopération japonaise JICA, un projet sur la cogestion durable

des ressources côtières dans le golfe de Gabès. Son objectif est de préserver les stocks halieutiques et d'améliorer par conséquent les revenus des petits pêcheurs. Ce projet comporte un ensemble cohérent d'actions impliquant l'administration, la recherche et la profession dans une approche participative et vise la promotion de la pêche artisanale ainsi que sa gestion durable. Ce plan d'action repose sur une meilleure organisation de la profession et son implication directe dans la gestion des ressources côtières, et ce, à travers l'organisation d'ateliers régionaux de sensibilisation sur l'ensemble du littoral du pays, l'implantation de récifs artificiels dans la frange marine côtière, la participation à des opérations d'ensemencement d'alevins produits par les écloseries dans les zones appropriées, la création de zones protégées, l'établissement de petits projets pilotes de cultures d'éponges en mer et de repiquage des palourdes pêchées n'ayant pas la taille marchande, etc.

Ces différentes composantes constituent une première phase du projet de coopération tuniso-japonaise, qui s'est étalée de 2005 à 2009. Celle-ci a été suivie par une deuxième phase qui s'intitule «Projet de cogestion des pêcheries côtières dans le golfe de Gabès en Tunisie» (COGEPECT) et s'étend sur la période 2012–2016, objectif global étant de consolider la pratique de la cogestion de la pêche côtière acquise lors de la première phase et d'élargir celle-ci à l'ensemble des zones du golfe de Gabès.

Sur un autre plan, la Tunisie, dans le cadre du projet ArtFiMed (CopeMed 2; coopération espagnole) et du projet FishinMed (coopération Italienne et financement UE) consolide ces efforts de bonnes pratiques de gestion de la petite pêche à travers une conception et une analyse comparée des systèmes d'exploitation et de gestion de la pêche côtière utilisés dans différents pays de la Méditerranée.

Par ailleurs, La Tunisie encourage et incite la société civile, à travers les associations, les clubs, les groupements de pêcheurs, à adhérer aux efforts de cogestion de la pêche artisanale. À ce propos, je tiens à mentionner la réalisation de deux actions récemment menées en Tunisie sur le développement durable de la pêche artisanale: la première en septembre 2013 à Bizerte (nord de la Tunisie) organisée par l'Association tunisienne de développement de la pêche artisanale en collaboration avec la FAO, le WWF et la Direction générale de la Pêche et l'aquaculture, et la deuxième en novembre 2013 à Gannouche (sud de la Tunisie), organisée par l'Association des pêcheurs artisans de Gannouch avec l'appui du Bureau de la FAO à Tunis. Un ensemble de recommandations se sont dégagées en faveur du développement et d'une gestion raisonnée de la pêche artisanale, suivant une approche de cogestion.

Mesdames et Messieurs,

Je suis convaincu de l'intérêt et de l'opportunité de ce symposium au regard des thématiques programmées, en particulier pour ce qui est des stratégies et méthodes permettant d'établir un diagnostic fiable de la pêche artisanale, de la cogestion des ressources et de l'intégration de la pêche artisanale dans les aires marines protégées.

Ce symposium constitue une plateforme judicieuse pour l'échange d'expériences réussies, qui permettra à chacun des pays de la Méditerranée d'en tirer profit pour la promotion de la pêche artisanale dans un cadre durable. Je saisis cette occasion pour souligner encore une fois l'engagement de notre pays à participer et soutenir les actions aboutissant à une pêche responsable et ayant pour objectif la gestion rationnelle des ressources marines vivantes de notre mer Méditerranée, chère à nous tous, et à les élargir aux autres mer telle que la mer Noire.

Enfin, je tiens à réitérer mes vifs remerciements pour l'organisation de ce symposium et je vous souhaite un plein succès dans vos travaux.

MR ABDELLAH SROUR
Executive Secretary of the General Fisheries Commission for the Mediterranean (GFCM), Rome

Honorable Leo Brincat, Ministre pour le Développement durable, l'environnement et le changement climatique de Malte,
Excellence Sid Ahmed Ferroukhi, Ministre de la Pêche et des ressources halieutiques de l'Algérie,
Excellences,
Mesdames et Messieurs,
Chers collègues et amis,

Faisant suite à l'intervention du Président de la CGPM, Monsieur Stefano Cataudella, c'est avec un immense plaisir que je prends la parole pour l'ouverture de ce symposium, devant un auditoire si prestigieux, si nombreux et si varié.

Je tiens à remercier tout particulièrement les autorités maltaises, pour leur accueil chaleureux dans cette île emblématique de la Méditerranée et de la pêche artisanale et pour leur précieuse contribution à l'organisation de cet événement, ainsi que les partenaires avec qui nous avons travaillé main dans la main pour préparer les contenus du programme de ce symposium. J'exprime également ma reconnaissance aux donateurs qui ont rendu possible la réalisation de cet événement, en l'occurrence la France, l'Italie et l'Union européenne.

Ce symposium est un événement sans précédent dans la région car il réunit pour la première fois des représentants du secteur de la pêche de toutes les catégories et des horizons les plus divers: des décideurs politiques jusqu'aux artisans pêcheurs, en passant par les scientifiques, les représentants d'administrations et d'organisations internationales et les acteurs de la société civile.

L'idée de ce symposium est née de l'intérêt commun de plusieurs organisations, qui ont formulé la nécessité de faire le point sur les enjeux d'un secteur qui n'est pas encore suffisamment appréhendé et qui, pourtant, représente une part considérable de l'activité de pêche en Méditerranée et en mer Noire et constitue un pilier pour la subsistance de nombreuses communautés côtières.

D'après les informations recueillies par la CGPM, la pêche artisanale compte en effet pour plus de 80 pour cent des quelque 90 000 flottilles qui opèrent en Méditerranée et en mer Noire, utilise plus de 50 types de métiers et emploie plus de la moitié de la population œuvrant dans le secteur de la pêche.

Pour toutes les activités qu'elle englobe, pour ses traditions et ses valeurs, la pêche artisanale possède un immense potentiel pour jouer un rôle déterminant dans le développement durable et contribuer efficacement à la gestion durable des ressources marines et halieutiques, à la préservation des stocks de pêche dans l'ensemble de la Méditerranée et de la mer Noire et à la mise en place de plans de gestion pluriannuels.

Pourtant, ce secteur est aujourd'hui confronté à de nombreux défis, qu'il faut envisager de relever ensemble afin de lui donner l'assise dont il a besoin: un cadre juridique propice reconnaissant un certain nombre de droits et de règles, des mécanismes adéquats de contrôle et d'application, de gouvernance et de participation, un meilleur accès au marché et des ressources appropriées.

La tribune d'échange que nous ouvrons aujourd'hui dans le cadre de ce symposium devrait être un lieu propice au dialogue et à la coopération. Elle devrait aussi former un point de départ pour renforcer la visibilité de la petite pêche en Méditerranée et en mer

Noire, pour mieux la connaître, et pour identifier des domaines d'intervention afin de concevoir des politiques régionales efficaces, des projets de coopération et des outils appropriés.

À l'issue des débats, les participants adopteront des conclusions qui serviront de principes directeurs en vue de l'élaboration d'une feuille de route déterminant la marche à suivre pour la réalisation progressive d'actions à l'appui du développement durable de la petite pêche en Méditerranée.

Il ne me reste qu'à vous souhaiter une réunion et des travaux fructueux.

Je vous remercie pour votre attention.

MR SERGI TUDELA

Head of the Fisheries Programme, WWF Mediterranean

Excellencies,
Ladies and Gentlemen,
Friends,

Let me express my deepest satisfaction, on behalf of WWF, to address you all today in the context of this First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea.

This symposium is not just another fisheries event. It is a real milestone in our collective journey towards sustainable fisheries in our region, and it is so for several major reasons.

First of all, it means an historic reparation for the continued unfair treatment applied to this important fishing segment in our region, often deemed of only second order relevance. Indeed, as the distinguished speakers preceding me have already stressed, the historical, cultural, social, economic and also ecological relevance of small-scale fishing in our region cannot be overemphasized.

But I want to highlight now another aspect, with the sight on the future. The relationship of our societies with our regional seas is changing in a way formerly unknown, with profound and likely permanent consequences. The historical supremacy of fisheries as the more relevant sectorial activity in our seas is rapidly vanishing, in parallel to a chronic crisis due to overfishing and overcapacity, and the dramatic intensification of strategic interest on aquaculture and, very particularly, marine energy production and extraction.

We are at a crucial crossroads; whether there is a future for fisheries or not in the Mediterranean will depend on the right societal choices we will – or not – make from now. This is a real make-or-break moment. In this context, WWF is firmly convinced that there is a future for fisheries, and that this future is called "sustainable fisheries". But for this to happen, we need a real change of paradigm in the way we manage fisheries. New approaches such as co-management, implying a real adaptive multi-stakeholder management of fisheries tailored to local conditions, have the potential to bring the transformational change we need.

The natural laboratory for this real resurgence of fisheries we envisage for the Mediterranean is our generally low-impact, multi-species, multi-gear and labor-intensive small-scale fisheries. There are already promising examples in our region proving that our vision is not utopical but just a matter of willingness.

We genuinely believe this symposium will represent the starting point for this exciting journey towards a better world for our fishermen, our societies and our marine ecosystems. Allow me to invite you all to get onboard and set sail. Thank you!

MS CHLOË WEBSTER

Scientific Officer of the MedPAN Organization

On behalf of Ms Purificació Canals, Chairwomen of the Network of Marine Protected Area Managers in the Mediterranean (MedPAN)

I will make this speech on behalf of the Chairwomen of the MedPAN, Ms Purificació Canals.

First and foremost, I wish to thank the GFCM for organizing this First Symposium on Sustainable Small-scale Fisheries and inviting MedPAN to join and take part in shaping Session III. Small-scale fisheries are an issue dear to us.

Who is ''us''?

For those who do not know MedPAN, we represent the network of MPA managers in the Mediterranean Sea. In fact, we are a social network with about 55 members, 30 partners and we reach to 6 000 people working with 22 countries around the Mediterranean basin.

Although it had been existing informally for a few years, this network was made "official" four years ago, when the MedPAN Organization was created with a Secretariat based in France and counting six staff members. The Board of Directors which counts institutions and management structures and represents the different regions of the Mediterranean. We work with many partners in the region, including GFCM with whom we have had a memorandum of understanding for a few years now.

What do we do? We have a strategy for the network at large which you are welcome to consult on our website. But for example, a couple of years ago, we constructed the database of MPAs in the Mediterranean together with RAC/SPA and conducted an analysis of the system of MPAs in response to the Convention on Biological Diversity targets (coverage, representativity, management effectiveness) and were able to point to gaps and lacks. Yet another very prime aspect is to support MPA managers directly (knowledge, capacity-building, improving management). For example, we organise exchange of experience workshops – the last one, just less than a month ago, was on enforcement and compliance, and I will come back to some key issues that came out.

Artisanal (or small-scale) fisheries are coastal and, from our analysis, most MPAs of the current system are coastal. In fact, small-scale fishermen and MPA managers have a common prerequisite to our end goals: ''make sure fish stocks are maintained, and in many cases restored to satisfactory levels''.

Perhaps our reasons are different, perhaps we have a different language, different methods… and this is why dialogue matters!

The very nature of small-scale fisheries is of interest to us, in its economic, cultural, legal and environmental dimensions.

While some of our partners have been working on the issue for many years, we are only beginning.

Over the next year, we will be developing a position paper to define what solution-based actions we could take, and moreover how they fit a niche and complement our partners' activities so that we bring added value.

We have already begun to work on some specific features.

With GFCM, we are looking into integrating the recording of all "fisheries reserves" (nationally and internationally designated) into MAPAMED.

We supported a study on co-management involving artisanal fishermen, lead and coordinated by WWF France under the MedPAN North Project (which will be presented during Session III).

We have looked into different case studies of successful examples where MPAs involve fishermen in the management of a site, and also funded some small projects on the issue (this is a scheme to support concrete actions for MPA management).

We will be looking into the outcomes of our annual exchange of experience workshop on enforcement where it appeared that many issues concerned the interface with fisheries activities. Within this framework we envisage conducting exchange visits between MPAs involving fishermen.

We look forward to taking part in the GFCM working group on fisheries and MPAs, as well as exchanging with the Mediterranean Platform of Artisanal Fishermen and developing joint action.

We are also following the EU Common Fisheries Policy and its integration with the Marine Strategy Framework Directive, Natura 2000 guidance and also the Water Framework Directive.

On this note, I thank you for being here and wish the symposium to reach the most productive results for future action.

Appendix 2 – List of participants

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Appendix 3 – **Agenda**

Wednesday 27 November
Morning session 10.00 – 12.30

10.00 – 12.30 Official opening and general presentation of the symposium

General Coordinator: **Mr Abdellah SROUR**, Executive Secretary, GFCM

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Mr Sergi TUDELA, Head of the Fisheries Programme, WWF Mediterranean

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Ms Marie-Christine GRILLO COMPULSIONE, Executive Secretary, ACCOBAMS

Mr Giampaolo BUONFIGLIO, President, RAC MED

Prof. Stefano CATAUDELLA, President, GFCM

Wednesday 27 November
Afternoon session 14.00 – 17.30

Thematic session I. Current situation of small-scale fisheries in the Mediterranean and Black Sea: strategies and methodologies for an effective analysis of the sector

Chaired by the FAO regional projects and the GFCM Secretariat

14.00 – 14.30 Opening of the session and nomination of rapporteur(s)

Introduction and presentation of the background paper (Henri FARRUGIO)

14.30 – 15.10 Existing information and data on small-scale fisheries to assess their potential in terms of production and socio-economics

State of small-scale fisheries sector on the Romanian and Bulgarian Black Sea coast during the past decade (Simion NICOLAEV)

Pêche artisanale en Méditerranée marocaine, un secteur en plein essor et un intérêt scientifique de plus en plus important (Mohammed MALOULI IDRISSI)

Analyse de l'activité de la pêche côtière artisanale dans le golfe de Gabès: moyens de production, métiers de pêche et aspects socio-économiques (Scander BEN SALEM)

Submission for the First Regional Symposium on Sustainable Small-Scale fisheries in the Mediterranean and the Black Sea (Roberta MIFSUD)

15.10 – 15.30 Key elements linked to small-scale fisheries for planning and management purposes

Amélioration du système statistique de la pêche artisanale (Inès BEN HAFSIA)

The socio-economic situation of small-scale fisheries in Lebanon (Dario PINELLO)

15.30 – 15.45 Coffee break

15.45 – 16.10 Data and information gaps at different levels (biological, socio-economic, environmental)

Small-scale fisheries in the Adriatic Sea: information gaps at the biological, socio-economic and environmental level (Mimoza COBANI)

Economic performance of small-scale fisheries *versus* active gear: the Albanian case study (Mimoza COBANI)

Secteur de la pêche artisanale au Maroc (Abdellah MOUSTATIR)

16.20 – 16.30 Definition of common methodologies to monitor the regular collection of relevant data

A standard methodology to collect socio-economic data in the eastern Mediterranean: experience from Egypt, Gaza Strip, Lebanon and Turkey (Mark DIMECH)

16.30 – 17.00 Open discussion

17.00 – 17.30 Closure of the session: general conclusions

17.30 – 18.00 Poster session for Thematic session I

Thursday 28 November
Morning session 09.00 – 12.30

Thematic session II – Management and co-management options for small-scale fisheries in the Mediterranean and Black Sea

Chaired by WWF and the GFCM Secretariat

09.00 – 09.30 Opening of the session and nomination of rapporteur(s)

Introduction and presentation of the background paper (Nicolas GUTIERREZ)

09.30 – 09.45 Management and co-management: actual co-management *versus* participatory advisory schemes

Introduction and Q&A with participants

09.45 – 10.00 Overview of traditional fisheries management in the region

Introduction and Q&A with participants

10.00 – 10.15 Relevant options for co-management: area-based management; access limitation; limitation of fishing opportunities; time/area management; monitoring, control and surveillance (MCS)

Introduction and Q&A with participants

10.15 – 10.30 A legal framework for fisheries co-management: how does co-management fit in national and regional legal frameworks?

Introduction and Q&A with participants

10.30 – 10.45 Coffee break

10.45 – 11.45 Decentralization of fisheries management: Social structures and institutions in co-management

La Méditerranée et la gestion de territoires halieutiques: un nouveau modèle de production durable et responsable (François FÉRAL)

Co-management: getting States and the fishing sector to share responsibilities and dialogue on the sustainability of the sea (Antonio GARCÍA-ALLUT)

Gestion durable de la pêche artisanale: actions menées par la Fondation Mohammed VI pour la Protection de l'Environnement dans la Marchica (Nador) (Najia FATINE)

How could we convince fisheries stakeholders to establish no-take zones? Lessons from small-scale fisheries in Gökova Bay (Eastern Mediterranean), Turkey (Vahdet ÜNAL)

11.45 – 12.00 Functioning of co-management committees

The Co-management Committee of the Catalan Sand-eel Fishery: a bottom-up approach successfully delivering on sustainability for fish and fishing (Jordi RODON)

12.00 – 12.30 Closure of the session: general conclusions

Thursday 28 November
Afternoon session 14.00 – 17.30

Thematic session III – Integration of small-scale fisheries in marine protected areas (MPAs)

Chaired by Purificació CANALS (MedPAN) and the GFCM Secretariat

14.00 – 14.35 Opening of the session and nomination of rapporteur(s)

Introduction and presentation of the background paper (Bertrand CAZALET and Chloë WEBSTER)

How can MPAs have positive outcomes both for conservation and fisheries management in the context of small-scale fisheries? (Lena WESTLUND)

14.35 – 15.00 MPAs impacts on small-scale fisheries

Artisanal fisheries and marine protected areas in the Western Mediterranean: monitoring for assessing effects and benefits (Federico ÁLVAREZ)

15.00 – 15.40 Small-scale fishers in MPAs: from participation to co-management

Present state of fishermen engagement into management of Mediterranean marine protected areas (Chloë WEBSTER)

Petite pêche côtière et gestion d'aires marines protégées: des objectifs partagés (Alain PIBOT)

Projet pilote de création de trois aires marines protégées aux fins de pêche au Maroc (Mohamed NAJI)

Marine protected areas for artisanal fisheries: recent activities in the southern and eastern Mediterranean (Alain JEUDY DE GRISSAC)

15.45 – 16.00 Coffee break

16.00 – 16.40 Small-scale fishers in MPAs: from participation to co-management (*cont.*)

La consultation et la concertation avec les pêcheurs pour le classement de la zone marine du Parc national de Taza (Nadia RAMDANE)

The North Sporades marine park and historical co-management with its artisanal fishing community (Daniel CEBRIAN)

Three years' experience with small-scale fishers and no-take zones in Gökova Bay (eastern Mediterranean), Turkey (Z. Derya YILDIRIM)

16.40 – 17.00 Promotion of small-scale fisheries and potential of reconversion in and around MPAs

The tonnarella of Camogli, an example of sustainable fishery in Portofino MPA (Valentina CAPPANERA)

17.00 – 17.30 Closure of the session: general conclusions

17.30 – 18.30 Poster session for Thematic sessions II and III

Friday 29 November
Morning session 09.00 – 12.30

Thematic session IV – Enhancing small-scale fisheries value chains in the Mediterranean and Black Sea

Chaired by Giulio MALORGIO, Mohamed NAJI and the GFCM Secretariat

09.00 – 09.40 Opening of the session and nomination of rapporteur(s)

Introduction and presentation of the background paper (Giulio MALORGIO and Mohamed NAJI)

09.40 – 09.50 Small-scale fisheries value chains and economic accounts in light of the current crisis

The economic constraints of the small-scale fisheries in the eastern Mediterranean (Dario PINELLO)

09.40 – 09.50 Local, national and international value chains related to small-scale fisheries production

Ecotourism potential in the artisanal fisheries sector along the Lebanese coast (Manal NADER)

10.00 – 10.10 Costs and earnings analysis of small-scale fisheries and reasons for differences

Indicateurs de durabilité : une proposition pour la valorisation de la petite pêche artisanale en Sicile (Iuri PERI)

10.10 – 10.20 Small-scale fisheries production through the value chain method

Projet de création d'une organisation de producteurs de pêche artisanale dans le golfe du Lion, Méditerranée française (Frédérick RESTE)

10.20 – 10.40 Open discussion

10.45 – 11.00 Coffee break

11.00 – 11.10 Investing in quality improvement: quality of life of small-scale fishers

Viability of small-scale fisheries in the Datça-Bozburun special environmental protection area (SEPA), (eastern Mediterranean), Turkey (Vahdet ÜNAL)

11.10 – 11.20 Assessing existing structural and community needs and socio-economic approaches towards multi-functionality and diversification

FishinMed: cross-border cooperation to promote the sustainability of the small-scale fishing communities in the Mediterranean area (Massimo ZUCCARO)

11.20 – 11.30 Options to maximize the price of small-scale fisheries catches at time of sale, including specific certification requirements (labelling, etc.)

High added value processed seafood from fish species of low demand (*Thunnus alalunga, Boop boops,* etc.) in the island of Kalymnos, Greece (Nikos STAMATIS)

11.30 – 11.40 Innovative measures to enhance production and market: capacity-building and institutional strengthening

Small-scale fisheries in the Emilia Romagna region: structural, social and marketing issues (Luca MULAZZANI)

11.40 – 12.10 Open discussion

12.10 – 12.30 Closure of the session: general conclusions

Friday 29 November
Afternoon session 14.00 – 17.30

Thematic session V – Setting up a regional platform to promote the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines)

Chaired by the FAO Fisheries Department and the GFCM Secretariat

14.00 – 14.25 Opening of the session and nomination of rapporteur(s) (Nicole FRANZ)

Introduction and presentation of the background paper (Lena WESTLUND)

14.25 – 14.50 Challenges and opportunities for the sector in the Mediterranean and Black Sea

FAO-ArtFiMed: an experience based on EAF to promote the sustainability of the resources that combines small-scale fisheries management and social development (Matthieu BERNARDON)

Q&A

14.50 – 15.30 Human rights-based approach: current situation and needs in terms of access to basic economic, social and cultural rights

Human rights and legal empowerment in small-scale fisheries (Carlos FUENTEVILLA)

Supporting fisherwomen in small-scale fisheries in Turkey (Vahdet ÜNAL)

Q&A

15.30 – 15.45 Coffee break

15.45 – 16.30 Social and economic development for fishers, fishworkers and fishing communities towards sustainable small-scale fisheries

Introduction to the SSF Guidelines (Cherif TOUEILIB)

Experience with empowering small-scale producers in Mauritania (Nedwa NECH)

Q&A

16.30 – 17.15 National experiences of collective actions and organizations and their development potential

The Mediterranean platform of artisanal fishers: a contribution of the artisanal fishing sector towards sustainability (Ramón TARRIDAS)

Présentation des principaux résultats de l'Atelier sous régional de renforcement des organisations professionnelles de la pêche artisanale dans les pays de l'Afrique du Nord, Bizerte, Tunisie, 24-26 septembre 2013 (Yassine SKANDRANI)

Q&A

17.15 – 17.30 Closure of the session: general conclusions

17.30 – 18.00 Poster session for Thematic sessions IV and V

Saturday 30 November
Morning session 09.00 – 13.00

09.00 – 13.00 Free time (participants)

(Preparation of the final conclusions by the partner organizations of the symposium)

Afternoon session 14.30 – 16.30

14.30 – 16.30 Closure of the symposium

Presentation of the Final Conclusions of the First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and the Black Sea

Appendix 4 – **Engagement de Malte sur le renforcement de la plateforme MedArtnet à l'échelle régionale et sous-régionale**

Premier symposium régional sur la pêche artisanale durable en Méditerranée et Mer Noire
27–30 Novembre 2013, St. Julian's, Malte

MedArtNet

Plateforme Méditerranéenne des pêcheurs artisans

ENGAGEMENT DE MALTE sur le renforcement de la plateforme MedArtNet à l'échelle régionale et sous-régionale

La plateforme MedArtNet a été créée en 2011 par plusieurs représentants nationaux de la pêche artisanale en Méditerranée : Espagne, France, Italie, Grèce. Membres de l'Union Européenne, notre action s'est d'abord concentrée sur la défense des intérêts et de l'avenir de la pêche artisanale dans le cadre du processus de réforme de la Politique Commune des Pêches (PCP) et de ses instruments financiers. MedArtNet vient également de se rapprocher de l'initiative LIFE (Low Impact Fishers of Europe) lancée à St Jacques de Compostelle (Espagne), les 23 et 24 novembre 2013. LIFE regroupe plus de 1000 pêcheurs de 50 organisations différentes basées en Grèce, France, Espagne, Croatie, Royaume Uni, Hollande, Pologne et Allemagne.

L'organisation du *1er Premier symposium régional sur la pêche artisanale durable en Méditerranée et Mer Noire,* les 27–30 Novembre 2013 à Malte, a permis à MedArtNet de rencontrer d'autres représentants professionnels de Méditerranée. Les pays du Maghreb en particulier (Maroc, Algérie) ont manifesté leur volonté d'intégrer la démarche MedArtNet. MedArtNet à vocation à représenter les enjeux de la pêche artisanale à l'échelle de la Méditerranée et vise à renforcer ses liens, échanges et coopérations dans ce sens. MedArtNet souhaite que les représentants professionnels du Maghreb accentuent les efforts engages pour la constitution d'une structure sous-régionale susceptible de soutenir les attentes des pêcheurs artisans d'Afrique du Nord. Cette composante « Sud » de la plateforme permettra de porter la voix des pêcheurs et d'engager, à travers MedArtNet, une collaboration constructive avec les États riverains, la CGPM, la FAO et leurs partenaires.

Fait à Malte, le 29 novembre 2013,

Ramon TARRIDAS (Espagne)

Frederick RESTE (France)

Mohamed Bachir CHABOU (Maroc)

Hacene HAMDANI (Algérie)

Le Président
H. HAMDANI

Association de la Pêche Artisanale et l'Environnement "Le Dauphin" Azeffoune W.T.O Agréé 01/2013

Appendix 5 – Conclusions of the First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea

PREAMBLE

The following conclusions have been developed based on the outcomes of the First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and the Black Sea (Malta, 27–30 November 2013). They are grouped under one cluster of general and transversal proposals and five clusters relating to the specific thematic sessions of the symposium, and they are put forth to urge actions in support of sustainable SSFs in the Mediterranean and the Black Sea.

The symposium was attended by more than 170 participants, including policy-makers, scientists, practitioners, fishery representatives, civil society organizations (CSOs), NGOs, research institutions, international organizations, etc., who shared their views, opinions and experiences during the meeting. It was organized under the overall coordination of the GFCM Secretariat and with the active support of the co-organizers: FAO Fisheries and Aquaculture Department, FAO Regional projects (AdriaMed, CopeMed, EastMed and MedSudMed), WWF, MedPAN and CIHEAM–MAIB.

In the Mediterranean and the Black Sea, SSFs represent an important share of the fish caught. About 80 percent of the fisheries are small-scale in terms of fishing units. The socio-economic role of SSFs, along with their culture and ancient traditions, has long been recognized. They often rely on a family-based structure, and they are characterized by fishing activities close to home ports, mainly employing relatively small vessels powered by engines with reduced fuel consumption and non-motorized units and using a great number of fishing techniques and mainly static fishing gear. Small-scale fisheries products are often sold directly on landing beaches, at local markets or for export, and provide these markets with fresh and high-quality marine food. Nonetheless, it had been acknowledged that, in order to provide a full picture of SSFs in the Mediterranean and the Black Sea, comprehensive information should be collected from riparian countries and analysed in depth. Improving the knowledge on SSFs will help in defining strategies to address the sector in terms of management, monitoring and sustainable development actions.

The GFCM Framework Programme acknowledges the importance of SSFs in the Mediterranean and the Black Sea while aiming at underpinning ongoing efforts of the FAO relating to the development of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines), expected to be adopted by COFI in June 2014.

GENERAL CONCLUSIONS

There is a widespread interest in securing sustainable SSFs in the Mediterranean and Black Sea, consistent with the Code and with the aim of contributing to the MDG and to the commitments made within the framework of the United Nations Conference on Sustainable Development "Rio+20". Strong political commitment, intergovernmental

cooperation and technical assistance for Mediterranean and Black Sea riparian States are needed. New transversal governance and management approaches must be developed and translated into actions underpinning the consolidation of the knowledge base, data collection and analysis, management and co-management mechanisms, and integration with environmental objectives, including MPAs.

Participants acknowledged the importance of the First Regional Symposium on Small-Scale Fisheries in the Mediterranean and the Black Sea to promote cooperation at all levels. In this respect, gratitude was expressed towards the Government of Malta for having hosted the symposium, which was vowed for prompting the extension of the MedArtNet platform to new professional organizations.

In particular, the meeting proposed to:

- Launch a regional programme in the GFCM area fostering a domain-by-domain knowledge of all the components linked to SSFs involving all interested stakeholders. The work plan and outputs of this programme are expected to be defined by the co-organizers and any other interested partner, in connection with a preparatory meeting to be held in the first quarter of 2014. The organization of a second Regional Symposium on Small-Scale Fisheries in the Mediterranean and the Black Sea should be envisaged to focus on more specific topics and to evaluate progress made with the regional programme on SSFs. The Algerian delegation offered to host this second symposium.
- Establish, under the auspices of FAO–GFCM, a task force aimed at supporting Mediterranean and Black Sea countries in the implementation of the SSF Guidelines and the creation, support or extension of platforms of small-scale fishers and fishworkers.
- Foster a strategy underpinning the valorization of opportunities and products of SSFs for the benefit of local communities and stakeholders.

Participants invited the GFCM Secretariat to promote the conclusions of the symposium in the context of high-level political and institutional meetings, as well as other pertinent fora that could foster sustainable SSFs.

Specific conclusions relating to the five thematic sessions of the symposium are given in the following sections.

Thematic session I – Current situation of small-scale fisheries in the Mediterranean and the Black Sea: strategies and methodologies for an effective analysis of the sector

Small-scale fisheries in the Mediterranean and the Black sea have been acknowledged as the main fishing sector providing food supply and livelihood in both regions. Small-scale fisheries are family-based, and fishers' incomes are in general lower than their country gross domestic product (GDP) per capita. It appears that the sector has not so far received the support that it deserves at the national level, while trying to thrive in the same fishing grounds fished by different actors. However, the scarcity of SSF data, including information on biological indices, catch trends and socio-economic indicators, certainly demands a country-oriented monitoring system.

In light of the discussions held during thematic session I, it is proposed to:

- Bridge gaps in data and information on SSFs, their interactions with other human activities and their socio-economic aspects, with a view to developing permanent national, subregional and regional databases and information systems building upon the lessons learned from case studies undertaken so far.
- Develop through the proposed programme an information monitoring system to improve knowledge on SSFs and collect relevant data and information on the

activities of the fleet, including parameters and synthetic indicators of social, economic and environmental relevance[1].

- Launch, within the remit of the proposed regional programme on SSFs, a survey in Mediterranean and Black Sea countries to provide a detailed status of SSFs.
- Recognize the socio-economic specificities of SSFs as well as the seasonal and unstable features of the sector, in order to enable investments for their development, to improve the human conditions of the people involved and to eradicate poverty.
- Include SSFs in national fisheries management plans and MCS activities to deter illegal, unreported and unregulated (IUU) fishing, identify fishing grounds and address aspects such as safety at sea while building capacity and raising awareness among stakeholders.

Thematic session II – Management and co-management options for small-scale fisheries in the Mediterranean and Black Sea

Fisheries co-management has the potential to become an effective delivery mechanism for sustainable fisheries in the Mediterranean and the Black Sea. Joint multistakeholder decision-making results in increasing fishers' adherence to the rules and developing their sense of ownership. In addition, co-management committees can foster community-based data collection programmes, gather valuable traditional environmental knowledge and involve fishers in MCS activities; hence, reducing costs and increasing efficiency. Overall, co-management allows for an adaptive management of fishing activities tailored to specific local realities. However, for co-management to succeed, there is a need for more case studies to be undertaken, for an adequate flow of information on lessons learned and capacity-building programmes in order to enable different stakeholders to acquire essential skills.

In light of the discussions held during thematic session II, it is proposed to:

- Support (i.e. the GFCM and all interested partners) the implementation of co-managed fisheries, including through the critical analysis of available case studies, the compilation of best practices and the wide dissemination of main achievements.
- Promote in a participatory way the creation of an active network of fisheries co-management pilot cases in the GFCM area, which should ideally include, on the basis of the proposed regional programme on SSFs, at least one per country, and ensure an equitable geographical coverage at the subregional level.
- Evaluate capacity-building needs for fisheries co-management based on lessons learned, including support to community-based data collection programmes and MCS.

Thematic session III – Integration of small-scale fisheries in marine protected areas (MPAs)

In the Mediterranean and the Black Sea, SSFs mainly occur in coastal areas, and MPAs are mostly located in these very areas. Consequently, small-scale fishers and MPA managers share the prerequisite to their end goals, namely, making sure that biodiversity is preserved and that fish stocks are restored and maintained at a sustainable level. Although MPAs are neither the only tool available to manage fisheries nor the sole conservation management option, they represent one potential solution to deal jointly with several problems at the same time. Too often, small-scale fishers remain outside

[1] Participation in the Working Group on a common methodology to carry out socio-economic analysis of the GFCM Subcommittee on Social and Economic Sciences (Budva, Montenegro, 3 February 2014) is encouraged in order to underpin the collection of socio-economic data and the use of socio-economic indicators in SSFs.

the relevant processes in which they should be directly involved (e.g. monitoring, management, surveillance). In the case of MPAs, the likely costs and benefits to fisheries should be evaluated whenever adopting protection measures. Management would hence become more adaptive and rely on effective participation. This would ensure that the traditional knowledge (and know-how) of fishers is taken into account along with science. Capacity building needs to be strengthened and funding-related considerations should be regarded as priorities.

In light of the discussions held during thematic session III, it is proposed to:

- Enhance a participatory and bottom-up approach inclusive of small-scale fishers communities in all the phases leading to the establishment of MPAs, and promote a stronger involvement of small-scale fishers in MCS, in order to manage MPAs more effectively by developing a sense of ownership and responsibility.
- Facilitate the development and implementation of a work plan aimed at the adequate management of resources in and around MPAs, actively involving small-scale fishers and fisheries managers in addition to relevant institutions (i.e. GFCM and other national and international bodies as per their mandate) and other partners in the implementation of the proposed regional programme on SSFs[2].
- Ensure that the network of MPA managers in the GFCM area contributes to facilitating cooperation between MedPAN and small-scale fishers' platforms with the support of the GFCM, to strengthen understanding, capacity building, relationships and the synergies required for effective participatory processes and/or co-management mechanisms for the conservation of marine ecosystems.

Thematic session IV – Enhancing small-scale fisheries value chains in the Mediterranean and Black Sea

Improving the quality of life of coastal communities has a multidimensional character, depending on the interaction among the different components that are relevant to prompt empowerment. Integrating fishing activities with other economic activities is a precondition to internalize some of the positive externalities of SSFs. Knowledge of value chains remains sporadic and confined within national borders, while interactions among actors in value chains – including North-South – remain largely unexplored. The problem of fragmentation and imbalance in bargaining power between large marketing firms and downstream fisheries operators should be addressed. Vertical and horizontal collaboration could ultimately lead to "win–win" partnership models.

In light of the discussions held during thematic session IV, it is proposed to:

- Support private and public stakeholders in the sector in acquiring better knowledge on local and regional value chains, particularly in connection with issues relating to the creation of added value and revenue distribution through the implementation of good practices / quality systems, ecolabelling, enhancing human resources and concerted actions with local and regional authorities/ organizations.
- Identify the needs of Mediterranean and Black Sea countries for an educational and scientific programme while supporting national institutions in the implementation of actions to empower fisheries coastal communities, highlighting the importance of multifunctionality and diversification activities;
- Set up technological information systems and networks to obtain and share information and policies on multifunctionality, diversification and supply

[2] Participation of the network of MPA managers in the GFCM MPA Working Group (Budva, Montenegro, 3 February 2014) is encouraged to further discuss all issues linked to interactions between fisheries and MPAs.

chains and assist decision-makers in the development of strategies on SSFs at the national and regional level.

- Lay the ground, through the proposed regional programme on SSFs, for integrated horizontal and vertical coordination, with special emphasis on North–South interactions throughout the global supply chain, including via the strengthening of the role of regional organizations and the identification of best practices for professional stakeholders.
- Encourage the creation of cooperatives and consortiums of professionals, namely to enable direct sales.

Thematic session V – Setting up a regional platform to promote the implementation of the voluntary Guidelines for Securing Sustainable Small-Scale Fisheries (SSF Guidelines)

The SSF sector suffers from low visibility in spite of its importance, and the success of the SSF Guidelines will ultimately depend on the possibility to ensure increased recognition of and attention to the sector's importance. The SSF Guidelines offer a unique opportunity to support small-scale fisheries as they embody a comprehensive and holistic framework for both policy and actions. Their implementation will require concerted efforts from a vast array of actors as well as political will and resources. Civil society organizations (CSOs) – representing fishers, fishworkers and their communities – governments, NGOs, research institutions and other stakeholders are therefore called upon to support this process. In this context, the efforts by FAO and other partners to promote and support small-scale fishers and fishworkers' organizations were acknowledged by the symposium. Collaboration, communication and sharing of experiences and knowledge should define future actions to be undertaken.

In light of the discussions held during thematic session V, it is proposed to:

- Increase the visibility of SSF actors and facilitate the engagement of CSOs and other stakeholders in the implementation of the SSF Guidelines.
- Integrate the provisions of the SSF Guidelines in regional, national and local policies, strategies and action plans, taking into account the need to consider responsible fisheries in parallel to social and economic development and to apply a human rights-based approach, and allocate adequate human and financial resources for their implementation.
- Support the establishment and development of organizations and networks created for and by SSF actors and having clear and shared objectives as well as adequate funding to transform shared concerns and problems into shared solutions.
- Facilitate the establishment of regional confederations to gather relevant professional organizations and platforms.
- Promote the inclusion of both men and women in decision-making processes, develop community-based monitoring and evaluation systems, ensure the collection of gender disaggregated data, support women's organizations and work towards gender equality.
- Work together within the remit of the proposed regional programme on SSFs to create and support, following a participatory approach, one or more platforms of small-scale fishers and fishworkers for enhanced communication and information to support SSFs and the implementation of the SSF Guidelines.

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First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea

27–30 November 2013
Saint Julian's, Malta

The First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea was organized from 27 to 30 November 2013 by the General Fisheries Commission for the Mediterranean (GFCM) in partnership with the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) – Mediterranean Agronomic Institute of Bari (MAIB), the FAO Fisheries Department and FAO regional projects, the Network of Marine Protected Area Managers in the Mediterranean (MedPAN) and the World Wide Fund for Nature (WWF) Mediterranean Programme, and hosted by the Government of Malta.

More than 170 participants gathered to share their experience and discuss the future of small-scale fisheries in the Mediterranean and the Black Sea. For the first time in the region, national administrations, international organizations, scientists, non-governmental organizations, fisher communities, stakeholders and civil society sat around the same table to address issues of common interest and challenges for building common strategies, synergies and cooperation to support the sustainable development of this sector.

The discussions enabled insights on the main issues at stake and laid the groundwork for a regional programme fostering knowledge on small-scale fisheries and involving all interested stakeholders. The event was also marked by the signature of a cooperation agreement at the regional and subregional level between fishers from the northern and southern shores of the Mediterranean. Finally, all participants concurred on the importance of organizing a second regional symposium in order to follow through on this momentum.

ISBN 978-92-5-108846-3 ISSN 2070-6103

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I4861E/1/08.15