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GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN

COMMISSION GÉNÉRALE DES PÊCHES POUR LA MÉDITERRANÉE

GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN

SCIENTIFIC ADVISORY COMMITTEE

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REPORT OF THE EIGHTH MEETING OF THE SUB-COMMITTEE ON ECONOMIC AND SOCIAL SCIENCES (SCESS)* Kavala, Greece, 17–20 September 2007

* Available only in English

OPENING AND ARRANGEMENTS FOR THE MEETING

1. The Sub-Committee on Economic and Social Sciences (SCESS) was held at the National Agriculture Research Foundation (NAGREF) in Kavala (Greece), from 17 to 20 September 2007. The meeting was attended by 11 participants from nine (9) GFCM Members (Croatia, the European Commission, Italy, Libya, Montenegro, Morocco, Slovenia, Tunisia, and Turkey). The list of participants is provided in Annex 2.

2. Mr Malouli Idrissi, Coordinator of the SCESS, welcomed the participants and opened the meeting. He recalled the context and the main objectives of the meeting as well as the following GFCM recommendations to the SCESS:

- to analyse the impact of market forces on fisheries management, with special reference to sardines in GSA 3, striped mullet in GSA 5, hake in GSA 6 and small-pelagics in GSA 17;
- to analyse the socio-economic impacts related to the implementation of the Recommendation on the 40 mm square mesh in bottom trawling;
- to define a minimum list of sociological indicators to be integrated in the GFCM Task 1, possibly through organizing transversal workshops by subregions;
- to update and extend to the whole Mediterranean the FAO Fisheries Circular No. 978 entitled "The fish trade of North African Mediterranean countries: intra-regional and import-export with the European Union", as well as the FAO Fisheries Circular No. 927, entitled "Les pêches en Méditerranée: éléments d'information sur le contexte halieutique et les enjeux économiques de leur aménagement";

- to analyse the legal framework regarding recreational/sports fisheries and initiate exploratory surveys of the socio-economic status of selected fisheries; and
- to organize a Workshop on the use of socio-economic indicators in fisheries management, including with reference to recreational and sport fisheries.

Discussions on steps taken to fulfil the six GFCM recommendations are described below.

3. Mr Malouli presented the main issues to be discussed as well as the arrangements for the meeting. Messrs Paolo Accadia and Scander Ben Salem were appointed Rapporteurs.

ADOPTION OF THE AGENDA

4. The agenda was discussed and approved with several amendments as presented in Annex 1.

REVIEW AND DISCUSSION OF TRANSVERSAL ISSUES

a. Preliminary review by the Sub-Committee[1]

5. The SCESS congratulated the participants and organizers of the intersessional workshops for their successful outcomes and then discussed the following four transversal workshops, focussing on those issues with direct relevance to the SCESS:

Methodology to Analyse Disaggregated Fishery Data

Regarding the workshop's conclusion on the preparation of disaggregated data methodological guidelines, the SCESS stressed the need for an inter-disciplinary team to contribute to this document. An inter-disciplinary effort will improve the usefulness of the resulting guidelines. The SCESS also noted the possibility of using disaggregated information (prices by species) to analyse the effects of market forces on changes in effort.

Selectivity in the Mediterranean trawl fisheries

Mr Malouli introduced the workshop's results toward developing a interdisciplinary understanding of the adoption 40mm square mesh size in trawl fisheries. The potential short- to long-term economic impacts related to the move toward 40mm square mesh size where described and a framework for quantifying and analysing these impacts was presented (Annex 3). The SCESS appreciated the use of expert opinion to qualitatively identify potential impacts stemming from a management measure. The SCESS recommended that this process be followed as a first step to understanding the socio-economic impacts of any management measure and further recommended that the impacts analysis framework be adopted throughout the GFCM.

The SCESS noted the importance of gathering baseline as well as post management measure information in order to allow for precise measures of impacts. Potential economic impact studies in Morocco, Tunisia, and Libya were discussed and recommended for implementation.

Ecosystem Approach to Fisheries

The SCESS fully supported the FAO definition of the ecosystem approach to fisheries (EAF) as provided for in the FAO Technical Guidelines for Responsible Fisheries as a holistic, integrated and participatory approach to sustainable development and stressed that the human dimensions to the approach form the basis for its application.

[1] Note: all workshop reports are available at ftp://ftp.fao.org/FI/DOCUMENT/gfcm/sac_scess/2007/sept2007/Default.htm

Ms De Young informed the SCESS of the June 2006 Expert Consultation on Economic, Social and Institutional Considerations of Applying the Ecosystem Approach to Fisheries Management[2]. From this meeting, an FAO Technical Paper and supplemental Technical Guidelines will be produced as aids in understanding the role that human dimensions (i.e. social, economic, political, and institutional) should play in the implementation of the EAF.

To further the application of the EAF in the GFCM, the SCESS recommended the formation of a transversal EAF working group, under the aegis of the SAC, to set a common framework and roadmap for the implementation of the EAF in the GFCM. Draft terms of reference for this working group are presented in Annex 4. Draft terms of reference for the first meeting of this transversal EAF working group are also provided.

Marine Protected Areas

The SCESS acknowledged the importance of marine protected areas (MPA) as a spatial tool in the EAF management tool box. The SCESS recommended the implementation of analyses of potential socio-economic impacts (benefits of ecosystem services as well as costs) of proposed MPAs as well as the need for integrated and participatory approaches to management plan development and implementation.

The Compilation of GFCM Task 1 data

The SCESS commended the workshop for the applied nature of its processes and results. Discussion within the SCESS focussed on whether or not there exists a need to revise the GFCM fleet segmentation.

The group realised that the nine countries that are members of both GFCM and the EU have to segment their fleet differently according to Task 1 and according to the fleet-fishery matrix of the EC Data Collection Regulation. The SCESS also acknowledged the need to understand the practical issues related to any changes in the GFCM fleet segmentation, which has been used as a data collection framework in some countries. A call for an adaptive framework was made in order to benefit from Task 1 implementation experiences in applying the fleet segmentations as a data compilation tool.

Acknowledging the complexity of the issues, the SCESS, along with the SCIS, called for the organization of a workshop on reviewing fleet segmentations that form the basis of Task 1. The draft terms of reference for this workshop are presented in Annex 5.

Task 1.3 – Economic components variables

The SCESS supported the list of indicators and their definitions included in task 1.3 as reviewed during the 3-5 July 2007 meeting held in Tripoli (discussed below) with few changes, as follows:

- To specify the unit of measure for each indicator;
- To use current year local currency for the economic indicators;
- To specify completely items within each variable to facility cross-country comparisons of data. For example, a listing of cost items to be included in the variable costs (“Cost of fishing/day per vessel”) and fixed costs (“Yearly Fixed costs per vessel”); and
- To add a non-obligatory sub-variable “fuel costs as % of total variable costs”.

The use of local current currency can facilitate the compilation of Task 1 by member countries. The SCESS agreed on the necessity of including a new table for automatic currency conversion into Task 1 to facilitate the comparability of data from different countries. The problem regarding the costs is related to the data consistency and comparability and occurs due to two basic reasons. First is the different treatment of particular cost issues in different countries (e.g. insurance treated as a fixed or variable cost). The second refers to the different contents of the same issues (e.g. income, turnover etc. having different definitions in different countries).

[2] The report of the meeting is available at ftp://ftp.fao.org/docrep/fao/009/a0673e/a0673e00.pdf

The SCESS recommended the following definitional table of minimum indicators be used within Task 1 (once the two cost variables have been fully identified) and that these data be collected annually.

Data	Description	**Sources**
Gross Tonnage	Total gross tonnage of fishing vessels belonging to the given Fleet Segment.	**Census**
Engine Power	Total engine power (kW) of fishing vessels belonging to the given Fleet Segment.	**Census**
Employment	Total number of people employed on fishing vessels belonging to the given Fleet Segment. The number of crew members can be estimated on a full time equivalent (FTE) basis.	**Surveys**
Salary Share %	Percentage of the revenues (after discounting commercial costs, daily costs and fuel costs) that pertain to the crew. It will be distributed among the crew as salary.	**Surveys**
Landing weight	Total landings in weight. (tonnes live weight)	**Auctions – Surveys**
Landing value	The volume of landed fish valued against actual market prices. It equals to quantities landed multiplied by the landing average price (current year local currency)	**Auctions – Surveys**
Vessel value of total Fleet	This is defined as present value of the total invested capital - value of hull, engine, gear and equipment. The replacement-value method can be used to estimate this parameter (current year local currency).	**Surveys**
Working days/year per vessel	Number of working days per year for each vessel (average).	**Surveys**
Working hours/day per vessel	Number of working hours per day (average) including the time of work in harbour preparing the trip and commercialization.	**Surveys**
Variable costs of fishing/day per vessel	These include daily expenses incurred in fishing activity, such as fuel, lubricants, etc. They are variable costs that depend on the time spent in fishing. **(complete list to be added)**	**Surveys**
% of V.C. from fuel costs	The percentage of total variable costs from fuel costs	**Surveys**
Yearly fixed costs per vessel	These comprise costs not directly connected with operational activity, such as non-routine maintenance, vessel insurance, taxes and dues, etc. The fixed costs are all the costs that are inevitable to pay yearly, independently from the time spent to fish. **(complete list to be added)**	**Surveys**

b. Review and discussion by the sub-Committees Transversal Session

6. The SCESS participated in the above-mentioned transversal session and provided its comments as relevant.

THE USE OF SOCIO-ECONOMIC INDICATORS IN FISHERIES MANAGEMENT

a. The Workshop on the Use of Socio-Economic Indicators in Fisheries Management

7. The SCESS commended the hosts of the July 2007 workshop on the use of socio-economic indicators in fisheries management, held in Tripoli, Libya. This meeting was considered the most successful SCESS workshop to date.

8. M. Malouli presented the outcomes of the workshop[3] and the SCESS accepted the workshop's recommendations as presented below:

a) Review the Task 1.3 list of definitions
This item was discussed in agenda item 3.1 above.

b) The use of the Traffic Light Method
The SCESS recommended the adoption of use of the traffic light method of trends analysis for fisheries management (Annex 6). The SCESS recommended the use of the following reference points to define the "traffic lights colours":

- for the indicators evaluating the status of fisheries, reference points should be set according to their percentile values in the following series: > 66th percentile, 66th-33rd, and < 33rd percentile;
- for the indicator measuring economic sustainability (ROI, return on investment), the reference point should be the average rate of the Treasury securities with a long term maturity (risk free investment); and
- for the indicator measuring social sustainability (the average salary per man employed), the reference point should be the minimum salary stipulated by the national laws.

c) The use of integrated indicators in fisheries management
In the move toward using biological, ecological, economic, and social data as information for management, the group discussed the use of decision rule parameters (reference points and trends indicators) as trigger points leading to management responses as presented in Annex 7. Fisheries management plans would detail specific indicators, trigger points indicating the need for a management response, and potential management responses, such as presented in the following table:

Example uses of indicators in fisheries management

	Example indicator in fishery	**indicator trend**	**decision rule parameters (reference point or trend)**	**example management measures/responses**
If	average weight of fish	drops	Below long-term average (…%)	review precautionary TAC
If	catch composition	changes	by over 10% decline in high-value species	institute protected zones
If	CPUE	falls	for 3 years	suspend credit for new vessels
If	recruitment	falls	below significant level (quantified)	increase minimum mesh size
If	market price	falls	by 20% of long-term average	implement temporary closures
If	number of vessels	increases	to more than 100	introduce limited entry schemes

The SCESS recommended that specific case studies be defined to apply this framework for the use of integrated Task 1 data in fisheries management. A pilot study project proposal to apply this framework in GSA 18 is presented in Annex 8.

d) To further the collection and use of socio-economic indicators, the SCESS recommended the following:

[3] The recommendations concerning recreational fisheries and sociological indicators are discussed in agenda items 5 and 7.

1. The speedy publication of the COPEMED Study "*The economic indicators estimation in the Mediterranean fisheries"*, completed in 2005. It is also suggested that this study include the last Libyan study recently completed in the eastern part of the country.

2. The elaboration of a handbook as a guideline on the use of socio-economic indicators in fisheries management supported by software. The software is intended to facilitate data processing at national level. It should:

- be free and open to national users (including the code source);
- assure the property and control of the gross data in the hands of the national administrations;
- facilitate the homogeneity of the frames of data transmitted to GFCM;
- include facilities to export data to graphical representations, bio-economic models, the modification of reference points; and
- allow to accumulate gross data, to analyse the quality of enquiries and to include statistical analysis to optimise the distribution of the surveys inside the observed population by stratum.

The draft table of contents for the handbook, as amended by SCESS, is presented in Annex 9.

b. Update of the FAO Circular N° 927 « Les pêches en Méditerranée: éléments d'information sur le contexte halieutique et les enjeux économique de leur aménagement »

9. Ms. De Young updated the SCESS regarding the on-going updating of the FAO Circular 927 and requested the assistance of the SCESS in providing the information necessary for the effective completion of the review. The draft table of contents for the review are provided in Annex 10.

LEGISLATIVE AND SOCIO-ECONOMIC STATUS OF RECREATIONAL FISHERIES IN THE MEDITERRANEAN SEA

10. M. Malouli presented the discussions and recommendations from the July, 2007 workshop based on the upcoming GFCM Study and Review 81[4] and country experiences with recreational fisheries (RF).

11. The SCESS addressed the problem of the recreational fisheries' definition and recommended that SAC adopt a common definition at the Mediterranean level. Common definitions should also be adopted for the different types of recreational fisheries activities, known as sport fishing, tourism fishing and amateur fishing, each having their own associated goals. The SCESS recommended that the following definitions be adopted to assist in coherency and completeness in the recreational fisheries legal frameworks:

Leisure/Recreational fisheries – non-commercial (i.e. not for sale, barter, or trade) fisheries motivated by personal uses for recreation, tourism or sport. Leisure/recreational fisheries comprises three sub-categories:

Amateur fishing – unorganized hobby fishing not associated with specific events or competitions. Catches from amateur fishing are either released (catch & release) or are retained for private consumption.

Sport fishing – organized fishing involving free competition between fishermen to catch the largest fish of certain species, the largest number of specimens or the largest total weight depending on the rules of each particular competition.

Tourism fishing – fishing conducted by commercial fishermen ("pesca-turismo") or by recreational fishing professionals ("charter") and can be understood as a fishing activity carried out by a third party who organizes a fishing expedition for tourists.

12. It was noted that, although it is necessary to clearly define the recreational fisheries in the legal and management frameworks, differentiated laws and management measures are currently difficult in practice.

13. SCESS recommended that these definitions be added to the GFCM glossary and that this glossary be made available on the GFCM web site.

[4] Gaudin, C. & De Young, C. Recreational fisheries in the Mediterranean Countries: A review of existing legal frameworks. Studies and Reviews. General Fisheries Commission for the Mediterranean. No.81. Rome, FAO. 2007.

14. The SCESS also noted a severe lack of data and of social and economic surveys which prevents homogeneous and regular monitoring of these activities. The SCESS recommended the following minimal list of social and economic indicators for future inclusion within the Task 1:

a. Number of licenses/permits for each segment for sport, tourism and amateur fisheries (shore based, boat based, underwater fishing) with the aim of evaluating the number of recreational fishermen;
b. Catch amounts (kg) with the view of contributing to the assessment of fishing effort for all the species caught and to better understand the impact of recreational fisheries on marine resources. These "catch reports" should include daily catch focusing initially on selected GFCM priority species, in addition to migratory species;
c. Data and information on recreational fishing expenses (hotel, restaurant, transport, fishing gears [e.g. baits and accessories], etc.) with the view to estimating the value of the induced economic activity;
d. Age of the fisherman
e. Years of experience in fishing activity
f. Share of the fishing incomes over the total yearly personal revenue

15. A framework for understanding the socio-economic contributions of recreational fisheries was discussed and recommended for adoption by SCESS. This framework, as presented in Annex 11, will assist countries in prioritizing their data collection efforts and assist GFCM in understanding the existence of interactions between RF and Commercial fisheries. In most cases, questionnaires and surveys should be used to collect data.

a) The SCESS recommended the creation of an inter-disciplinary working group on RF to assist in a holistic approach to the management of recreational fisheries. Terms of reference for this working group and its first meeting are presented in Annex 12.
b) The SCESS underscored the need for stakeholder involvement and information dissemination in data collection and management processes.
c) While harmonization on regulatory frameworks at regional level would appear premature in a context of lack of information, the SCESS recommended that relevant guidelines should be prepared. Such legal framework guidelines on recreational anglers could include, *inter alia,* the following issues:
    a. Access regimes such as for shore based, boat based and underwater fishing.
    b. Conservation measures including prohibition of sales, gears restriction, daily bag limit, prohibited species, minimal sizes, fishing reserves and others restrictions.
    c. Special leisure fisheries regulation including underwater fisheries, sport fishing, tourism fishing (charter fishing and pesca turismo).
    d. Monitoring and control measures (inspection, sanctions and reporting).

ANALYSE THE IMPACT OF MARKET FORCES ON FISHERIES MANAGEMENT

a. Update the FAO Circular N° 978 "The fish trade of North African Mediterranean countries: intraregional and import-export with the European Union"

16. Ms. De Young updated the SCESS regarding the updating of the FAO Circular 978. The work, which will be extended to the entire Mediterranean will be completed in March 2008. The draft table of contents are presented in Annex 13.

b. Country studies on market forces

17. The SCESS recognized that very few studies were implemented due to lack of resources and available data.

18. M. Ünal presented his research on a small-scale fishery in Gokova Bay, southwest of Turkey, which was carried out to understand the relationship between the fish prices and fishing effort. Integral to this work was the cooperation with the head of the Akyaka fishing cooperative, in the region to collaborate with the project. During the one year Ege University project (from May 2005 to May 2006), the fishing cooperative provided reliable daily price and landings data by species as well as number of daily fishing trips. These data

have been used to understand the behavior of fishermen that is explained by prices and other supply and demand factors. Final results will be provided at the following SCESS.

19. The SCESS recommended the creation of a workshop to establish a standard method of using market data to explain changes in effort for use in management. The terms of reference for the SCESS workshop are provided in Annex 14.

c. Understanding market and other incentives

20. Ms. De Young presented a background paper regarding the understanding of sociological, economic, institutional, and legal incentives behind aquatic resource user (Annex 15). Understanding existing incentives structures is crucial to successful fisheries management as such incentives may explain why or why not a given management measure is effective (i.e. price incentives driving illegal fishing) and may be used as management mechanisms (participatory processes instilling ownership of resource management).

21. The SCESS recommended that incentive structures be studied and that the use of incentive mechanisms be examined for use within the GFCM as part of the fisheries management toolbox.

SOCIAL SURVEYS AND SOCIOLOGICAL INDICATORS

a. The AdriaMed Sociological Information System

22. Ms. Milone presented the AdriaMed Sociological Information System[5]. The information system takes the form of an easy to use database, which each country may adapt according to its own needs. Country-specific survey questionnaires, data entry systems, and information analyses are easily created through this system, which is freely available to any potential users, and assisted by a user's manual. This information system stems from the work of the social survey implemented in Albania and will be applied in Montenegro in the near future. Additional potential users of the system are South African and the FAO Central Asia sub-region.

23. The SCESS highly commended the work of AdriaMed and recommended the use of the sociological information system to be used as widely as possible throughout the GFCM. It was also recommended that the Sociological Information System be expanded to cover Economic information for use at the national level.

b. Minimal list of Sociological indicators for use in Task 1

24. The SCESS recommended the following minimal list of three sociological indicators for inclusion within the Task 1; to be calculated as the average for each fleet segment based on statistically representative surveys:

- Age of the fisherman
- Years of experience in fishing activity
- Share of the fishing incomes over the total yearly personal revenue

JOINT SCESS-SCIS TASK 1 MEETING

25. As discussed above in agenda item 3.1.

CONCLUSIONS, RECOMMENDATIONS, AND THE 2008 SCESS WORKPLAN

26. General conclusions of SCESS

[5] Information concerning the social survey is available from the AdriaMed website: http://www.faoadriamed.org

Socio-economic indicators for fisheries management

The SCESS stressed the importance of time series analyses to provide management advice using trend analysis methods, such as the Traffic Light Method, to analyse the dynamics of socio-economic indicators with the aim of evaluating the status and trends of fisheries. It was recognized that the longer the period under investigation, the more reliable results are; hence a need to collect at least four years of data for the application of time series methods.

The SCESS also stressed the importance of the effective use of indicators (complete with trigger points and management reactions), whether through time series or annual indicators, in fisheries management.

The SCESS welcomed the creation of the Sociological Information System, which will greatly assist in the collection and use of sociological information throughout the GFCM.

Recreational Fisheries

The SCESS noted that there are few comprehensive recreational fisheries regulatory frameworks, often as a result of a lack of specific policy.

The SCESS underscored the need for consistent definitions of recreational fisheries (comprising amateur, sport, and tourism fisheries) across the GFCM and the lack of understanding regarding the biological and socio-economic impacts of these fisheries. The SCESS also recognized the need for a structured framework to assist in the collection of socio-economic data at the national level. The SCESS also stressed the important role of the federations, associations, fisheries administrations, port authorities and other relevant stakeholders in obtaining and sharing relevant data such as catch reports.

The SCESS emphasized that cooperation between national authorities and recreational anglers should be further developed. In the case of sport fishing, the creation of federations or associations facilitated cooperation. There would be a need to further promote the establishment of federations or alike for amateur and tourism fishing.

The SCESS agreed that without an education and sensitization campaign, the success of any legislative framework would be compromised. Thus, the SCESS advised that GFCM Members diffuse information on leisure fisheries regulations by disseminating booklets or other context specific formats, including minimal sizes, gear restrictions and bans.

Besides economic and social dimensions, recreational fisheries have bio-ecological dimensions of importance due to their impacts on the environment and marine food webs. Therefore, recreational fisheries are an integrated issue, needed to be taken into account by not only SCESS but also by the other SAC Sub-Committees. Interdisciplinary interaction, research and evaluation are needed to estimate the impacts of RF on marine environment, fishery, community, economy etc.

Disaggregated data

The SCESS discussed the conclusions of the working group on “Methodology to analyse disaggregated fishery data” held in France, 12-16 March 2007. The SCESS recognized the importance of analyse disaggregated data especially for the identification of relationships among prices by species and the effect of market forces on the level of effort.

The SCESS agreed on the usefulness of taking part in the preparation of methodological guidelines to work with disaggregated data and on the importance to analyse the effects of market forces on fisheries management.

Gear Selectivity

The SCESS agreed on the importance of a structured analysis of the economic effects of the move toward the use of square 40 mm meshes in trawling fisheries. It was stressed the relevance of this information for Libya, Morocco and Tunisia, where the 40mm mesh size will potentially impact their trawl fisheries.

GFCM Task 1

The SCESS welcomed the GFCM Task 1 as a basis for data compilation at the GFCM level and recognized the need to review the GFCM fleet segmentation that forms the basis for the GFCM Task 1. The SCESS discussed methods for using of Task 1 data in monitoring and evaluating fisheries management.

Incentives Mechanisms

The SCESS highlighted the importance of understanding the sociological, economic, legal, and institutional incentive structures that exist in all fisheries and the role of such incentives in fisheries management.

The Ecosystem Approach to Fisheries

The SCESS embraced the holistic, integrated, and participatory nature proscribed by the ecosystem approach toward sustainable fisheries and recognized the need for a GFCM-wide approach to its application.

Marine Protected Areas

The SCESS acknowledged the importance of marine protected areas (MPA) as a spatial tool within the EAF management tool box. To assist in the success of MPA, the SCESS acknowledged the need for integrated and participatory approaches to MPA management plan development and implementation.

Market Forces and Management

The SCESS acknowledge great gaps in our understanding of the role of market forces in fisheries and the inter-relationship between such market forces and fisheries management.

27. Recommendations from SCESS

Suggestions to SCESS

- To define precisely the Task 1.3 variables, including a detailed listing of information to be included in the variable and fixed costs variables;
- To collect annually the minimal list of economic data as described in Task 1 and to collect the following minimal sociological information for commercial fisheries:
- To elaborate mechanisms to help in the production of economic indicators, including:
    - The publication of the COPEMED Study "*The economic indicators estimation in the Mediterranean fisheries"*, completed in 2005 but to include the latest result from eastern Libya;
    - The elaboration of a handbook as a guideline on the use of socio-economic indicators in fisheries management supported by software (table of contents in Annex 9);
- To collect the following minimum list of data for recreational fisheries:
    - Number of licenses/permits for each segment for sport, tourism and amateur fisheries (shore based, boat based, underwater fishing) with the aim of evaluating the number of recreational fishermen;
    - Catch amounts (kg) with the view of contributing to the assessment of fishing effort for all the species caught and to better understand the impact of recreational fisheries on marine resources. These "catch reports" should include daily catch focusing initially on selected GFCM priority species, in addition to migratory species;
    - Data and information on recreational fishing expenses (hotel, restaurant, transport, fishing gears [e.g. baits and accessories], etc.) with the view of evaluating the value of the induced economic activity;
    - Age;
    - Gender (male, female);
    - Education (number of years of formal schooling); and

  - Employment status (unemployed, part-time, full-time);
- To study the role of incentive structures and mechanisms in national fisheries;
- To apply the AdriaMed Social Information System throughout the GFCM;
- To develop recreational fisheries legal framework guidelines;
- To analyse the impact of market forces on fisheries management;
- To use disaggregated information (prices by species) to analyse their impacts on fishing effort;
- To implement selectivity impact analyses in Libya, Morocco, and Tunisia;
- To organize a workshop to establish a standard method of using market data to understand changes in fishing effort for use in fisheries management (ToR in Annex 14);
- To co-organize a workshop on the review of the GFCM fleet segmentation (ToR in Annex 5);
- To develop a pilot study project proposal to apply the framework for the use integrated Task 1 data in fisheries management (ToR in Annex 8); and
- To update and extend to the whole Mediterranean the FAO Fisheries Circular No. 978 entitled "The fish trade of North African Mediterranean countries: intra-regional and import-export with the European Union", as well as the FAO Fisheries Circular No. 927, entitled "Les pêches en Méditerranée: éléments d'information sur le contexte halieutique et les enjeux économiques de leur aménagement" (ToC in Annexes 10 and 13).

Suggestions to SCSI

- To include a new table for annual currency conversion in Task 1 to facilitate the comparability of monetary value data from different countries; and
- To co-organize a workshop on the review of the GFCM fleet segmentation (ToR in Annex 5)

Suggestions to SAC

- To create an interdisciplinary team to assist in the drafting of the "Disaggregated data methodological guidelines";
- To adopt the use of expert opinions as a first attempt in understanding the potential impacts of management measures and to adopt the socio-economic information framework for the analysis of gear selectivity impacts analysis (Annex 3);
- To adopt the use of Traffic Light method for integrated indicators trends analyses, including the use of reference points and indicators to assist in the monitoring and evaluation of fisheries management (Annexes 6 and 7);
- To adopt the minimal list of sociological indicators for commercial fisheries for inclusion into Task 1: age, years of experience in fishing activity, and share of the fishing incomes over the total yearly personal revenue;
- To adopt the minimal list of socio-economic indicators for recreational fisheries, as presented above.
- To consider the inclusion of social, economic, legal, and institutional incentive mechanisms into the GFCM toolbox of management measures (Annex 15);
- To create a Transversal Working Group to set a common framework and methodology to implement the Ecosystem Approach to Fisheries within the GFCM (Annex 4);
- To organize the first meeting of the Transversal Working Group on the Application of the Ecosystem Approach to Fisheries within the GFCM (Annex 4);
- To use integrated and participatory approaches to marine protected areas management plan development and implementation;
- To adopt the following recreational fisheries definitions to assist in the coherency and completeness of recreational fisheries legal frameworks:

  Leisure/Recreational fisheries – non-commercial (i.e. not for sale, barter, or trade) fisheries motivated by personal uses for recreation, tourism or sport. Leisure/recreational fisheries comprise three sub-categories:

  Amateur fishing – unorganized hobby fishing not associated with specific events or competitions. Catches from amateur fishing are either released (catch & release) or are retained for private consumption.

  Sport fishing – organized fishing involving free competition between fishermen to catch the largest fish of certain species, the largest number of specimens or the largest total weight depending on the rules of each particular competition.

Tourism fishing – fishing conducted by commercial fishermen ("pesca-turismo") or by recreational fishing professionals ("charter") and can be understood as a fishing activity carried out by a third party who organizes a fishing expedition for tourists.

- To include these definitions within the GFCM Glossary and for the publication of the Glossary on the GFCM web site;
- To adopt the framework for socio-economic impacts of recreational fisheries (Annex 11);
- To create an inter-disciplinary (transversal) Working Group on recreational fisheries in the GFCM; and
- To organize the first meeting of the Transversal Working Group on Recreational Fisheries within the GFCM (Annex 12).

Suggestions to GFCM

- The SCESS recommended that Member State administrations proceed urgently in the collection of data following the Task 1.3 table.

FUNCTIONING OF THE SCESS REGARDING THE SCIENTIFIC ACTIVITIES, IN CONNECTION WITH ITS WORKING GROUPS AND WITH THE TRANSVERSAL ACTIVITIES.

28. The SCESS expressed its contentment with the functioning of its activities and working groups. The SCESS stressed its dependence on the sub-regional projects for intersessional activities and participation to the SCESS meetings and workshop and welcomed the initiation of the CopeMed II and EastMed projects. The SCESS discussed the use of the FAO Technical Cooperation Programme[6] to assist in the fieldwork of the SCESS. The SCESS welcomed the active use of e-mail to share information regarding reports, publications, preliminary and final results of projects and other experiences.

ANY OTHER MATTERS

29. The SCESS expressed it thanks to the MedSudMed and AdriaMed projects for their assistance in allowing for participation in the intersessional workshops and SCESS meeting as well as their on-going support to the SCESS.

30. Ms. De Young introduced her work on the "State of the World Marine Capture Fisheries Management" reviews, for which she has already completed volumes for the Indian and Pacific Ocean countries[7]. Ms. De Young will commence a Mediterranean, Black, and Caspian Seas volume this fall/winter and would welcome the assistance in identifying individuals interested and capable of provided a critical review of their country's marine capture fisheries management.

NOMINATION OF THE SCESS COORDINATOR

31. The SCESS expressed its heartfelt appreciation of the work of M. Malouli during his six-year tenure as Coordinator for the SCESS. The SCESS acknowledged the difficulties in garnering and maintaining enthusiasm and, therefore, congratulated M. Malouli for his successful efforts within the GFCM.

32. The SCESS welcomed the nomination of M. Ramon Franquesa, from the University of Barcelona, Spain, to hold the office of SCESS Coordinator as M. Malouli's successor.

[6] http://www.fao.org/tc/tcp/index_en.asp

[7] Review of the state of world marine capture fisheries management: Indian Ocean. *FAO Fisheries Technical Paper*. No. 488. Rome, FAO. 2006 and Review of the state of world marine capture fisheries management: Pacific Ocean. *FAO Fisheries Technical Paper*. No. 489. Rome, FAO. In preparation.

DATE AND VENUE OF THE NEXT MEETING

33. The SCESS recommended that the 2008 SAC Sub-Committees meetings be held during the 2nd week of October 2008. The participant from Turkey informed the SCESS of his government's interest in hosting the 2008 meetings of the SAC Sub-Committees in Turkey (Antalya).

ADOPTION OF THE REPORT

34. The meeting report was adopted by e-mail Friday, September 28, 2007.

Annex 1

Agenda

1. **Opening and arrangements for the Meeting**
2. **Adoption of the agenda**
3. **Review and discussion of transversal issues**
   1. Preliminary review by the Sub-Committee
   2. Review and discussion by the sub-Committees transversal session
4. **The use of socio-economic indicators in fisheries management**
   a. Tripoli workshop results
   b. Update Circular N° 927 « Les pêches en Méditerranée: éléments d'information sur le contexte halieutique et les enjeux économique de leur aménagement »
5. **Legislative and socio-economic status of recreational fisheries in the Mediterranean Sea**
6. **Analyse the impact of market forces on fisheries management**
   a. Update Circular N° 978 "The fish trade of North African Mediterranean countries: intraregional and import-export with the European Union"
   b. use of market data to understand changes in fishing effort
7. **Social Surveys and sociological indicators**
8. **Conclusions, recommendations, and 2008 SCESS workplan**
9. **Functioning of the SCESS regarding the scientific activities, in connection with its Working Groups and with the transversal activities.**
10. **Any other matters**
11. **Nomination of the SCESS Coordinator**
12. **Date and venue of the next meeting**
13. **Adoption of the report**

CONTENT OF THE SUB-COMMITTEES
TRANSVERSAL SESSION
(Agenda item 4.2)

1) **Methodology to Analyse Disaggregated Fishery Data (by J.Lleonart)**
   - Conclusions of the Workshop on disaggregated Fishery Data (France, 12-16 March 2007)
   - Elaboration of guidelines on the use of disaggregated data to identify fisheries parameters (OU, fishing effort…)

2) **Selectivity in the Mediterranean trawl fisheries (by K.R. Constantina/Sacchi)**.
   - Conclusions of the Workshop on selectivity in the Mediterranean trawl fisheries (Spain, 2-4 April 2007)
   - Presentation of the document on reference technics on impact of certain fishing gears on the environment
   - Works on improving gear selectivity, with special attention to trawls

3) **Ecosystem Approach to Fisheries (by M.N Bradai).**
   - Conclusions of the Workshop on EAF (Tunisia, 22-23 May 2007)
   - Common framework for the implementation of EAF in the Mediterranean, according to the FAO guidelines, including feasibility studies in selected GFCM GSAs.

4) **Marine Protected Areas (MPAs) (by C. Rais).**
   - Conclusions of the Workshop on MPAs (Tunisia, 24-25 May 2007)
   - Presentation of the inventory/synthesis of published studies on fisheries and biodiversity of the Mediterranean deep sea.
   - Proposition of new fisheries restricted areas

5) **The compilation of GFCM Task 1 data (by M. Camilleri).**
   - Conclusions of the Workshop on the compilation of GFCM task 1 (Morocco, 19-22 June 2007)

Annex 2

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Annex 3

Potential Economic Impacts of Mesh Size Changes and Framework for Their Analysis

Potential economic consequences of square codend application to Mediterranean trawl fisheries* (From the net maker to the market)

Indicators	Short-term	Long-term	Observations
catch-landing	decrease or stable	increase	The improvement of selectivity assume the reduction of catch of the small size individuals
effect: price-quantities/quality	increase or equal	decrease or equal	The reduction of landing assumes the reduction of the supply and the increasing of the price
costs : gear cost maintenance cost fuel cost	 increase equal decrease	 equal equal decrease	The change of the gear assumes en initial investment that not affects other maintenance cost. The increasing of the opening of the mesh assumes less resistance to water, less retention of biomass in the cod-end, in consequence less consumption of fuel. finally, the recover of the biomass allow in long term improve the quantity cached by fuel consumed
costs per landing if biomass recover	increase	decrease	The initial reduction of the catch assumes increasing the cost per landing
added value	decrease	increase	The initial reduction of catches assumes the reduction of the added value, net profit and wages
Net Profit	decrease	increase	idem
wages	decrease	increases	idem
social effect (employment)	decrease	stable	The initial reduction of the revenue assumes the of wages and a decrease of employment. in the long term, it could be observed an attraction to the metier as there is an increase of the wages and an net profit.
acceptability by the fishing sector	rejected	accepted	The initial cost of the transition produces a resistance to change. When the biomass is recovered, the fishermen improve their profits and so they support the new regulation

*based on expert opinions during the July 2007 workshop on the Use of Socio-Economic Indicators in Fisheries Management

Framework for the Analysis of Applying the mesh regulation

The objectives of the mesh regulations are:

- to improve in the demersal fisheries,
- to assure a adequate level of biomass of commercial species,
- to assure a sustainable environment on other species affected by the trawl fishery,
- to assure a sustainable from the socioeconomic perspective in the trawl fleets
- Through some rules that minimise the transition cost, in terms of employment and in terms of revenues

Steps needed in the economic analysis on mesh regulations

- Evaluate the cost of the change of gears
  - By individual vessel
  - Extrapolated to the vessels and fishermen affected
- Evaluate the losses in the sales (short term)
- Evaluate the effects on prices (short, medium and long term)
- Evaluate the effect on operative cost (carburant, etc.)
- Evaluate the effect on revenues from the changes in catches (medium and long term)

Two paths to improve the knowledge

- Bio economical analysis to simulate the behaviour of the fishermen and the resource
- The microeconomic analyse over the enterprise behaviour
  - Thesis of Master of Science in Fisheries Economics and Management: *Evaluate the cost of the change in Catalonia (Spain) and one Italian region.*
- Need of support of the Mediterranean projects (i.e. MedSudMed, CopeMed II, AdriaMed, and EastMed)
- Need of Support of regional and national administrations

The critical work

- Collection of data.
  - Fleets concerned: employment, investment, spatial distribution, economic situation
  - Biomass status: % over the MSY, time to recover
- Develop the methodology: Extrapolation by Economic Indicators
- Develop reference/triggers point for each indicator as well as potential management responses for when indicator value exceed or go below agreed upon reference points

Annex 4

Draft terms of reference for a transversal EAF working group and its first meeting

The GFCM EAF working Group

In 2003, the FAO published its Technical Guidelines on the Ecosystem Approach to Fisheries in accordance with a request in the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem to develop technical guidelines for an ecosystem approach to fisheries (EAF), focusing on fisheries management. Recognizing the wide range of interpretations of the approach, the FAO proposed the following definition, which is aligned with the more general ecosystem approach (EA) but takes a pragmatic approach in that the EAF remains mainly bounded by the ability of fisheries management to implement the EA; however, not downplaying the fisheries sector's responsibility in collaborating in a broader multi-sectoral application of the EA:

> *"an ecosystem approach to fisheries (EAF) strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties of biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries"*

Understanding the need for a holistic, integrated, adaptive, and participatory approach to the implementation of the EAF, a transversal EAF working group is recommended within the GFCM SAC. This working group will have the following mandate:

- To define what the application of the EAF entails (and does not entail) for the GFCM, across biological/ecological, economic, social and governance dimensions;
- To define a framework for the application of the EAF within the GFCM;
- To identify integrated pilot projects in which to apply the EAF framework;
- To identify multi-disciplinary priority information to assist in the application of the EAF (i.e. differentiating between information for management and basic research information); and
- To collect experiences/case studies in the application of the EAF throughout the GFCM.

The working group will commence with a basin-wide approach, which will then be adapted to the particularities at the sub-regional level.

The working group will be open to all interested parties and housed directly under the aegis of the SAC, rather than under a specific sub-committee, in order to facilitate the integrated approach of the working group.

The First Meeting of the GFCM EAF Working Group

The first meeting of the GFCM EAF Working Group will convene to address the first two aspects of its mandate: agreement on the definition of the EAF application within the GFCM, and the development of an EAF implementation framework for the GFCM. The group will need to establish the appropriate boundaries that take into account both jurisdictional and natural considerations that will be used to implement the GFCM EAF framework at a more local/sub-regional levels.

As an input into this 3-day meeting, experiences from other large-scale EAF projects, within the GFCM and elsewhere, will be presented as an aid to developing a GFCM-appropriate implementation framework.

The outcome of the meeting will be a detailed logical framework that will describe the objectives, means, outcomes, and monitoring and evaluation mechanisms to promote a systematic approach to implementation as well as the sharing of lessons learned in order to effectively assist the GFCM in its application of the EAF.

The working group will also identify potential partners to assist in the transition through the EAF toward sustainable fisheries.

The working group will also define action points as follow-up activities from previous EAF workshops.

The first meeting of the EAF Working Group is recommended to be held at the GFCM headquarters in Rome in June, 2008.

Annex 5

Terms of Reference for a SCESS/SCIS Workshop on the Review of the GFCM Fleet Segmentation

As is required in any adaptive management framework, periodic review of the methods, procedures, and tools is a necessary step to ensuring the management system's sustainability. With recent experiences in collecting data for reporting to the GFCM Task 1, issues have been identified; signalling the need to review the basic assumptions behind the GFCM fleet segmentation, such as:

- Reconsidering the fleet segmentations for clarity and internal consistency (e.g. consistent allocation criteria to be applied across the length classes) to avoid straddling of vessels across fleet segments
- Revising the name of "minor gear" categories
- Reconsidering vessels groupings (e.g. splitting large categories into several smaller segments) to minimize a loss of information through the forced merging of vessels with different exploitation patters and, hence, a mismatch between the economic and biological characteristics attributed to the particular fleet segment
- Understanding areas of compatibility and subsequent divergence between the GFCM fleet segmentation and the European Commission fleet segmentation (e.g. vessel length categories and dominant versus exclusive gear categories)

Therefore, a three-day SCESS/SCIS workshop is proposed to allow for proper reflection of these issues with the aid of specific examples and background data.

To assist in the discussion, a review of similar systems of fleet segmentations around the world will be presented and specific examples and data from the GFCM will be analyzed by participating members to discuss issues needing to be reviewed. The final outcome of the meeting will be either a revised GFCM fleet segmentation proposal (with relevant justifications) or the recommendation to maintain the current GFCM fleet segmentation.

Annex 6

THE TRAFFIC LIGHT METHOD OF TRENDS ANALYSIS

Socio-economic indicators for the Adriatic Sea Demersal Fisheries*

Abstract

This paper analyses the state of demersal fisheries in the North and Central Adriatic Sea (FAO Geographical Sub Area (GSA) 17) from an economic and social point of view. The analysis is performed using a set of 25 socio-economic indicators. Indicators represent a valid tool to support the decision making process in fisheries management. Economic indicators include 6 indicators on economic performance, 8 on productivity, 4 on costs and prices, and one general indicator summarising economic sustainability. From the social point of view, 5 indicators plus one general indicator summarising social sustainability are defined. Particular attention is devoted to the selection and analysis of sustainability indicators. The standard distinction among environmental, economic, and social sustainability has been held in this paper. Trends of these indicators are analysed using the so-called Traffic light system. Reference values are set according to their percentile value in the following series: > 66th percentile, 66th-33rd, and < 33rd percentile. Based on each specific indicator, the three standard colours, green, yellow, and red, are assigned to the three areas defined by the reference values at 33rd and 66th percentiles. The analysis is performed by using data available from the IREPA monitoring system along the Italian coastline on three Operational Units: bottom trawlers less than 12 metres, between 12 and 18 metres, and more than 18 meters. The period under consideration goes from 1996 to 2004. The results highlight critical conditions for the demersal fishery in the GSA 17 from the economic and social points of view, due to decreasing productivity. Even though many socio-economic indicators show low levels during the period under consideration, the sustainability indicators are not in the critical area and the fishery sector cannot be classified as unsustainable.

Applicability and performance of some biological and economic indicators for the Adriatic Sea trawl fisheries in the western GFCM GSA 18**

Abstract

This paper analyses the state of trawl fisheries in the Southern Adriatic Sea (FAO Geographical Sub Area 18) from a biological, economic and social point of view. The analysis was performed using a set of forty-six indicators, twenty-one of which belong to the category of biological (population and community) indicators to be obtained from fishery-independent data and the remaining twenty-five are of socio-economic nature and of fishery-dependent origin. Biological indicators and relative estimators were classified for the single species (population level: Eledone cirrhosa, Eledone moschata, Illex coindetti, Merluccius merluccius, Mullus barbatus, Nephrops norvegicus, Parapenaeus longirostris, Raja clavata, and Zeus faber) as well as for the multispecies approach (community level). Economic indicators include six indicators on economic performance, eight on productivity, four on costs and prices, and one general indicator summarising economic sustainability. From the social point of view, five indicators plus one general indicator summarising social sustainability are defined. Particular attention was devoted to the selection and analysis

* Accadia, P., Spagnolo M. 2006. *Proceedings of the Thirteenth Biennial Conference of the International Institute of Fisheries Economics & Trade (IIFET)*, July 11-14, 2006, Portsmouth, UK. The International Institute of Fisheries Economics & Trade, Corvallis, Oregon, 2006. ISBN 0-9763432-3-1. CD-ROM Format.

** Ungaro, N., Accadia, P., Ceriola L., Mannini P., Massa F., Milone N. 2006. *Applicability and performance of some biological and economic indicators for the Adriatic Sea trawl fisheries in the western GFCM GSA 18*. Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea. GCP/RER/010/ITA/OP-19. *AdriaMed Occasional Papers* 19: 24 pp. Available from the World Wide Web at http://www.faoadriamed.org/pdf/OP-19.zip.

of sustainability indicators. The standard distinction among biological, economic, and social sustainability has been held in this paper. Trends of these indicators were analysed using the so-called Traffic light system. Reference values were set according to their percentile value in the following series: > 66th percentile, 66th-33rd, and < 33rd percentile. Based on each specific indicator, the three standard colours, green, yellow, and red, were assigned to the three areas defined by the reference values at 33rd and 66th percentiles. The analysis was performed by using data available from the MEDITS surveys project and from IREPA monitoring system in the basin concerned. The period under consideration goes from 1996 to 2003. The inclusive discussion of the results from both fishery-independent and fishery-dependent data analysis underlines some common features. In fact, an apparent and progressive deterioration seems to affect the demersal trawl fishery in the GSA 18 during the investigated period, according mainly to the variation in catch composition (increasing of r-strategist species and decreasing of k-strategist ones) and to the trajectories of some socio-economic indicators.

Keywords: Demersal fisheries; Indicators; stock assessment; Fishery management; Models; Adriatic Sea; Mediterranean Sea

Annex 7

Incorporating fisheries management indicators into the GFCM task 1 data and analysis system

Indicators assist in the process of assessing the performance of fisheries policies and management at global, regional, national and sub-national levels. They provide a readily understood tool for describing the state of fisheries resources and fisheries activities and for assessing trends regarding sustainable development objectives. In the process of measuring progress towards sustainable development, a set of indicators should also stimulate action to achieve sustainable development.

The development of indicators is an iterative process in which, once sustainable development objectives have been defined, criteria for monitoring such objectives need to be defined (including the use of proxy indicators where necessary) and tested over time for their effectiveness, efficiency, and ease of use/communicability in the decision-making process. Once the sets of indicators, addressing ecological, social, economic, and institutional objectives, have been established (as relevant for each fishery), the short- and long-term trends of these indicators can be compared with the pre-defined target, limit, and threshold references points, which would call for immediate responses from management. The following table includes examples of the use of indicators in fisheries management, which could readily be included into the GFCM Task 1 data and analysis system.

Example uses of indicators in fisheries management

	Example indicator in fishery	indicator trend	decision rule parameters (reference point or trend)	example management measures/responses
If	average weight of fish	drops	Below long-term average (…%)	review precautionary TAC
If	catch composition	changes	by over 10% decline in high-value species	institute protected zones
If	CPUE	falls	for 3 years	suspend credit for new vessels
If	recruitment	falls	below significant level (quantified)	increase minimum mesh size
If	market price	falls	by 20% of long-term average	implement temporary closures
If	number of vessels	increases	to more than 100	introduce limited entry schemes

Similar to the Traffic Light approach promoted in the Adriatic Sea, including automatic triggers, based on the decision rule parameters above, into the Task 1 database will alert decision-makers and fisheries managers to issues in need of immediate management responses. At the Mediterranean level, the decision rules of a generic nature (e.g. below 20% of the five-year moving average, below the 33rd percentile) may be agreed upon by the relevant SAC sub-committees. At the national level, more detailed, context specific decision rules, such as those proposed by the Transversal Workshop on the Use of Socio-Economic Indicators in the Mediterranean Fisheries Management (Tripoli, Lybia, 3-5 July 2007) (e.g. national minimal income) may be used. What is important is that managers are made aware of potential problems in a fishery automatically and in a way that is easy to understand.

Annex 8

A Pilot Study to use the integrated indicators framework in the GSA 18

During the Transversal Workshop held in Casablanca from 19th to 22nd June 2007, GFCM Task 1 has been tested and found very useful as an electronic tool for compiling multidisciplinary data and identifying OUs. Data collected in Task 1 and their structure should be tested now also to verify its usefulness for fisheries management.

The lack of economic data for many Mediterranean countries represents a problem in testing GFCM Task 1 from a management point of view. For this reason, GSA 18 is suggested as a potential pilot study in this direction. The AdriaMed project is supporting the development and implementation of a Monitoring System to collect economic data for the Montenegran fleet with the IREPA technical advice. The availability of biological and economic data for the entire GSA 18 makes this area particularly suitable for testing the usefulness of the biological, economic and social data, as defined in GFCM Task 1, for fisheries management.

Annex 9

Draft table of contents for a workbook/guidebook on the use of indicators for GFCM fisheries management

Section 1

1. Introduction - motivating the need for indicators
    - for policy makers
    - for fisheries management
    - for industry
    - for other stakeholders
2. Linking goals and objectives to indicators (a framework life cycle of indicators)
    a. Management objective/question to be measured
    b. Justification for indicator selection (cost effective, representative, etc)
    c. Targets – reference points for indicators determined
    d. Methodology for indicator calculation
    e. Data sets and metadata collected and indicator estimated
    f. Scenario analyses
    g. Presenting the data of ease of use/interpretation (trends analyses, graphics, etc)
    h. Recommendations based on indicator data
    i. Reporting the indicators (communicating results)
    j. Management action/adapted fisheries management
3. Overview of decision-making tools for fisheries management (for steps e and f, above)
    Bio-economic models, baysien networks and fuzzy logic in decision support systems, social impact assessment methods, etc

Section II

4. Socio-economic indicators and the GFCM fleet segmentation
    a. Fleet segments: GFCM segmentation, use of census and stratification
    b. National indicators: description, international sources of data, and interpretation
    c. The survey process: sampling plan, description of questions, field work at harbours, introduction of data ad revision. The alternative use of other sources.
    d. The calculation of outcomes: files, reports and graphics and time series
    e. Fleet Segment indicators: description and interpretation
    f. The use of the statistical procedures to evaluate the validity of the outcomes
    g. The improvement of the quality of the survey sampling distribution. The proposal for next period survey sampling distribution.
    h. The use of reference points: definition, interpretation and potential modification of the reference levels
    i. The use of the bio-economic models, social impact assessment models as well as decision support systems to produce simulations and impact analysis.

5. A GFCM socio-economic indicators software package
    a. The structure of the software
    b. Implementing steps a through i, above
    c. Data export routines
    d. Modification mechanisms

6. Working examples in the Mediterranean

7. Glossary

Annex 10

Draft Terms of Reference for the FAO Circular
"Economic Status of Mediterranean Capture Fisheries"

1 General Introduction
  1.1 Importance of the fisheries and aquaculture sector in Mediterranean economy
2 Overview of the Mediterranean Harvesting Sector
  2.1 Introduction
    - species description
    - main indicators by country
    - coverage of data (% of fleets covered by segment)
  2.2 Quantity, Ex-vessel value and composition of landings/production
  2.3 Effort by fleet segments
  2.4 Socio-economic aspects of fisheries (age, unemployment, mobility, dependency on fisheries, etc.)
  2.5 Regulatory framework
  2.6 Management of fisheries
  2.7 Data needs
3 Overview of Med Aquaculture Sector
  3.1 Intro
    - species description
    - main indicators by country
    - coverage of data (% of fleets covered by segment)
  3.2 Supply of production inputs
  3.3 Quantity, Off-farm value and composition of production, Stocking Density
  3.4 Productivity by cage culture or species
  3.5 Socio-economic aspects of aquaculture
  3.6 Regulatory framework
  3.7 Management of aquaculture
  3.8 Data needs
4 Market interactions between capture fisheries and aquaculture
  4.1 Outputs as inputs
  4.2 Market substitutes/complements
  4.3 Data needs
5 Mediterranean Processing Sector
  5.1 Description
  5.2 Outputs as inputs
  5.3 Data needs
6 Mediterranean Trade Sector
  6.1 Exports
  6.2 Imports
  6.3 Trade and efficiency
  6.4 Demand for Seafood
  6.5 Data needs
7 Factors likely to influence the fisheries and aquaculture sectors
-international regulations/norms
-market forces (trends in demand, supply)
-financial transfers

Annex 1. Regional reviews by fleet segments (Adriatic, MedSudMed, etc)
Annex 2. Country reviews by fleet segments

Annex 11

Framework for a Base-line Understanding of the Socio-Economic Dimensions of Recreational Fisheries in the Mediterranean and Black Seas

In the move toward a base-line understanding for improved management of recreational fisheries in the Mediterranean and Black Seas, the following proposed set of activities provide a framework for a short- to medium-term collection and analysis of information concerning the human dimension (i.e. political, institutional, social, and economic) of recreational fisheries in the Mediterranean and Black Seas. This information, when combined with biological and ecological information, is central to decisions about fisheries management.

1. A first step would include desk-top studies of available information in each country with the aim to describing, *inter alia*, the following:

Definitions and descriptions

- Clarify the terminology in use (i.e. recreational fishing, sports fishing, angling fisheries, etc.)

Stakeholder Identification

- Understanding the basic categories of interested parties (shore-based casual fishers not organized, boat-based organized fishers, fishers associations, universities/research centers, governmental organizations, non-governmental organizations including environmental groups, etc) – who would be interested in participating in recreational fisheries management? Who is in charge of management? Who is in charge of application of management (monitoring and control)?
- To what extent are stakeholders included in the management process? Formal and informal mechanisms.

Recreational fishing participation

- What do we know about how many people fish, the types of fish and fishing methods employed, where people fish, etc?

  Examples indicators include:

  - number of moorings;
  - number of recreational vessels;
  - number of licenses;
  - number of participants;
  - captures.

Organization of recreational fishers

- Are recreational fishers organized (i.e. members of associations?)? How is information disseminated to recreational fishers (i.e. attached to licences, internet, mailings)? What are the roles of existing organizations?

Consumer Demographics

- What do we know about the age, income, education, etc of recreational fishers? (age distribution, gender, marital status, average household income, education, etc)

Sales and other Trends

- What do we know about how much anglers spend on fishing activities (travel, hotels, gear, charter trips, vessels, etc), the economic impact of recreational fishing, tax/licence revenue generated, and other benefits created by recreational fishing?

  Example indicators include:

  - tackle Sales Trends Indices;
  - fishing License Sales Indices;
  - fishing Tackle Imports Indices;
  - online Tackle Sales Indices;
  - rainfall Indices – (statistically shown to be the top indicator of fishing activity);
  - recreational fishing boat sales;
  - hotel revenues to large recreational areas;
  - tax/licence revenues.

Interactions with Commercial Fisheries

- What are the areas of potential conflicts between recreational and commercial fisheries – fishing zones, shared target or non-target species, selling of recreational fisheries catches, etc.

To assist in such information gathering and sharing, each country study would include a listing of information resources available (e.g. fishing census, industry reviews, licence records), including third-party data resources and web sites.

2. A second step would include a collation of the country reviews at a sub-regional or regional level; organizing the information into homogenous categories and highlighting areas where necessary information are lacking. Based on the region's experience and experience elsewhere in the world, an inclusive set of information necessary for recreational fisheries management would then be developed and propose appropriate methods available.

3. Step three would comprise regional meetings in which the results of the first two steps are presented, priorities for "information for management" are defined, and relevant activities are programmed.

4. A fourth step, based on the priorities and recommendations from steps 2 and 3, would be to deepen our understanding of the total economic value of the recreational fisheries. Estimating the economic contribution of a recreational fishery is made more complicated in that this activity generates both market and non-market impacts. Market values are those for which a market price exists (e.g. the purchasing of fishing tools, hotels, and transport – how much they spend on a fishing experience) and, therefore, more easily calculated. Non-market values, such as cultural and social benefits of fishing experience (i.e. how much they value the resource beyond what they pay to access it), do not have direct market prices and, therefore, must be estimated indirectly. Box 1 comprises a brief listing of current economic valuation techniques for recreational fisheries.

Crucial to this process is the inclusion of stakeholders in the provision and analysis of such information. For example, sports fishing associations and related sport fishing events/competitions are a potential wealth of information but may not know how these data could be useful for fisheries management.

Expanding our knowledge to the suite of human dimensions of recreational fisheries (i.e. economic, social, institutional, and political) from the limited socio-economic dimensions addressed in this framework will be crucial to developing effective recreational fisheries management.

Box 1. Economic valuation techniques for recreational fisheries

Current economic valuation techniques can be divided into three sub-categories:

1) revealed-preference approaches:

Travel cost: Valuations of sit-based amenities are implied by the costs people incur to enjoy them (e.g. improved sport fishing activities, fishing tour).

Market methods: Valuations are directly obtained from what people must be willing to pay for the service or good (e.g. ecolabelling price differentials, increased value of a fishery).

Hedonic methods: The value of a service is implied by what people will be willing to pay for a service through purchases in related markets, such as housing markets (e.g. recreational vessel purchases, housing purchases on coastal areas and waterfronts).

Production approaches: Service values are assigned from the impacts of those services on economic outputs (e.g. increased efficiency from by-catch reduction methods, improved CPUE in a fishery).

2) stated-preference approaches:

Contingent valuation: People are directly asked their willingness to pay or accept compensation for some change in ecological service (e.g. coastal reef preservation, endangered species protection).

Conjoint analysis: People are asked to choose or rank different service scenarios or ecological conditions that differ in the mix of the conditions (e.g. MPA with varying levels of permitted human activities).

3) cost-based approaches:

Replacement cost: The loss of a natural system service is evaluated in terms of what it would cost to replace that service (e.g. alternative coastal livelihoods).

Avoidance cost: A service is valued on the basis of costs avoided, or extent to which it allows the avoidance of costly averting behaviours, including mitigation (e.g. participatory fisheries management reduces conflicts, health benefits of fish products).

Source: Farber, et al. 2006. Linking Ecology and Economics for Ecosystem Management. Bioscience; Vol 56 (2) pp. 121 – 133; Academic Research Library.
Notes: Examples have been changed to reflect fisheries aspects.

Annex 12

Draft terms of reference for a Transversal Working Group on Recreational Fisheries in the GFCM and its first meeting

In addition to its economic and social dimensions, recreational fisheries (RF) have bio-ecological dimensions of potential importance, due to their impacts on the environment and marine food webs. Therefore, as is the case with all extractive fisheries, RF management is an integrated issue, requiring the attention not only of SCESS but also of the other SAC Sub-Committees. Interdisciplinary interaction, research and evaluation are needed to estimate the impacts of RF on the marine environment, commercial fisheries, recreational fishing communities, economies etc. In this respect, a transversal or an interdisciplinary working group is needed for continuing the discussion between experts that had began in the frame of the SCESS and to exchange experiences.

The mandate of the working group will be to:

- define, as is the case for the socio-economic dimensions, a framework for the collection and analysis of biological, ecological, environmental, economic and social data for RF management;
- define the minimal list of bio-ecological, environmental, economic and social data or indicators for future incorporation in the Task 1;
- to develop a common interdisciplinary methodology for monitoring RF;
- to develop common legislation and effective enforcement for RF,
- to develop a code of practice/conduct or guidelines for RF in the GFCM;
- to develop methodologies to study the RF economic and social (direct and indirect) impacts on national and sub-regional level;
- to develop methodologies to study the interactions between RF and commercial fisheries (fish stock competition, fishing area conflicts, environment, regulations, market, and socio-economic status, etc.) with a link to Task 1 to understand interactions with existing fleet segmentations (i.e. operational units); and
- To continuously improve the framework as presented in Annex 11.

The terms of reference for the first meeting of the Working Group will be to:

- review and complete the definition of RF as proposed by SCESS, 2007.
- review the existing legal, management and environmental frameworks are to be considered;
- define an integrated framework for the collection and analysis of biological, ecological, environmental, and socio-economic data for use in RF management;
- identify and develop priority case studies at the country level to assist in the finalization of the above; and
- define the terms of references for the second meeting of the RF Working Group.

As inputs into the first meeting, the following documents will be considered:

- The upcoming GFCM Study and Review 81[8] and country experiences with RF (including legislation and enforcement) that had been presented in the July, 2007 workshop on the use of socioeconomic indicators in fisheries management held in Tajoura, Lybia;
- The report of the workshop on the use of socio-economic indicators in fisheries management held in Tajoura, Lybia (July, 2007); and
- The report of the 8th Meeting of the Sub-Committee on Economic and Social Sciences (SCESS) held in Kavala, Greece, 17–20 September 2007, which includes the framework for a base-line understanding of the socio-economic dimensions of RF in the Mediterranean and Black Sea as well as the minimal list of social and economic indicators for RF.

[8] Gaudin, C. & De Young, C. Recreational fisheries in the Mediterranean Countries: A review of existing legal frameworks. Studies and Reviews. General Fisheries Commission for the Mediterranean. No.81. Rome, FAO. 2007.

Annex 13

Draft outline for the FAO Circular "Fish Trade of Mediterranean Countries: Intra-Regional Trade and Import-Export with the European Union"

Annex 14

Terms of Reference for a SCESS Workshop on the Methodology to use market data to understand the changes in effort in a fishery management framework

In order to provide a proper and efficient fishery management framework, regardless of its territorial scope (national, regional, etc.), understanding of the impacts of the market factors (such as price, demand, competition etc.) on the fishing efforts and, consequently, changes in the ecological, economic and social indicators, becomes crucial.

At the SCESS meeting several examples were mentioned, such as study of the relationship between price change and fishing effort in Morrocco which provided valuable insights relevant for future decisions. Apparently, there is a significant intererst in other countries to do such and similar studies, either of national or regional scope (e.g. the impacts on the 40mm net regulation).

Thus, a SCESS Workshop is proposed to allow for the exchange of experiences among the countries as well as to discuss:

- potential studies at the country level, based on the methods used so far;
- potential studies in the methodologies yet to be introduced in the analyses of the market impacts,
- development of common decision support tools for the fisheries management in the Mediterranen.

As an aid to the discussion, a background paper will be prepared reviewing the methodologies used in analysing market data to understand the changes in effort.

The final outcome of the Workshop would be a report presenting a methodological framework and some examples of its application.

Annex 15

Creating Incentives in Fisheries Management: A Portfolio of Approaches for Consideration in the GFCM[9]

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and
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1 INTRODUCTION

There is widespread agreement on the need to enlarge our fishery management "tool box"; thereby increasing the range of creative measures available to suit the panoply of fisheries that managers face. A key challenge lies in determining the right tools to utilize in specific situations. The idea in choosing suitable management tools is not to rely on *a priori* judgments of the rightness or wrongness of any given tool, which would be inappropriate, but rather to develop and build on an understanding of the biological, sociological, economic, and political context in question.

Discussion of the management "tool box" is influenced by current thinking in fisheries management, which is moving toward a set of understandings that include (but are not limited to) the following: (1) that tools used in isolation have less of a chance of being effective than a mix of complementary tools used in tandem; (2) that although managing people is complicated, managing fish and ecosystems is even more difficult if not impossible; (3) that new tools are necessary to help us manage in light of our recognition of the uncertainties we face; (4) that if people are included in the management process and understand why it is in their interest to do something, chances of successful implementation of the resulting management are increased; and (5) that something needs to change since, on the whole, fisheries management has been neither effective not efficient.

This paper attempts to broaden the tool kit discussion by presenting a certain sub-set of management mechanisms – the use of incentives. A brief introduction by means of a problem statement and the possible role of incentives in addressing these issues is followed by a description and discussion of incentives as categorized into legal, institutional, economic, and social incentives. In addition, concise examples are provided as starting points for further investigation. The ultimate goal of this paper is to stimulate discussion regarding the appropriateness and desirability of including the use of incentives as part of the toll box within GFCM Members' fisheries strategies towards sustainable development.

2 WHAT ARE INCENTIVES MECHANISMS AND WHY DO WE NEED THEM IN FISHERIES MANAGEMENT?

An incentive in the broadest sense is any factor which affects an individual's choice of action – such factors could range from the price of an input (e.g., fuel) or final product (e.g., fish) to fines for breaking established rules, to social or peer pressure, and religious beliefs, etc. In any given situation, incentives of various kinds will already be in place, but these may not induce the sort of individual decisions that society may desire. This leads to a need to create or introduce more appropriate incentives – a need that arises in particular in marketplaces when the market price of a product does not fully reflect the impacts (either positive or negative) of its production or consumption on society.

This need for appropriate incentives is related closely to the existence of externalities. Examples of negative externalities include nutrient runoff from farms into water bodies (an action taken by farms that impact negatively on non-farming users of the water bodies) and carbon emissions from electricity production. Examples of positive externalities include those arising from education and health-care provision, which provide benefits beyond those specific sectors of activity. The lack of internalization of any of these costs and benefits by those choosing to produce or consume goods leads to socially suboptimal levels of such

[9] The information contained in this brief is primarily based on De Young, *et al*., 2006.

activities – i.e. too much of those producing negative externalities, and too little production of goods that provide positive externalities.

In capture fisheries, externalities have been classified into the following five categories of externalities (Seijo, *et al.*, 1998)[10]:

- **Stock externalities**. The impacts of one fisher's activities on the availability of the target species for other fishers in the fishery (i.e., the activity of each fisher reduces the fish stock available to other fishers).
- **Crowding externalities**. The impacts of vessel aggregation in the fishing grounds on marginal catch costs in the fisheries (i.e., the presence of any one fishing vessel increases the level of 'crowding', thus increasing the costs of fishing for all vessels).
- **Technological externalities**. Similar to stock externalities but relating to fishing gear impacts on population structures of by-catch species that are targeted species for other fisheries (so one fleet, targeting certain species, produces negative externalities for other fleets).
- **Ecologically based externalities**. Broadened concept of stock externalities that considers ecological interactions between various species targeted by different fisheries. This could include positive externalities (e.g., if one fishery harvests a species that is competing against the species targeted by another fishery), as well as negative externalities (e.g., if the species are part of the same food web [i.e., predator and prey]).
- **Techno-ecological externalities**. The impacts of fishing practices/gears on the broader ecosystem (e.g. habitats and biodiversity).

Where such externalities are not managed, over-capacity, over-fishing, and welfare losses are the predicted results; thereby impacting the ability of fisheries to 1) contribute to economic development, food security, and poverty prevention/alleviation and 2) maintain the wide range of services provided by fisheries ecosystems (e.g. income and employment, social, religious, and cultural identities, habitats and biodiversity regulation).

Other externalities impacting ecosystem productivity stem from non-fisheries activities, such as agriculture and aquaculture nutrient runoff, marine transport pollution, and tourism-related impacts. Depending on the level of integration within coastal and marine management systems, the fisheries sector may have varying degrees of influence on the management of non-fisheries externalities affecting fisheries ecosystems; however, it remains important that these links be identified and acknowledged as these external factors will certainly impact the effectiveness of any fisheries management system.

The first three categories of externalities mentioned above: stock, crowding, and technological, are those which would fall under the narrow definition of conventional fisheries management; while a consideration of the final two categories: ecological and techno-ecological, as well as extra-fisheries externalities, would be a broadening of the management concept to the ecosystem approach to fisheries (EAF). And with this broadening, the scale and scope of benefits and costs related to applying the EAF will also expand. For example, minimizing turtle mortalities due to fishing activities through gear, spatial, and temporal adjustments may impose costs locally (i.e. to the fisherman) but create benefits globally (i.e. to those holding values for biodiversity). In addition, while the costs associated with EAF implementation are borne often in the short-term, benefits accrual may take place quite far in the planning horizon.

Hence, correcting for externalities is one of the major challenges of implementing the EAF. This brings the focus back to incentives, as it implies a need for additional measures of various sorts to induce fishery participants (and others) to change behavior in keeping with the EAF. Such measures supporting positive behavioral change could be social, economic, legal or institutional in nature; all of which involve the use of 'incentives' toward behavioral change, i.e. considerations that an individual will factor into their decision making and which will lead to a result more in keeping with desired societal directions (in this case, effective implementation of EAF). From an economics perspective, one might view incentives as influencing the profit-maximization of a fishery participant (i.e., increasing profits as a result of EAF-compatible actions, and conversely reducing profits for actions contrary to EAF objectives). From a sociologist's perspective,

[10] The discussion focuses only on the physical capture of fish and other aquatic organisms.

incentives might be social constraints on behavior (e.g., resulting from peer pressure and cultural institutions) that lead to more desirable outcomes.

This brief will present and discuss social, economic, legal and institutional incentives in support of the implementation of sustainable fisheries management, as understood as follows:

- **Legal incentives** (e.g., effective legislation creating positive 'carrots' as well as 'sticks' in the form of significant penalty structures with effective enforcement capability);
- **Institutional incentives** (e.g., fisheries management systems and participatory governance arrangements that induce support from stakeholders).
- **Economic/market-based incentives** (e.g., win-win measures that lead to outcomes that are better both for the fisher and for the fishery ecosystem, such as the use of some excluder devices in fishing gear, to increase profits by reducing fishing costs, broadening market access, while also reducing by-catch); and
- **Social incentives** (e.g., community-based institutions and social environments that create peer pressure on individuals to comply with agreed-upon community rules).

It is clear that incentives can take many forms – some being of quite general applicability, and others being very specific to particular circumstances. Similar to technical management tools, such as spatial restrictions and catch limits, no single incentive will be a panacea for management – a mix of incentives measures that are appropriate to the fisheries and their social-cultural settings will minimize unintended consequences and increase the likelihood of effective EAF management. The following sections will provide an array of incentive measures within fisheries (generally applicable to EAF management as well as conventional fisheries management, if deemed different), as well as a final section discussing extra-fisheries mechanisms that are in use to improve ecosystem performance and encourage sustainable development.

3 LEGAL INCENTIVES

Regulatory frameworks form the legal backbone of fisheries policies and management systems. These regulatory frameworks, which specify the requirements, rights, and responsibilities placed on fishery users so as to meet desired policy goals (such as EAF objectives), are usually enunciated within the fisheries legislation. These might include the requirement to hold a fishing license, to undergo environmental and other impact assessments, to develop fleet-specific or local-level management plans, or to use specified impact-minimizing gear. In addition, regulatory frameworks can provide the legal basis for EAF by, among other things:

- setting property rights systems;
- providing a framework for coordination and integration;
- defining roles and responsibilities;
- specifying international norms and requirements;
- providing a framework for management processes;
- providing legal mechanisms for conflict resolution;
- describing the penalty structures for violations of rules and laws; and
- providing for monitoring and control systems.

Such legal backing provides credibility and clarity to management systems, and hence provides incentives for compliance. In addition to direct incentive-promoting content within legislation, certain characteristics of regulatory frameworks would contribute to promoting positive change, including: (1) being flexible and responsive to various changes, for example to changes in the knowledge base, and biological, ecological and socio-economic changes; (2) being stable enough to provide continuity; and (3) being congruous – providing consistency between fisheries and other sectors and between local, national, regional, and international regimes.

4 INSTITUTIONAL INCENTIVES (INCLUDING FISHERY RIGHTS)

In moving from conventional fisheries management toward EAF management, some changes to current institutional frameworks are likely necessary in order to, *inter alia*, motivate stakeholder buy-in and participation in fisheries management. These changes will likely include providing ways of taking account of and dealing with the increased scope and demands of this management approach, including:

- A need for increased coordination, cooperation and communication within and among relevant institutions and resource users in the planning process as well as in implementation.
- A need for more information regarding the ecosystem and the factors affecting its health and productivity.
- A need for incorporation of uncertainties into the decision-making process due to the increase of factors (predator-prey relationships, nearby activities, such as agriculture, and their impact on the ecosystem etc.) causing uncertainties.
- A need for ways of truly involving the broadened definition of stakeholders in decision-making and management, such as capacity building and multi-directional information dissemination.

Although not incentive mechanisms *per se*, proper institutional arrangements may generate incentives to assist in the application of the EAF, such as buy-in, cooperation, and reducing the race to fish. One commonly-advocated institutional approach for creating incentives supportive of policy goals, such as the EAF, is that of rights-based approaches (i.e. assigning, or recognizing, rights over the use and management of a fishery). Two key elements of rights-based approaches are as follows (Charles, 2002):

Use rights - an institutional mechanism by which fishers, fisher organizations and/or fishing communities hold rights and some security of tenure over access to a fishing area, or the use of an allowable set of inputs, or the harvest of a quantity of fish. If use rights are well established, fishers will have greater security, as there will be increased clarity with respect to who can access the fishery resources and how much fishing each is allowed to do. This can encourage fishers to support conservation measures – since protecting 'the future' becomes more compatible with their own long-term interests. Examples of use rights include territorial use rights (TURFS), customary marine tenure (CMT), and individual transferable quotas (ITQ).

Management rights – the right to be involved in managing the fishery – reflects the need, as noted in the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), to "facilitate consultation and the effective participation of industry, fishworkers, environmental and other interested organizations in decision-making with respect to the development of laws and policies related to fisheries management…". This has led notably to the emergence of co-management arrangements involving joint development of management measures by fishers, government, local communities, and other stakeholders.

Through use rights and management rights, it is hoped that incentives will be improved, increasing the possibility that participants will (1) adopt a longer-term perspective on the fishery, since their use rights are secure over a longer time frame, (2) comply with management regulations, since they have been involved in developing those regulations within the management process, and (3) engage in greater cooperation, since one's well-being may become more closely intertwined with that of others. Of course, introducing a rights system will have accompanying benefits and costs (and varying distributional impacts of each) so there is a need to assess these aspects (as well as monitoring any negative impacts of the measures).

While use rights and management rights have been well-discussed in the general fisheries literature, there are some specific considerations that need addressing with respect to EAF implementation. In particular, as EAF implies a broader scope of fisheries management (to include multiple species, the aquatic ecosystem, the range of societal objectives, and any interactions with other economic sectors, amongst other aspects), use and management rights within such a context will need to deal with other 'users' of the ecosystem beside the specific stakeholders in the fishery being addressed. Other capture fisheries, recreational fisheries, aquaculture, offshore oil and mining activities, eco-tourism and/or coastal tourism, shipping, urban development, coastal industries, and other aquatic-based human endeavours all vie for resources and impact the ecosystem along with fisheries. Just as rights may be allocated to use specific fishery resources and to be involved in managing those resources, so too may there be rights arrangements for others – perhaps in the context of integrated coastal and ocean management, or integrated watershed management. While this goes

beyond EAF *per se*, clearly it is a reality that must be taken into account, and which bears very much on the broader goal of ecosystem health and necessarily involves more than just those within the fishery.

In summary, the judicious recognition or adoption of use rights and management rights can help align incentives to desired EAF policy, but this is not a simple task, and indeed taking the wrong approach can produce results contrary to the aims of EAF management. Thus it is important to understand the relationship between rights and incentives, which will vary from case to case.

Example: Multi-stakeholder management rights

An example of broad-based ecosystem-level *management rights* is that of the regional aquatic management board established on the west coast of Vancouver Island, on the Pacific coast of Canada, which was formalized in 2001, as a multi-stakeholder institution for community-based co-management of aquatic-based resources. It is a forum for shared decision-making, where coastal communities and others affected by aquatic resource management can work with governments on integrated management, on an ecosystem basis. The Board is made up equal numbers from governments (federal, provincial, regional and native) and non-governmental representatives (various economic sectors, communities, etc.). Its operation is based on several principles: Shared Responsibility (all participants are jointly responsible and accountable), Inclusivity (all should have the opportunity to participate in management decisions) and Flexibility (structures and processes should be flexible and expected to evolve). Key objectives are (a) to consolidate information relating to different aquatic resource uses and utilization, (b) to integrate expertise and knowledge from all sources, and (c) to ensure opportunities for coastal communities and others affected by the resource management to participate in integrated management, protection and restoration of aquatic resources.

Sources: Pinkerton et al. (2005) and http://www.westcoastaquatic.ca

5 ECONOMIC/MARKET-BASED INCENTIVES

Economic incentive mechanisms that are created outside of existing markets are based on the idea of establishing a situation in which economic actors/agents are convinced that it is in their private interest to make the socially desirable choices. In this brief, the discussion is separated into 'carrot' and 'stick' incentives categories – we refer below to "economic incentives" as the 'carrots' (positive incentives) that promote desired behavior, and "economic disincentives" as the 'sticks' (negative incentives) that penalize undesirable behavior. Such categorization is artificially derived to reflect how the mechanisms affect the benefits and costs structures of the economic agents. Therefore, benefit- and cost-sharing mechanisms have been inserted into these pre-defined categories although neither clearly carrots nor sticks.

5.1 Economic incentives (the carrot)

The use of positive incentives may be split into three categories: conservation price differentials, best-practice/conservation payments, and rights-based incentives. From an economic perspective, all of these seek to shift cost and revenue curves with the aim of attaining a level of fishing activity that is optimal from a societal perspective. In addition, positive economic incentive instruments would, in theory, allow actors to determine for themselves the least cost means of obtaining a given management objective.

Price differential payments occur when consumers demonstrate through the prices they pay the values they hold for ecosystem goods and services; such payments serve as market signals to industry and governments. For example, these payments may take the form of higher prices paid for 'ecolabeled' products, which establish a mechanism for identifying sustainably-produced products and may relate to price premiums or export certificates. The impact on the international market has begun to make itself felt as large retailers pick up on the movement and, perhaps, the price differentiation.

Other attempts to affect consumer choices include fair-trade labels, good fish guides[11], and fish fairs promoting artisanal and local products. Such instruments are geared towards the provision of information to consumers regarding the circumstances leading to the availability of the offered products (e.g. fishing practices, stock status/sustainability, and fishery management regimes).

Example: Certification of Red Rock Lobster, Baja California, Mexico

In April 2004, the Marine Stewardship Council certified the Red Rock Lobster fishery on the Pacific coast of Baja California, Mexico, as a sustainable fishery. The trap fishery "is currently exploited by about 500 fishermen belonging to nine fishing co-operatives and spread over ten villages. Fishing legislation for the fishery was first drawn up in the 1940's as a result of which fishing rights were allocated to co-operatives… Management involves a combination of limited entry, strict delineation of co-operatives fishing areas and community-based self-regulatory measures." The fishery is heavily export-oriented, with 90% of the catch going to markets in Asia, France and the United States. There is thus a clear economic incentive for certification, which provides the potential for better global access to markets, and a higher market price (if a 'price differential' develops relative to non-certified lobster).

Source: Marine Stewardship Council (http://www.msc.org)

Best-practice/conservation payments are transfers to the fishing industry, fishing communities and/or fishers directly, from governments, nongovernmental organizations (NGOs) or other institutions, to compensate for some or all costs of implementing sustainable fishing practices. Such practices may include the use of best-available technologies (e.g. turtle exclusion devices and vehicle monitoring systems [VMS]) or restrictions on fishing patterns (e.g. no-take zones or seasons, and buyback programmes). These transfers may be considered as payments from those who benefit from conservation or best-practices to those who bear the direct costs of their implementation. If the transfers are made by governments, they may be equivalent to environmentally-positive subsidies, made on behalf of society as a whole, while if originating with nongovernmental organizations, foundations, etc., such conservation payments would typically reflect the focus of those bodies.

One form of best-practice/conservation payments are competitions to engage and reward the fishing industry in the design of fishery-specific technology. These can complement regulatory mechanisms (that involve the requirement of technological change), allowing industry participation through the design of the most appropriate and low cost options – they have met with certain success as creativity from within the industry is rewarded and the process tends to increase acceptance of use (see, for example, Annex 1).

Conservation payments can occur when the non-use/existence benefits of certain resources are higher than the extractive use benefits. In these cases, the opportunity costs of not using the resources need to be compensated, either through direct or indirect transfers. This is especially important in small-scale fisheries that depend on the extractive uses for their livelihoods. Direct payments have been used by specific conservation projects in which fishing communities are paid to maintain a given habitat or not to use a resource. Unfortunately, such payments are usually linked to the longevity of the given project and, therefore, once the project has finished, so have the conservation payments. Ferraro and Kiss (2002) present a review of current debates regarding direct payments to conserve biodiversity.

Other conservation payments have focused on indirect transfers focusing on training or other livelihoods diversification methods based on the thesis that reducing fishing communities' vulnerability will naturally increase their ability to sustainably use and management fisheries resources (SFLP, 2006).

Another market-based conservation mechanism is that of eco-tourism development, involving shifts from extractive uses of resources to non-extractive uses. Essentially, the idea is that payments from tourism compensate for lost fishing revenues and may provide for alternative or diversified livelihood sources. However, as is often the case for substitutes, negative impacts on ecosystems may occur (e.g. pollution, crowding, and noise from boats and divers); thereby warranting caution in their use. In addition, the demand

[11] These guides present lists of fish products ranked by some measure of biological sustainability and are usually focused on specific markets to assist consumers in their consumption choices of fish products commonly found in local markets or supermarkets.

for eco-tourism may not be sufficient and stable enough to guarantee conservation of habitats and commercial species and this demand may only pertain to highly valued species, such as sharks, whales, and turtles.

Example: Valuation of whale sharks

Graham (2004) studied this matter, comparing the Taiwan market price for a (dead) whale shark – between US$7,116 and US$21,400 – with the (live) value derived from tourism estimates. She notes that "Using the 2002 Belize whale shark tourism survey results, each shark is worth at least US$34,906 annually. A similar annual value of US$33,500 for each grey reef shark…was recorded in the Maldives. If whale sharks live to at least 60 years old, then an individual might be worth US$2,094,340 over its lifetime providing it repeatedly visits the tourism site." She concludes that "the economic argument for protecting whale sharks is undeniable". This in turn implies the potential for conservation payments to encourage such practices.
Source: Graham (2004)

Rights-based incentives are the third form of 'carrot' – such incentives, as discussed earlier, typically address the implementation of user rights within a fishery; thus removing, to a greater or lesser extent, the condition of open access and providing an incentive for long-term sustainability. With an effective mix of user rights, the remaining fishing actors may be able to maximize the net present value of the resources, if any future streams of benefits and costs are either integrated into the price/value of the use right (e.g., a permit or a quota), or into the choices made by the 'owners' of the resources. For a review of experiences in the use of property rights and the implementation of transferable quota rights in fisheries management, see FAO (2000a) and (2001), respectively. FAO (1982) provides a discussion on the conditions affecting the successful creation and maintenance of TURFs. Examples of TURFs may be found across the globe (e.g. Argentina, Chile, Japan, Peru, Philippines, South Africa, the U.S., and Vanuatu) and have usually, but not always, developed in situations with historic roots of community-based management of natural resources.

Example: Territorial Use Rights in Fisheries

When fishers hold use rights, there is more secure access to the fishery, and potentially greater incentives for compliance with management – particularly when there are accompanying management rights. Castilla and Defeo (2001), in a review of management practices in Latin American shellfish fisheries, examined the role of TURFs, concluding that the examples studied "illustrate the strong potential that the apportionment of TURFs has, when accompanied by a co-management approach. In Chile, the allocation of TURFs among communities that extract benthic shellfish is an efficient tool to cope with overexploitation concerns… Allocation of TURFs to fisher organizations ameliorated the weaknesses of enforcement regulations and the high transaction costs in a country with more than 4,200 km of coastline… [and] improved the status of shellfisheries… The formal allocation of TURFs to fisher organizations such as the collectively managed spiny lobster fishery of Punta Allen (Mexico) constitutes another sound example…"

Source: Castilla and Defeo (2001)

5.2 Economic disincentives (the stick)

Economic disincentives within an EAF context mirror the polluter-pays and user-pays principles (PPP and UPP, respectively) used in the allocation of costs of pollution prevention and control measures and sustainable development paradigms.[12] These principles attempt to correct for existing market failures by internalizing into the production function the costs of using natural resources and of negative impacts on the ecosystem. Such principles have become standard policy in treating water, air, and hazardous chemicals/waste issues; while their application to the fisheries sector has been slower to materialize. Coffey and Newcombe (2001) have provided a nice analysis of the current and potential use of PPP in European fisheries and the generalized results are presented below. In their work, one can identify several objectives

[12] The polluter pays principle means that the polluter bears the expenses related to any pollution prevention and control measures; meaning that these costs are reflected in the cost of goods and services which cause pollution in production and/or consumption. The user pays principle is a variation on the polluter pays principle that "calls upon the user of a natural resource to bear the cost of running down natural capital" (UNSD, undated).

for the use of economic instruments (e.g. taxes, charges, and levies[13]) in line with the PPP/UPP: (i) cost recovery for fisheries management, (ii) paying for resource use, and (iii) paying for environmental damage prevention or alleviation.

Cost recovery for fisheries management, generally through taxes/levies, while not really a 'stick' incentive measure, will change the private profit functions of fishing activities and should instil a sense of ownership of the results of management as a direct link is made between the benefits of management and their costs (Cox, 2000).[14] However, while explicit research on applying cost-recovery mechanisms elsewhere and implicit use within fisheries co-management regimes are occurring,[15] It must be noted that use of cost recovery mechanisms has, for the most part, been applied only within the OECD countries, and indeed in cases where revenues are collected from fisheries activities, more often than not these revenues go directly to the central government budget. In such cases, the link between benefits and costs of management services cannot be made and fisheries authorities continue to base their management activities on governmental appropriations.

Example: Fisheries management cost recovery in Australia

In Australia, cost recovery for fisheries management "means that the commercial fishing industry pays for those costs directly related to fishing activity, while the Commonwealth government pays for management activities that may benefit the broader community (as well as the industry) and that satisfy a range of specific community service obligations". In line with the Australian national cost recovery policies, the State of Victoria has proposed their *Fisheries Regulations 2006*, amending the amount paid for fisheries management services (FMS) levies by the capture fisheries sector. The rationale of the FMS levy increases was to continue the phased introduction of the recovery (to 100%) of the attributable costs associated with the delivery of FMS and to link each beneficiary to these costs. Attributable fisheries management costs are defined as the costs associated with FMS that benefit private beneficiaries belonging to a particular fishery sector or class of access licence.

Sources: Cox (2000); DPI (2005)

Paying for resource use, often through license/access fees, taxes, and tradable or auctioned quotas, is an acknowledgement within the fisheries sector of the value of natural resources, much as in the use of land, water, or other natural resources. Historically, access to fisheries resources was free and all profits from the use of these resources were either dissipated, in the case of open access fisheries, or kept by the fishing industry. Governments and, hence, societies, had not insisted on payments for the use of these natural resources. However, with the onset of the Law of the Sea in 1982[16] and the idea of national ownership/stewardship of marine resources, the idea of private individuals paying society for the use of natural resources has gained ethical acceptance and jurisdictional backing.

The level of such payments would depend on the particular fishery and the economic concept of rent, which is the 'bonus' profit[17] from using a natural resource. In an open access fishery, there would be no rent to be had; so no rent extraction is possible. Moving from an open access fisheries to a socially optimal fishery, would increase the rent value of the fishery to the private users and, by consequence, those remaining in the fishery would pay for this privilege.

[13] The word taxes will be used interchangeably in the text for taxes, charges, fees, and levies.
[14] The OECD has proposed further that including industry in the decisions about and in the provision and payment of management services is highly likely to create incentives to improve the fishery's performance and to increase the cost-effectiveness of management services (OECD, 2003).
[15] See, for example, Keizire (2001) analysis of the fisheries management financing in Uganda and the Asia-Pacific Fishery Commission (APFIC, 2005) work regarding the implementation of fisheries co-management.
[16] The United Nations Convention on the Law of the Sea of 10 December 1982. See http://www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm
[17] "In relation to fisheries, a 'rent' is generally thought of as the difference between total revenues obtained from the fishery and the total costs (estimated at their opportunity costs) of employing the various factors of production that together make up the enterprises participating in the fishery." FAO (2000b)

Third country access agreements (i.e. foreign fleets paying for the right to fish in another country's EEZ) have been used in cases where national fishing fleets do not have the capability of exploiting certain stocks and could benefit from rent extraction through fees and taxes. These agreements have been wrought with criticisms (e.g. IEEP, 2003) but as information sharing[18], experiences, and monitoring capabilities[19] are increased, such agreements may benefit national economies while ensuring sustainable harvest levels.

Paying for ecosystem damage prevention or alleviation, either through bearing the costs of appropriate technology or through paying fines for damages inflicted, is probably the most politically palatable use of economic incentives as it relates to a given 'bad' action. The fining of actions that have negatively affected ecosystems is quite common; however, these cases tend to involve actors outside of the fishing sector who have damaged habitat, such as through oil spills or dock building.[20] Fishing activities that have harmed the ecosystem (e.g. dynamite fishing, destructive anchoring, discarded by-catch, and incidental fishing of marine mammals) tend to be controlled through regulations, such as no-take zones, gear restrictions, and by-catch limits.

One economic disincentive in use with respect to harmful fishing activities is the use of trade barriers, such as the blocking of export permits under the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)[21]. CITES was developed to minimize the effect of international trade on commercial species either threatened with extinction (Appendix I species) or exploited unsustainably (Appendix II species). Trade in Appendix I species is all but prohibited; while trade is permitted for Appendix II-listed species if the related fishing practices are proved sustainable (i.e. the species "was legally obtained and if the export will not be detrimental to the survival of the species"). If the potential exporter is unable to prove the sustainability of the fishery, exportation rights are not granted; hence representing a change in the burden of proof. In theory, sustainable management of fisheries should keep the commercial species from being placed on the CITES listing; however, such trade measures are an acknowledgement of the impacts of market forces on our ability to manage resources.

Example: CITES and Queen Conch in Jamaica

The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) represents an international legal mechanism that has the effect of creating incentives for positive EAF-related behavior, particularly through the provision of export permits. As Cascorbi (2004) reports:

"Until 1999, Jamaica was the world's largest producer of queen conch. Most of this was fished on the Pedro Banks, a large undersea area that is the habitat for one of the Caribbean's largest and most important queen conch stocks. In the early 1990s, Jamaica's landings of Pedro Banks conch topped 3 000 metric tons per year. Jamaica also conducted its first conch stock assessments in the early 1990s. Recognizing a decline in the resource, the Jamaican government introduced annual catch and export quotas, implemented in 1994 in Jamaica's first conch fishery management plan. MSY for queen conch was calculated at 700-1 300 mt/year. Unfortunately, illegal fishing is now rampant on the Pedro Banks, much of it by foreign vessels that simply ignore Jamaican law. In the years 1999- 2002, illegal harvest was estimated to account for 40% of the conch fishing on the Pedro Banks. Jamaica conducted its third conch stock assessment in 2003. Although this stock assessment suggested a total allowable catch of 900 mt, Jamaica set its conch export quota at 500 mt to allow for some inevitable losses to illegal fishing… Based upon the findings of its September 2003 Significant Trade Review, CITES considers Jamaica to have an adequate conch management regime and relatively healthy queen conch populations. Jamaica is one of only two Caribbean conch-exporting nations to earn the CITES designation of 'least concern' for its queen conch resources."

Source: Cascorbi (2004)

[18] To this aim, WWF has created a "Handbook for negotiating fishing access agreements" (Martin et al, 2001).
[19] See FAO (2002) for guidelines on monitoring, control, and surveillance (MCS) aspects within access agreements.
[20] See the discussion below on extra-fisheries mechanisms.
[21] See http://www.cites.org/

Other trade barriers at the national level, such as the U.S. dolphin-safe tuna policy, create incentives to implement sustainable fishing practices as defined by the importing country. However, such measures may prove ineffective in creating more sustainable practices if substitute markets are available for the given products.

Although the PPP concept may now be found in more and more national fisheries' legislations, and is applied in relation to the impacts of non-fisheries activities on fisheries habitats, it is difficult to claim a wide-spread use of such economic instruments. Coffey and Newcombe (2001) presented a few considerations as to why the use of economic disincentives with respect to environmental damage/control may prove difficult. Implicit in the shift toward PPP is the removal of perverse incentives (minimizing 'harmful' subsidies) as, without doing so, fishing effort will continue to rise; making ineffective and inefficient any attempts to internalize the environmental costs of fishing.

6 SOCIAL INCENTIVES

Just as economic and/or market mechanisms can induce individuals to make choices compatible with societal objectives, so too can social factors produce similarly desirable behavior. Thus, developing and implementing successful EAF strategies requires understanding and working with the social mechanisms surrounding access to resources, institutional organization and decision-making, local management and power structures, cultural and ethical values, and attitudes and perceptions towards authorities and institutions. In other words, attention is needed to *social incentives* that affect the choices individuals and groups make.

Indeed, much of what has been mentioned in earlier sections might be termed social incentives: providing alternative livelihood opportunities or transparent and participatory management approaches, for example, both impact and are impacted by the social framework surrounding the fishery. Properly implemented management systems, from inception to monitoring and control, will affect people's incentives to comply with regulations as well as the strict economic gains and losses related to these regulations. Peer pressure within fishing communities can be harnessed as a social incentive producing more socially-desirable choices (e.g., improved compliance). Moral and religious codes, whether fishing is considered a right or a privilege, and knowledge about the ecosystem, will certainly involve social incentives that influence individual and group behavior (even though these are rarely captured in conventional decision-making models).

Recognizing and/or developing social incentives requires suitable understanding of why people act in certain ways, as well as an understanding of the socio-economic context of a given fishery (e.g. employment and livelihood opportunities, fishing traditions, local ecological knowledge, changing demographics). Such an understanding will assist in the identification of potential impacts of management interventions (e.g. where would displaced effort go) and will assist in promoting wanted change – without such knowledge, much information regarding the motivations, interests, and priorities of the resources users will be lost and management misguided.

7 EXTRA-FISHERIES INCENTIVE MECHANISMS

The discussion above has focused mainly on mechanisms falling within the conventional management sphere of influence. However, as the EAF requires a broader approach to resource management, negative and positive externalities stemming from outside of the fisheries sector are increasingly being incorporated into management, whether promoted by the industry itself or by government instigation. Therefore, a brief description of mechanisms to internalize the benefits and costs of extra-fisheries activities and values is presented below.

7.1 Non-fisheries "Polluter pays"

Financing EAF implementation through a "polluter pays" approach involves collecting revenues from those using the natural resource and/or causing ecosystem damage, and using those funds to finance positive moves to EAF management. In addition to the polluter-pays and user-pays incentive mechanisms described above, governments and fisheries associations have begun reclaiming the restoration costs in dealing with ecosystem damage inflicted by actors outside of the fishery sector (e.g. upstream activities, changes to habitats, pollution, and destructive practices). Individuals convicted of damaging the ecosystem are required

to either pay fines, which may or may not be directly related to damage costs, or more directly to repair the damage or pay for work related to the conservation and protection of the affected habitat. Examples of trust funds established within fishing associations to manage funds collected for such restoration work are providing institutional precedence for the transfer of funds into the fisheries sector.

Example: Non-fisheries polluters paying for fishery ecosystem damages

Canada – Under the Federal Fisheries Act, the Department of Fisheries and Oceans (DFO) Canada uses fines from habitat violations to restore damaged fish habitat. The convicted offender pays money directly to repair fish habitat or enhance fish stocks, often through local non-profit environmental groups. For examples of such convictions, see DFO (2004).

United Kingdom – the Anglers' Conservation Association (ACA) represents its members in court cases against private and public entities polluting British lakes and rivers. Money collected is kept within member fishing clubs and used in rehabilitation trust funds. See http://www.a-c-a.org/whatwedo.html for examples.

United States - The Columbia River Estuarine Coastal Fund was established in 2004 through the collaboration of the Foundation, the Service and the U.S. Attorneys for Oregon and the Western District of Washington from fines imposed on shipping companies that illegally discharged oily waste into the Pacific Ocean near the mouth of the Columbia River. Conservation and restoration projects will be funded with $1.2 million in community service payments from polluters. See http://www.nfwf.org.

7.2 Extra-fisheries “Beneficiary pays”

Note that related to “polluter pays” is the idea of “beneficiary pays”, in this case implying that those receiving the benefits of EAF implementation should pay the costs required to achieve those goals. Extra-fisheries benefits that can accrue from application of the EAF are being acknowledged through a global increase in environmental awareness (i.e. the recognition of the goods and services provided by ecosystems and the need to minimize damaging impacts on these ecosystems), a desire to improve human conditions (i.e. decreasing hunger and poverty, improving livelihoods), and the hopes of holistic, decentralized natural resource management (i.e. through good governance, participatory processes, community-based management, and integrated resource management).

The possibilities for garnering funding from international sources to support EAF are numerous (e.g. donor countries, international trust funds, development banks, funding facilities). Combined, these possibilities may lead to initiatives for the global community to financially support EAF efforts, particularly in jurisdictions that otherwise might be unable to afford such efforts.

However, understanding the various and appropriate sources of funding requires a large and, perhaps, daunting investment on the part of fisheries managers. For example, some funding sources may target sectoral-specific activities, while others may target specific issues, such as biodiversity or marine protected areas. Accounting systems and even vocabulary may vary significantly across sources and funding sources may or may not be tied to certain conditions, economic or otherwise.

In addition, as EAF management is likely to comprise both development and conservation components, no one source of funding is likely to cover all EAF needs. Hence, a portfolio approach to funding will be necessary; increasing the time and energy devoted to developing and using these funds.

Furthermore, there is a crucial issue of institutional sustainability to consider when utilizing external funds – i.e., ensuring that long-term arrangements are in place so that EAF implementation is not jeopardized when the specific funding period ends.

In recognition of these complexities, guides to finding relevant financing sources have been developed. Importantly, some of these guides provide detailed business planning for marine protected areas and other

skills to assist fisheries managers in planning their financial needs assessments and donor funding requests. The major categories of international funding described in these guides[22] are:

- Bilateral & Multilateral donors
- Biodiversity Enterprise Funds,
- Debt for nature/environment swaps,
- Environmental Funds and Conservation facilities,
- the Global Environmental Facility, and
- Foundations.

In any case, an evaluation of the potential benefits from EAF application, whether at the local, national, regional, or international level, would assist in organizing efforts at the appropriate levels.

Example: Financing coastal resource management in the Philippines

Salamanca and Luna (2002) presented an historical perspective of coastal resource management (CRM) in the Philippines and discussed "the factors that are thought to have played crucial roles, the formal institutions that underpin its development, and the issues that need to be addressed for CRM to fully succeed." Within this report and a related background article (Salamanca, 2003), the authors estimated the financial needs and sources of funding for 290 coastal resource management projects and activities from 1974 to 2000. Over this period, approximately US$230 million were spent on activities undertaken to manage the coastal zone and its resources through various implementers (i.e. integrated, multi-sectoral, government-led, NGO-initiated, and fisherfolk-led) and various focuses (i.e., livelihood, education, research, advocacy, conservation, population, etc.). The authors estimated that approximately US$9 000 per km^2 of coral reef was spent over the sixteen-year period to protect the nation's 26 000 km^2 of reefs. While studying the financial investments, the authors also investigated the sources of funds and found that 63 percent of the funding came from 44 international sources (i.e. bilateral and multilateral sources, debt for nature swaps, the international NGO community, and international philanthropic organizations); 36 percent from the Filipino government, and one percent from local donors; thus, highlighting the importance of international sources of funding.

Sources: Salamanca and Luna (2002); Salamanca (2003)

8 CONCLUDING REMARKS

In this paper, we have addressed four forms of incentives: legal, institutional, economic, and social for use in fisheries management frameworks. Many of the incentive measures presented fit in quite naturally with existing conventional management strategies (e.g. participatory approaches, good governance, and well established rights systems); however, other measures adjust for the broader understanding of the values that societies have for ecosystem goods and services (e.g. polluter and user pays principles, extra-fisheries externalities, and garnering support for globally distributed benefits with localized costs).

While incentive mechanisms have been presented in this paper because of our belief in their usefulness for fisheries management, a few caveats are, nevertheless, warranted. The risk of relying on one tool or one sub-set of tools is, as always, high – unfortunately, there is no such panacea and the broader scope of EAF will require a broader mix of the tool kit. In the same vein, while economic incentives received considerable attention in this paper, in reality - given the nature of externalities - a reliance on the market to fix all ills may well disappoint. This is why it is also important to work with legal, institutional and social incentives, and furthermore, to recognize that the potential role of government remains strong in implementing EAF management. The use of resources, whether natural, human, or financial, will require societal choices and the need to understand the trade-offs among the various choices involved.

This paper has been based on the concept that understanding human behaviour is at the core of fisheries management. This would include considering both demand and supply sides of fisheries (i.e. markets and

[22] WWF Guides - http://www.worldwildlife.org/conservationfinance/pubs.cfm;
Conservation Finance Alliance Guide - http://guide.conservationfinance.org/;
Debt for nature/environment swaps guide - http://biodiversityeconomics.org/finance/topics-42-00.htm;
GEF funds guides - http://www.gefweb.org/Partners/partners-Nongovernmental_Organ/ngo_guide/ngo_guide.html;

trade) – the incentives they create and the impacts they have on our ability to manage – as well as the extra-fishing variables that affect human behaviour.

The mechanisms discussed in this paper are not new concepts; although, perhaps, there has been relatively little application to the fisheries sector. However, examples exist (within fisheries and among other sectors) that may provide us with some guidance on their use and, like most borrowed tools, creativity may be required to adapt them to context at hand.

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UNSD. Undated. United Nations Statistical Division. On-line Environment Glossary. http://unstats.un.org/unsd/environmentgl/.

Annex. Win-win by-catch possibilities in Australian's Northern Prawn Fisheries

With the required introduction of turtle exclusion devices (TED) and by-catch reduction devices (BRD) within the Northern Prawn Fisheries in 2000, concerns regarding the economic impact of this conservation-based management tool were voiced within the fisheries. Therefore, industry and scientists worked together to assess these impacts and to improve locally used designs.

While commercial prawn catches were decreased by approximately 4-6 percent, damage to prawns by heavy animals was decreased by over 40 percent, representing from one to three percent of their catches; thereby increasing the catch value. Further reductions in commercial losses are expected with increased familiarization and fine-tuning of the devices. In addition, other benefits such as increased ease in handling and sorting and reduced danger to the crew were associated with the exclusion of larger animals.

Large by-catch reductions were identified for sea turtles, sharks, rays, and large sponges; while by-catches of sea snakes and small by-catch left much room for improvement.

Percentage changes in catches due to the effects of TEDs and BRDs

Catch group	Treatment						
	TED + BRD	TED net	BRD only	Upward-excluding TED	Downward-excluding TED	Bigeye BRD	Square-mesh panel BRD
Sea turtles #	-100	-99	ns	-99	-100	–	–
Sea snakes	-5	ns	ns	–	–	ns	ns
Elasmobranchs #							
Sharks	-18	-13	-17	-20	-9	–	–
Rays	-36	-31	ns	-27	-35	–	–
Sawfish	ns	ns	ns	ns	ns	–	–
Large sponges #	-85	-86	ns	-82	-96	–	–
Small bycatch	-8	-8	ns	ns	-9	ns	ns
Prawns							
Total prawns (all commercial species)	-6	-6	-4	ns	-6	-4	ns
Tiger prawns	-7	-7	-4	-6	-6	-4	ns
Tiger prawns (soft and damaged)	-42	-55	ns	-36	-63	ns	ns
Endeavour prawns	-5	ns	ns	ns	ns	ns	ns
Endeavour prawns (soft and damaged)	-41	-44	ns	ns	ns	ns	ns
Byproduct							
Thenus spp.	ns	ns	ns	ns	ns	ns	ns
Teuthoidea spp.	ns	ns	ns	ns	ns	ns	ns
Amusium pleuronectes	ns	ns	–	–	ns	–	–

Notes: # = species groups where the 'TED net' analyses included any net with a TED (TED + BRD or TED only;
ns = no significant difference between comparisons; –, no comparison made.

Source: Brewer *et al*, 2006.