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# STUDY ON SAFETY AT SEA FOR SMALL-SCALE FISHERIES
# 1. SOUTH WEST INDIAN OCEAN

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# STUDY ON SAFETY AT SEA FOR SMALL-SCALE FISHERIES
# 1. SOUTH WEST INDIAN OCEAN

by
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## PREPARATION OF THIS DOCUMENT

The FAO Fisheries and Aquaculture Department has been working on safety at sea in fishing vessels for over 50 years. Over this time the social, political, economic and technological aspects of fisheries have evolved in ways that have caused intense pressure on aquatic resources. Governments, in recognition of this, are increasingly aware of the need to manage, rehabilitate and control the exploitation of their fishing grounds and resources through policies, legislation, research and effective control in order to prevent depletion and to facilitate rehabilitation of stocks. In general, the fisheries management measures put in place by fisheries administrations have focused on conservation and prohibition of fishing and have not focused on the human, social and market forces that drive the fishing sector.

Maritime administrations, on the other hand, have the mandate for regulating the safety of shipping and maritime transport. However, many fishing vessels are excluded from the vast majority of international conventions. Most of the world's fishing fleet are small vessels and operate from beaches and small harbours normally outside the control of the competent authorities. The differences in responsibilities for safety of these small vessels have caused gaps in the implementation of adequate safety measures which applies to the majority of the small-scale fishing vessels.

FAO's work on safety at sea, specifically through a project funded by Sweden (Support to Safety at Sea for small-scale fisheries in developing countries – GCP /GLO/158/SWE), focuses on reducing accidents and improving the safe working conditions of fishers globally. It achieves this by influencing national policy, improving legislation, awareness raising, creating standards and guidelines and providing technical support. In this context, the Fishing Technology Service of FAO's Fisheries and Aquaculture Department, which leads the safety at sea work, commissioned this study on the situation of safety at sea in the South West Indian Ocean region in order to update and provide an assessment of the opportunities, constraints and priority actions to be taken by national administrations and for FAO within the region.

## ABSTRACT

This document details the findings of a study on safety at sea undertaken in May 2006 in four countries in the South West Indian Ocean Region. The countries studied were Seychelles, Madagascar, Comoros and Kenya. In order to have a better comparison and a homogenous approach, the study analysed the same themes for each country; these were: the relation of fisheries management to sea safety, safety programmes, data recording, legislation, boat building and vessel design and 'other safety issues' which gave the possibility to include country-specific aspects. The document presents the results and analyses of the country case studies as well as conclusions and recommendations.

**Nageon de Lestang, J.**
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## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **ACP** | Afrique Caraïbes Pacifique |
| **AFD** | Agence française de développement |
| **AMPA** | Agence malgache pour la pêche et l'aquaculture (Madagascar; new) |
| **ANGAP** | Agence nationale de gestion des aires protégées (Madagascar) |
| **ANAE** | Agence nationale d'appui à l'environnement (Madagascar) |
| **ARCC** | Aeronautical Rescue Centre |
| **BMU** | Beach Management Unit |
| **CDA** | Coastal Development Authority (Kenya) |
| **CNRE** | Centre nationale de l'environnement (Madagascar) |
| **COAP** | Code des aires protégées (Madagascar) |
| **COI** | Commission de l'ocean Indien |
| **COMESA** | Common Market of Eastern and Southern Africa |
| **CRMN** | Coral Reef Monitoring Network |
| **CSP** | Centre de surveillance des pêches (Madagascar) |
| **CZM** | Coastal Zone Management |
| **DGE** | Direction générale de l'environnement (Comoros) |
| **DNRH** | Direction national des ressources halieutiques (Comoros) |
| **DPRH** | Direction de la Pêche et des Ressources Halieutiques (Madagascar) |
| **EAC** | East Africa Community |
| **EDF** | European Development Fund |
| **EEZ** | Exclusive economic zone |
| **EIA** | Environmental Impact Assessment |
| **EMCA** | Environmental Management and Coordination Act (Kenya) |
| **ENEM** | École nationale d'enseignement maritime |
| **EPIRB** | Emergency Position Radio Beacon |
| **ESD** | Environment Sustainable Development |
| **EU** | European Union |
| **FAD** | Fish aggregating device |
| **FRP** | Fibreglass reinforced plastic |
| **GAPCM** | Association of Madagascar Aquaculture and Shrimp Producers (Groupement des aquaculteurs et pêcheurs de crevettes de Madagascar) |
| **GELOSE** | Gestion locale sécurisée (Madagascar) |
| **GDP** | Gross domestic product |
| **GIS** | Geographic Information System |
| **GMDSS** | Global Maritime Distress Safety System |
| **GPS** | Global positioning system |
| **GRAP (Plan)** | Plan de gestion du réseau des aires protégées (Madagascar) |
| **ICAMP** | Integrated Coastal Management Project (Kenya) |
| **ICM** | Integrated Coastal Management |
| **ICZM** | Integrated Coastal Zone Management |

| | |
|---|---|
| **IDC** | Island Development Company |
| **IFREMER** | Institut français de recherche pour l'exploitation de la mer |
| **IOTC** | Indian Ocean Tuna Commission |
| **IRD** | Institut de recherche pour le développement |
| **IUCN** | World Conservation Union |
| **JICA** | Japan International Co-operation Agency |
| **KMF** | Kenya Marine Forum |
| **KMFRI** | Kenya Marine Fisheries Research Institute |
| **KWS** | Kenya Wildlife Service |
| **LOA** | Length overall |
| **MAEP** | Ministère de l'agriculture, élevage et pêches (Madagascar) |
| **MCS** | Monitoring, control and surveillance |
| **MECIE** | Mise en conformité des investissements à l'environnement (Madagascar) |
| **MEEF** | Ministère de l'environnement, des eaux et forêts (Madagascar) |
| **MPA** | Marine protected area |
| **MPDAE** | Ministère du développement rural, de la pêche, de l'artisanat et de l'environnement (Comores) |
| **MRCC** | Maritime Radio Control Centre |
| **NEMA** | National Environmental Management Authority (Kenya) |
| **ONE** | Office national de l'environnement (Madagascar) |
| **PADIL** | Integrated Coastal Management and Development Policy (Madagascar) |
| **PMU** | Project Management Unit |
| **PNRC** | Projet national de recherche crevétière |
| **PSDR** | Plan de soutien au développement rural (World Bank/Madagascar) |
| **RCU** | Regional Coordination Unit |
| **SADC** | South African Development Commission |
| **SAGE** | Service d'appui a la gestion de l'environnement (Madagascar) |
| **SFA** | Seychelles Fishing Authority |
| **SIDA** | Swedish International Development Agency |
| **SIDS** | Small Island Developing States |
| **SMA** | Seychelles Maritime Administration |
| **SPA** | Seychelles Port Authority |
| **SSAS** | Ship Security Alert System |
| **SWIO** | South West Indian Ocean |
| **SWIOFC** | South West Indian Ocean Fisheries Commission |
| **UNDP** | United Nations Development Programme |
| **UNEP** | United Nations Environmental Programme |
| **VMS** | Vessel monitoring system |
| **WCS** | Wildlife Conservation Society |
| **WIOMSA** | Western Indian Ocean Marine Science Association |
| **ZAC** | Zone d'aménagement concerté (Madagascar) |

# EXECUTIVE SUMMARY

## Objectives of the study

In May 2006, FAO undertook a study of fisheries-related sea safety of small-scale fishing vessels in the South West Indian Ocean (SWIO) region. The objective of the study is to assist in the development of regional strategies to improve small-scale fishers' safety and to guide the FAO Fishing Technology Service (FIIT) in its examination of global initiatives. The study should also help to raise awareness of the extent of the problem among policy-makers and administrations of the region, and should identify constraints that have reduced the effectiveness of efforts to improve safety. The study will serve as a background paper for a regional workshop on the subject of fishers' safety at sea.

## Scope of the study

The countries covered in the present study were Seychelles, Madagascar, Comoros and Kenya. Six main topics were covered: the relation of fisheries management to sea safety, safety programmes, data recording, legislation, boatbuilding and vessel design, and other safety issues.

## Fisheries management and sea safety

Except perhaps for the Seychelles, the concept of including safety at sea as an objective of fisheries management is not common for most of the countries covered in the study. Although all four countries are aware of safety at sea issues, when considering fisheries management options they do not consider it as a priority. Hence the concept of making provisions for saving lives at sea is generally not included in any fisheries development plan (except for the Seychelles).

## Safety programmes that have generally been a success

Safety programmes that have been proposed and at times successfully implemented in the fisheries sector include:

- A gradual shift from building wooden fishing vessels to fibreglass vessels, which are sturdier and more sea-worthy.
- Increasing availability of basic safety equipment, sometimes at subsidized prices (mostly funded by donor agencies).
- The concept of registering all fishing vessels is becoming more widely accepted even by fishers themselves.
- A concerted effort to update and revise small fishing vessels' safety regulations even if the law is not always enacted.
- Serious attempts to include or upgrade safety equipment when building and/or refurbishing a fishing vessel (navigation lights, buoyancy tanks, compasses, life rings, radar reflectors, etc).
- The importance of upgrading vessel communication and detection systems (vessel monitoring system [VMS] transceivers, global positioning system [GPS], radios, emergency position radio beacon [EPIRBS], etc.).

## Main reasons why safety programmes have been a failure

The main reasons that explain why safety at sea programmes have not always been a success include the following:

- Donating safety equipment to fishers free of charge without a long-term plan for self-acquisition or replacement. Giving advanced electronic safety equipment to fishers without giving adequate training.
- In all four countries concerned in this study (but in particular for the two larger ones, i.e. Madagascar and Kenya), there appears to be a lack of exposure to safety awareness on a recurring basis with the result that it is being ignored.

- Poor enforcement and monitoring of safety regulations.
- Failure on the part of governments to have adequate search and rescue vessels and trained human resources to organize credible search and rescue operations.
- Lack of proper training programmes for fishers (maritime training schools have been a failure in most of the countries surveyed).
- Too many government agencies with the responsibility for safety at sea programmes, with no single agency having the overall responsibility for implementing such programmes.

### Accident data recording

Up to 2005, all four countries did not have an agency with the specific responsibility for keeping a record of all accidents at sea. As of last year an authority has been created in the Seychelles, Madagascar and Kenya to fulfil this role. It appears, however, that this responsibility is only being taken to task in the Seychelles and perhaps Madagascar, with the Kenyan authority still not prepared to assume full responsibility. As for the Comoros, although the various authorities are very conscious of the security at sea problems and it is the country with the highest accident rate at sea, no one appears to be prepared to change the status quo.

### Sea safety legislation

Only in Seychelles have the authorities taken this issue seriously and "Small Fishing Vessels Safety Regulations" have been prepared and should be enacted before the end of this year. Madagascar is also following suit but lack of political will mean that it will take a while for the legislation to be passed or adopted.

In the Comoros, the legislation has been in the pipeline since the early 1980s but nothing concrete has yet been adopted. It appears that unless the new government makes a special effort to do so it will not be adopted soon.

In Kenya, there is much discussion on proposed new fisheries legislation but it appears that no special provision is being made to include safety at sea issues in the new legislation. The problem stems mainly from the fact that marine fisheries in Kenya account for only 5 percent of total fish landings and are not given any priority by the concerned authorities.

### Enforcement of legislation

Again it appears that except for the Seychelles, where the responsibility is more clearly defined, the other countries have limited (Madagascar) or no specific programmes for enforcement of the legislation. In the three other countries (Madagascar, Comoros and Kenya) the private sector plays an important part in assuming this role but the results are far from being satisfactory.

### Boatbuilding and vessel design

In all four countries considerable effort has been made to improve vessel design and boat construction, with the general trend being to move away from wooden vessels to build vessels from fibreglass. It is not clear, however, if this has been done with the objective of improving safety at sea or simply to improve fishing vessels' sea-worthiness so that fishers can travel further offshore. No doubt, however, the safety features of fibreglass built vessels cannot be ignored.

### Other safety issues

There is a need to increase the availability of communication and navigational equipment and spare parts, and to provide training for artisanal fishers; with a concerted effort by government to subsidize or eliminate import duties on such items to make them affordable to artisanal fishers.

There must also be more publicity and awareness programmes to sensitize the public and emphasize the necessity for safety at sea programs on a long-term basis.

### Political will

It is evident that safety at sea issues are not a priority in most of the four countries' national fisheries development plans, but there is a definite requirement for governments to be more concerned with the problem so that safety at sea can be improved. Additional attention must therefore be focused on such issues as keeping records of sea accidents and associated search and rescue operations.

### Regional sea safety workshop

A regional sea safety workshop as proposed in the objectives would be an excellent initiative to increase the awareness of the agencies responsible for these issues and it would have a positive effect on national and regional sea safety programmes.

### Priorities for future work

Within the scope of the topics covered in the present study it is recommended that the following areas should receive priority.

- Sensitizing government authorities, fishery managers and fishers themselves on sea safety issues and emphasizing the point that it should be an important objective of fisheries management.
- More attention should be focused on small artisanal fishing vessels, as in all four countries they produce most of the nations' marine fish supply and provide considerable employment for the local population.
- Countries should improve their present system of recording and analysing data on accidents at sea. In this respect, a single agency in each country should be appointed with the specific mandate of fulfilling this objective.
- There should be more public awareness programmes on the issue of safety at sea and both fisheries personnel and the general public should be sensitized on the importance of the problem.
- A regional workshop on sea safety should be organized in the near future with the objective of improving the design, construction and equipment of small fishing vessels. The ultimate objective of the workshop would be to create a regional register/database of all fishing vessels and boatowners that would facilitate search and rescue operations in the region. The workshop could be co-sponsored by SWIOFC/FAO/SIDA.

# 1. INTRODUCTION

## 1.1 Background

Safety at sea and issues related to search and rescue operations for small-scale fishing vessels are extremely important in the South West Indian Ocean (SWIO).

Indeed, marine fisheries are of crucial importance in all four countries involved in this particular study, i.e. Seychelles, Madagascar, Comoros and Kenya and, apart from Kenya, the national economy of the three island states is very dependent on marine resources. Although certain countries (for example, Seychelles) have always considered safety at sea as an integral part of fisheries development, others (such as the Comoros) have almost entirely neglected this aspect of the fishing industry.

In fact, one of the most striking points that came out of this study is that most of the countries do not even keep a proper record of the number of accidents or lives lost at sea. In all four countries until very recently there was no single agency/government organization mandated to keep such a record. Over the last 25 years, various UN agencies, national and regional organizations and other donor agencies have made an attempt to address this problem but results have been negligible.

Contrary to the Pacific region, very little work has been done on search and rescue at a regional level. The FAO SWIO project in the early 1980s considered certain options to raise the awareness of member states on this problem but no concrete proposals were made.

On a national level the individual SWIO countries have made certain effort to cope with this issue but unfortunately due to lack of political will or because of economic priority, very minimal results were achieved.

In April 2005, in response to requests from countries and discussions at an FAO/SIDA planning meeting, South West Indian Ocean Fisheries Commission (SWIOFC) in collaboration with the FAO Fishing Technology Service (FIIT) decided to undertake this particular study.

## 1.2 Objectives of the study

SWIOFC is undertaking this study in collaboration with FIIT in response to requests from countries and discussions at an FAO/SIDA planning meeting in April 2005.

The study will serve as an input into the SWIOFC to assist in the development of regional strategies to address small-scale fishers' safety at sea, and to guide FIIT in its examination of global initiatives. It will also raise awareness of the extent of the problem among policy-makers and administrators of the region, and should identify those constraints which have reduced the effectiveness of efforts to improve safety. The study will serve as a resource paper to a regional meeting on the subject of fishers' safety at sea. It is hoped that the study will also be able to examine the relevance of such programmes undertaken in the Pacific to the situation in the SWIO.

The results of the study will also be valuable to partners and donors that may be willing to support such initiatives in the fisheries sector.

## 1.3 Tasks

The consultant will closely examine developments in sea safety and related emerging issues within the small-scale fisheries, assess what positive advances have come from previous initiatives, determine the lessons learned and suggest productive future actions. To do this, the consultant will:

1. undertake a desk-study of relevant project documents, studies and other written material on the topic;
2. visit four SWIO countries (Seychelles, Madagascar, Comoros and Kenya) and interview local stakeholders;
3. participate in a workshop on Registration Systems for Small-Scale Fishing Vessels, Fishing Gears and Fishers planned for 22 and 23 May 2006 in Antananarivo, Madagascar;
4. contact staff from relevant national, fisheries and/or maritime, UN, partner/donor agencies, the private sector and others and interview them about past and related projects on the topic;
5. bring together the results of this examination in a report of approximately 50 pages;
6. present and discuss the results in a regional workshop and incorporate inputs from workshop participants.

During the course of the assignment, the consultant will discuss the form of workshop participation that would be most appropriate and develop a prospectus for such a workshop. He will seek to determine whether the primary value of such a workshop should be in awareness-raising among administrations and policy-makers (with a view to eliciting a statement of national/regional determination to tackle the problem) or a simpler technical workshop aimed at improving safety of fishing vessels through improved design, construction and equipment. The workshop would be co-sponsored by SWIOFC/FAO/SIDA.

### 1.4 Expected end product

The expected end product is a report based on studies of available documentation (complemented by field studies in the four countries mentioned above) and will cover the following topics (it is intended that the report should provide a regional overview, with particular reference to the four countries visited):

***Fisheries management***

- A description of the effects of development and fisheries management on fishers' safety and accidents (small vessels fishing further off shore, closed seasons and quotas forcing fishermen to go out in rough weather, conflicts between industrial and small scale fisheries, etc.).
- A more detailed description for each country.
- Has sea safety been included in fisheries management initiatives? If so, how? If not, why not?
- What could be done to ensure that sea safety is included in fisheries management?

***Safety programmes***

- A description of any projects or related activities that have been implemented.
- What has been especially effective in these projects or related activities?
- Which initiatives have had little or adverse effect on fishers' safety?
- What are the important areas for future interventions?

***Data recording***

- Which authority is responsible for data recording, analysis and feedback in the different countries in relation to fisher safety?
- How are data on accidents gathered, analysed and presented?
- What is done with the data generated, are there follow-up activities?
- Based on the above, how could data collection and analysis be improved?
- What conclusions can be drawn from the existing data?
- The report should contain a presentation of existing data, for the last ten years, on accidents related to fishing operations from the different countries (if available) and information about how to obtain more details.

### *Legislation*

- A description of existing legal, fisheries management or licensing agreements and national fisheries or maritime policies, that have a bearing on fishers' safety at sea.
- A description of the legislation/regulations for registration of fishing vessels and safety/safety equipment on fishing boats and for fishing operations in the countries visited.
- Which authorities are responsible for the formulation, control and enforcement of regulations related to safety for fishing boats and fishing operations?
- Which authorities are responsible for inspection of fishing vessels?
- Are the existing regulations enforced? If so, how? If not, why not?
- Based on the above, how could regulations and enforcement of regulations be improved?

### *Boatbuilding and vessel design*

- A description of past and ongoing initiatives related to fishing vessel design.
- How have these initiatives affected the safety of fishing vessels?
- Are safety issues being addressed in the vessels constructed in the region – if so, how?
- Have there been any initiatives to promote the use of sail? How successful have these been and if not why?
- Is there a need for future vessel design work with regard to safety and, if so, in what areas?
- Is there a role for FAO in the interface between naval architecture and safety?

### *Other safety issues*

- Give a description of the communication systems (VHF, shortwave, mobile phones, etc.), how they are used by fishermen and their usefulness in emergency situations.
- Give a description of the use of navigational equipment (GPS, maps, compass, etc.) in different types of fishing operations
- Describe the organization of search and rescue operations and what institutions are involved/ responsible
- Describe the availability and cost of safety equipment
- Describe the availability and cost of engine spare parts and repair
- Is there any local production of safety equipment or interest in starting such production?
- Are there safety problems related to the use of fishing vessels for transport of goods and passengers?
- Are there insurance schemes and other coverage for marine disasters?

## 2. THE SOUTH WEST INDIAN OCEAN REGION

### 2.1 Definition and characteristics of the South West Indian Ocean (SWIO) region

The SWIO region, as defined by FAO in the terms of reference of the newly formed South West Indian Ocean Fisheries Commission (SWIOFC), covers the following area: "from a point on the high water mark on the East African Coast at latitude 10° 00' North, thence due east along this parallel to the longitude 65° 00' East, thence due south along this meridian to the Equator, thence due east along this parallel to longitude 80° 00' East, thence due south along this meridian to a parallel 45° 00' South, thence due east along this parallel to the longitude 30° 00' East, thence due north along this meridian to the coast of the African continent."

The entire region lies within the influence of monsoon winds. The northeast monsoon blows from November to March while the southeast monsoon blows from May to October. Most of the islands are subject to cyclones.

Oceanographically, the region falls in the area of influence of the South Equatorial Current and the seasonal monsoons. The South Equatorial Current flows from East to West at about 10° south of the equator, dividing into north and south flowing arms when it reaches the African Continent. The North flowing arm becomes the Somali current, while the South flowing arm becomes the Mozambique/Agulhas current.

Surface and deep currents (such as the southern equatorial current) play a key role carrying nutrients, disseminating species and facilitating genetic exchanges between populations. Surface currents have a "pumping" effect that brings deep colder, nutrient enriched waters up to the surface creating upwelling zones rich in plankton that attract great numbers of fishes and their predators.

FIGURE 1
**Map of the region**

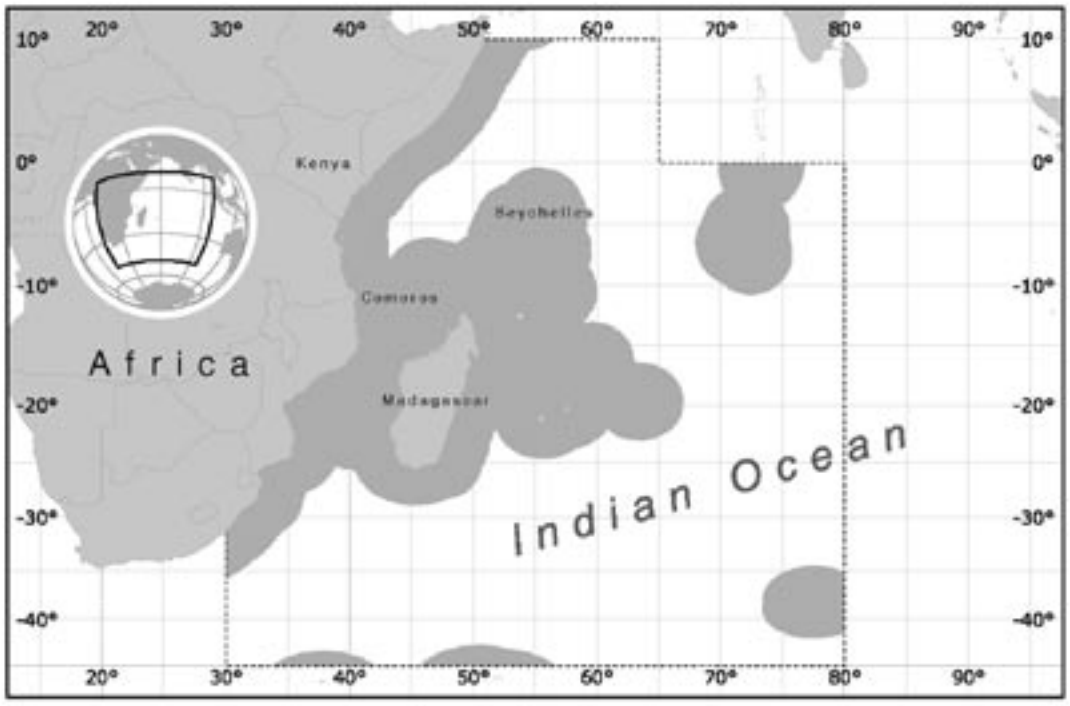


**TABLE 1.** Coastline data and characteristics

| Country | Coastline (km) | Area of the continental shelf ($km^2$) | Coral reef ($km^2$) | Threatened reefs (%) | Mangroves ($km^2$) |
|---|---|---|---|---|---|
| Comoros | 350 | 1 400 | 430 | 99 | 26 |
| Madagascar | 4 500 | 117 000 | 2 230 | 87 | 3 400 |
| Seychelles | 750 | 31 500 | 1 690 | 17 | 29 |
| Kenya | 600 | 655 | 600 (in length) | | 560 |

Source: Spalding, Ravilious and Green, 2001. World Atlas of Coral Reefs. UNEP, WCMC

Surface ocean currents also play an important role in the navigation and fishing operations of small scale fishing vessels and are an important cause of vessels being lost at sea.

The political entities of the SW Indian Ocean are characterized by large exclusive economic zones (EEZs) and very diverse land masses. The total area of the EEZs for the four countries in this study is estimated at 2 615 000 $km^2$ of which the Seychelles, with an EEZ of 1.3 million $km^2$ can claim 50 percent of this total EEZ surface area.

The land area is 1 172 305 $km^2$ of which more than 99 percent is in Madagascar and Kenya.

The islands' land mass ranges from the world's third largest island of Madagascar with a surface area of 593 000 $km^2$ and a population of 17.5 million (2005) to the smallest island of the Seychelles group with a land mass of 455 $km^2$ and a population of 85 000.

Certain distinctive features of the region that are important for sea safety are:

- Most small-scale demersal fisheries concentrate inshore and/or in coastal areas with important tuna industrial fisheries offshore.
- Small-scale fishing vessels fishing further offshore and staying longer at sea due to depleting coastal resources. This is in particular the case for the Seychelles and the Comoros islands, where coastal resources are rapidly being depleted.
- The occurrence of destructive tropical cyclones is particular to the area around Madagascar and the Comoros.
- A large percentage of the population (except for Kenya) is concentrated in coastal areas with considerable pressure on coastal resources for housing and industrial development including building of hotels and other tourism infrastructures (restaurants, marinas, diving and sport centres, etc)
- There is significant inter-island transport on small vessels (dhows/schooners), many of which serve as fishing vessels.
- Lingering tradition of the use of sail power for smaller fishing vessels (except for the Seychelles and Comoros).
- Widely dispersed island groups in particular in the Seychelles and on the west coast of Madagascar.
- A large percentage of the population (including both professional and recreational fishers) that is familiar with the sea (except for Kenya) and have a tendency to take unwarranted risks when travelling or/fishing on the open seas.
- Lack of available credit to fishers is a major constraint to fisheries development. Lack of credit inhibits the ability to purchase proper (safe) fishing vessels, motors, fishing gears and basic safety equipment that would help save lives at sea.
- A proneness to natural disasters, including volcanic eruptions, cyclones, tsunamis and floods. These disasters seriously affect the larger territories like Madagascar but the impact is more devastating on small island states.

It is also worth mentioning that in all four countries budgets for search and rescue operations are not considered as a national priority and in most cases are not included in the objectives of National Fisheries Development Plans. This attitude is, however, changing rapidly and for countries like the Seychelles, (and to a certain extent in Madagascar and Kenya), safety at sea programmes have been included in the countrys' next Fisheries Development Strategies. In the case of the Seychelles, a specific agency called the Maritime Safety Administration (MSA) has been set up since 2005 dealing specifically with safety at sea issues. New regulations concerning these issues are being enacted and will be signed into law by the end of 2006.

So far the regional organizations based in the Indian Ocean, including the Indian Ocean Commission (IOC), Southern African Development Commission (SADC) and Indian Ocean Tuna Commission (IOTC) have played no significant role in the safety at sea issues.

It has to be pointed out that the issue of training for seamen, including all aspects of safety at sea, both for the artisanal and the industrial tuna fishery, has been considered as a priority in all of the European Union (EU) Fishing Agreements that have been signed with three of the regional countries (Seychelles, Comoros and Madagascar). In all three agreements, a clause has been included that sets aside the sum of US$20 per day for training local seamen for every day that the vessel is fishing in the country's EEZ, without a local seaman on board.

# 3. SEYCHELLES

## 3.1 General background

The 100 or so small islands making up the Republic of the Seychelles have a surface area of 444 km², with a combined length of coastline of 600 km. Moreover, the islands have poor soil and few natural resources; hence, apart from the tourism industry, the country has limited opportunities for land-based development and, as a result, the fisheries sector is critically important for both food security and economic development. Fisheries and related activities are major employers in the Seychelles economy, accounting for 15 percent of formal employment.


The country's vast economic zone covers an area of over one million km² and is located on one of the most productive fishing grounds in the South West Indian Ocean. In addition to extensive pelagic resources, the Seychelles, unlike other island states in the region, has a large continental plateau, rich in demersal resources.

The plateaux have steep sides, which rise rapidly from around 1 000 metres, the largest being the Mahé Plateau. This is surrounded by a narrow shallow rim of around 15 to 30 m depth surrounding a central area of about 45 to 65 m, with the surface granite and coral outcrops forming small banks. The rim of the Seychelles plateau is by far the most productive fishing ground and, although traditionally the local fishers have concentrated their fishing effort on the shallow rim and banks, in recent years the advent of mechanized fishing reels, echosounders and GPS has contributed to a shift of the fishing effort to the slopes and drop-offs at depths of up to 150–200 m. In view of the fact that it is not possible to anchor at that depth the fishers drift up and down the slopes relying only on engine power, thus increasing the security risks significantly, in particular in the case of engine failure. In the past, most fishing vessels used to be equipped with sails (at least for security reasons), but this tradition is slowly disappearing and, except for a few larger schooners, fishers now rely mostly on motorized propulsion. All fishing vessels that carry out trips of two days or more are equipped with iceboxes and carry ice.

The majority of the population of 80 000 live on the three main granitic islands (Mahé, Praslin and La Digue), while the coralline islands are sparsely populated. The remaining islands and plateaux to the South and next to the Mahé Plateau are all coralline in nature and include the Amirantes Plateau, the Alphonse group, Providence and Farquar group and the Aldabra and Cosmoledo group. These islands are all low-lying coralline islands with very little continental shelf and the drop-off being generally less than one km from shore.

Most of the domestic fishing activity is centred on the Mahé and Amirantes Plateaux, with occasional fishing trips targeting specific species (for example deep-water snappers and groupers) to the Southern Island groups –, the furthest, Providence and Farquhar groups –being more than 700 km from Mahé.

The topography and climate of the islands have an important impact on sea safety and security at sea. Most fishers are based on the three main granitic islands and have to travel at least 100 km to reach the main fishing grounds, i.e. the drop-off. Fishing trips therefore generally lasts several days

(an average fishing trip is around six to eight days) and are dependent on the prevailing winds and ocean currents.

A northwest monsoon from November to March characterizes the Seychelles' climate, with variable winds and calm periods.

The South East Monsoon, which blows from the middle of May to October, with strong winds averaging between 20 to 35 knots, is a severe constraint to fishing operations. This is the period of the year when most accidents at sea occur.

There are two inter-monsoon periods from October to November and March to April, with light variable winds and calm periods. These are considered the most favourable fishing seasons for the domestic fishing fleet, corresponding to periods of glut for fish landings.

Air temperature is mostly stable throughout the year ranging from a low of 24 °C to a high of 30 °C. Rainfall may occur throughout the year but is heavier in December and January and there is a dry period between June and September.

The hydrology of the Seychelles is affected by the eastward flowing Equatorial Counter Current and the westward flowing currents north and south of it. The currents are modified to a certain extent by the onset of the different monsoon periods. The southern islands lie in the west-flowing South Equatorial Current, the northern in the east-flowing Equatorial Counter Current.

### 3.2 Fisheries management and sea safety

The Seychelles fishing sector can be subdivided into three main types of fisheries:

(i) the artisanal fisheries carried out by local fishers with small-motorized boats (5–15 m) targeting mainly demersal and semi-pelagic species;
(ii) the semi-industrial fishery consisting of small (14–22 m) locally owned longliners targeting pelagic species (mainly tuna and swordfish);
(iii) the industrial fisheries, which comprise foreign owned purse seiners and large longliners primarily targeting tuna species (yellow fin and skipjack).

Table 2 summarizes the number of boats involved in the various fisheries subsectors and their annual landings.

Marine capture fisheries management in Seychelles falls under the responsibility of the Seychelles Fishing Authority (SFA) and the Ministry Environment and Natural Resources (MENR), which is responsible for all marine issues. The Ministry is responsible for all fisheries policy matters while the SFA is the executive arm of government responsible to implement fisheries policy and projects. Over the last two decades, Seychelles has made considerable progress in fisheries management and development, especially with the development of industrial tuna fisheries in the western Indian Ocean.

**TABLE 2.** Vessels licensed and their annual fish landings

| Vessel type | Number of licences issued (2005) | Total catch (tonnes) | |
|---|---|---|---|
| | | 2003 | 2004 |
| Purse seiners | 48 | 407 684 | 358 261 |
| Longliners, 265 vessels | 415 | 6 273 | N/A |
| Semi-industrial (14–22 m) | 7 | 93.1 | 88.2 |
| Artisanal (5–15m) | 380 | 3 852 | 4 177 |

1. As of March 2005 there were 45 licensed foreign purse seiners of which 34 were Spanish and French (under the EU Agreement) and the remaining 11 were registered in the Seychelles (foreign owned vessels).
2. The longliners are Taiwanese and Japanese owned generally operating on a six-month licence.

Source: SFA Annual Report 2004

Seychelles now serves as a regional hub for industrial tuna purse seine fishery in the region and hosts the Secretariat of the Indian Ocean Tuna Commission (IOTC). Although industrial fisheries constitutes a major pillar

in the economy of Seychelles, the artisanal fisheries remains of great importance in terms of food security, employment and cultural identity in Seychelles.

The numbers of managed fisheries and management measures have increased over the last decade and several fisheries have been closed or regulated due to concern over their economic viability and for conservation reasons. The management measures that have fostered the development of the small-scale fisheries sector include:

- Closed seasons for the lobster fishery with fishing prohibited from the beginning of February to the end of October. In addition, a minimum carapace length at capture has been set for each lobster species and the capture of berried females is prohibited.
- Restricted fishing periods for the mackerel gill net fishery with no fishing allowed at night.
- There are protected fishing areas along the reef for all three main granitic islands where fishing with nets is prohibited.
- Marine parks have been set mainly around granitic islands where all fishing activity is prohibited and restricted zones have been set for foreign fishing vessels prohibiting fishing activities within 3 km from the 200-m isobaths.
- Mesh sizes have been established for fish traps with minimum mesh sizes of 40 mm in diameter.
- The number of licences for sea cucumber and lobster fishing has been capped at 25 and live fish for export has been banned.
- Mother ship ventures (with dories) are prohibited on the Mahé and Amirantes plateaux, being restricted to some offshore banks in the southern islands while a number of fisheries gear types are prohibited. These include demersal trawling, gill netting for sharks, drift net fisheries and fishing using explosives, poisonous substances and spear guns.

At the same time these management measures for the local artisanal and semi-industrial fishing sector have had an important bearing on security at sea. These include the following:

- Small artisanal vessels have had to move further offshore due to overexploitation of coastal resources.
- More vessels have been encouraged to switch from outboard engines to the more reliable inboard powered diesel engines to exploit resources further offshore.
- Fishing vessels are now better equipped with larger artisanal vessels having GPS, echosounders, Epirbs, electric reels, VHF radios and VMS transceivers.
- There has been a systematic fleet replacement programme, with larger and better built fibreglass vessels replacing wooden fishing vessels. These new vessels are not only more comfortable but they can operate in rougher weather, and security at sea has thus improved.
- Duty and trade tax on safety equipment has been reduced considerably making these items cheaper and more affordable for fishers.

Sea safety measures have been included in several fisheries management initiatives. These include:

- Registration of fishing vessels with registration number visibly painted on the hull so that patrol ships and aircrafts can easily locate vessels. There are presently 350 artisanal vessels that are licensed out of a total fleet of approximately 500 vessels. Moreover, only about 60 percent of the professional fishers are registered out of an estimated full-time fishers population of 1 700. There is a need therefore to have a comprehensive national register of all fishers (full-time and recreational) and of all fishing vessels. This would definitely be of assistance in all search and rescue operations.
- Reef passes have been cleared and clearly demarcated by leading lights to facilitate boat passage in particular at night. This allows fishing vessels to go out and enter port at any time of day or night and during poor weather conditions, thus allowing an increase in the fishing effort.

- Before fishers can be granted a loan by the bank for the purchase of a vessel, a registered boat surveyor must inspect it. All vessels must have the required safety equipment on board such as anchors, sufficient mooring ropes, life jackets, flares, etc. before they can be issued with a surveyor's certificate. These measures, however, are not always enforced as there is a limited monitoring system in place to ensure compliance. Moreover the perennial shortage of foreign exchange is a serious constraint that has limited the availability of safety equipment in local shops.

### 3.3 Safety programmes

In view of the long distances fishing boats have to travel to reach the fishing grounds and the unpredictable weather and ocean current patterns, there has always been a long tradition of safety awareness by the Seychelles' fishing community. For example, fishing skippers that travel more then 60 miles from Port Victoria are encouraged to pass the coxswain examination given by the Port Authorities (for skippers on cargo and passenger vessels this requirement is mandatory) and most fishing vessels are equipped with two anchors and adequate mooring ropes for security reasons. Moreover, ever since the first national fisheries policy document was drafted in the mid 1980s, the safety at sea issue was always considered as an important objective. This particular policy document states: "Government will continue to assist local boat owners in acquiring safety equipment at affordable prices and intensify its efforts to educate fishermen on the importance of safety at sea. In order to attain these objectives, government will provide the necessary navigational aids such as emergency distress beacons, VMS transponders, etc.".

In this respect, the installation of emergency position radio beacons (EPIRBs) on artisanal fishing vessels and the implementation of the vessel monitoring system (VMS) for the local fleet have played an important role in promoting safety at sea and most importantly in sensitizing fishers of the security risks at sea.

In 1995, at the request of the SFA, the British Government donated 20 EPIRBs to be installed on local artisanal fishing vessels to improve security at sea. All units were installed on larger artisanal vessels and a homing device (direction finder) was installed on the Caravan airplane that flies regularly to all the outer islands of the Seychelles group. When the EPIRB is activated, in cases of emergency, it emits a signal at a set frequency (121.5 MHz/406 MHz), which can be picked up by a satellite or by a receiver on a plane.

The system experienced several constraints, although it did improve safety at sea for certain fishers. The main problems encountered included discharged batteries, fishers activating the system when not in real distress, and finally, as from 2006, satellites have ceased to process the signals and these can only be picked up by a receiver from a plane. According to the Operation Manager at SFA there are presently 10 EPIRBs still in operation but their effectiveness has been reduced.

In 2002, with the help of funding from the EU, a vessel monitoring centre (VMS) was set up at SFA. Although the original objective of the VMS programme was to monitor foreign vessel activity, another important objective was to improve security at sea for the national fishing fleet, including the artisanal and semi-industrial fishing vessels. In all, 200 VMS transceivers were purchased with the objective of installing them on the local artisanal and semi-industrial vessels and, so far 75 units have already been installed. The programme has proved to be effective, in particular for larger decked vessels, but one of the main constraints encountered is that the system can only work for vessels that have an external power supply (battery). According to the MCS Manager at SFA, they are presently trying to work on a model of transceivers that will have an autonomous power supply.

The Seychelles Coastguard is the principal organization responsible for all search and rescue operations. It employs approximately 150 people and has the following functions: general

surveillance of the EEZ both for defense and fisheries purposes, search and rescue at sea, surveillance of illegal trafficking and pollution control. The Coastguard disposes of a fleet of around ten vessels including a patrol vessel of 46 m, two vessels of 20 to23 m and 6 patrol craft of 15 m. It does not however have any patrol aircraft and instead the planes from the Islands Development Company (IDC) that are mainly used to transport passengers and cargo to the outlying islands can be utilized by the Coastguard on a priority basis for fisheries surveillance and search and rescue operations. The Coastguard has a Marine Rescue and Coordinating Center (MRCC), which functions on a 24-hour basis, equipped with VHF and MF radio receivers dealing with both fisheries surveillance and rescue operations.

The radio watch for search and rescue at sea is also assured by a Coast Station operated by the local telecommunication company "Cable and Wireless" that is equipped with VHF radio and a MF station. Fishing vessels in distress or requiring assistance at sea, that are equipped with VHF or HF radios, can communicate directly with the Coast Station that retransmits their calls either to the SFA or to the Coastguard.

In addition the Seychelles Coastguard now have an additional responsibility of setting up a regional search and rescue system with a new MRCC financed by the IMO. This project will be based at the Seychelles Coastguard as Seychelles, together with the United Republic of Tanzania (Dar es Salaam), has been designated as the two main substations in the region (the central station is at Mombasa). In addition to VHF and HF, the equipment provided includes an IMMARSAT station equipped with an electronic map software to assist search and rescue, a ship security alert system (SSAS) and four computers that will enable the Coastguard to receive direct visual images from the VMS Centre at the SFA.

Finally, in the new National Fisheries Development Strategy (2006–11) provision has been made to include a programme for safety at sea for future fisheries development.

The broad themes of this strategy include:

***1. Awareness on safety at sea***

- Extension activities on importance of safety and vessel design.
- Organization of conferences, workshops and training on safety at sea.
- Organization of awareness programmes: manuals, leaflets and posters on safety at sea.

***2. Vessel design and construction***

- Definition of vessel design and construction standards for recreational and fishing vessels.
- Establishment of legislation on fishing vessel design and construction.

***3. Strengthen safety legislation***

- ransposition of IMO/FAO/ILO directives and conventions on safety into national legislation.

***4. Control and enforcement***

- Training of technicians for certification and control of safety equipments.
- Increased enforcement of safety legislation.

***5. Availability of safety equipment***

- Development of mechanism to ensure availability of safety equipments.

***6. Improve conditions and safety of fish landing sites***

- Installation of navigational aids in district fish landing sites.
- Improvement of jetty facilities at landing sites.

Most of these safety programmes should be implemented in the course of the next five years.

### 3.4 Data recording

Until 2005, there was no government agency in Seychelles with the responsibility of keeping a record of accidents and lives lost at sea. In principle, this responsibility should have fallen on the Port Authority but it appears that either data has been lost or were never recorded in the first place. As of the beginning of January 2006, the Seychelles Maritime Administration (SMA) has officially taken over this responsibility and a detailed form is now filled in for every accident at sea (including loss of lives). However, the Seychelles Fishing Authority (SFA), which has been closely involved with many search and rescue operations for the last 20 years (with its research vessels), has kept an unofficial record of all such incidents in which it was involved. According to the Operation Manager at SFA, sea safety accidents in Seychelles are principally due to the following factors:

- Strong winds that average around 20 to 35 knots, with gusts blowing up to 60 knots during the southeast monsoon period, in particular from June to August. This represents a serious constraint for fishing operations and it is the period when most accidents at sea occur.
- Engine breakdown mainly related to battery problems (broken fan belt or alternator) or simply because of discharged batteries. This is the reason the Authority has adopted a policy of ordering inboard engines (from Grant Aid and/or bilateral funded projects) equipped with hand crank starters as a back-up to engines with electric starters.
- Vessels colliding with each other or more frequently with large industrial fishing vessels (mainly tuna purse seiners). This is due to fishing vessels not always being equipped with lights at night.
- Poor quality of boat construction, in particular the installation of engine and electrical system and general negligence of the fishing crew.
- Crew falling overboard. This is often due to rough weather conditions or to drunkenness; in the latter case it generally happens on the first day of sailing.

In addition, the outer islands of the Seychelles present a special case of security risk for safety at sea. This is due to the fact that the islands are very isolated (far from Mahé and other islands), are low-lying, and hence are only visible at close range, most islands have sharp drop-offs close to shore, with the fishers being unable to anchor in the case of engine breakdown. Moreover, because of their isolation and distances involved, search and rescue operations are generally slow to start after the fishing vessel has been declared missing. In addition, certain skippers have the bad habit of not informing anyone on shore of the area where they are going fishing, thus complicating search and rescue operations further.

Table 3 is based on personal recollections of the author, interviews with the SFA Operation Manager, personnel from the commercial and fishing port, boat-owners and fishers themselves who have lost friends and colleagues at sea. It should be stressed that most accidents at sea occur in the rough weather period of the southeast monsoon between June and September.

### 3.5 Legislation

The principal legal instruments for the control of fishing in Seychelles are the Fisheries Act 1986 and the Fisheries Regulation 1987, which were subsequently amended, and the Licensing (Fisheries) Regulations 1987. The management of fisheries covered by the Fisheries Act is based mainly on the management plan implemented through Regulations. The Act mandates that the Seychelles Fishing Authority (SFA) should collect and analyse statistical and other information on fisheries and prepare and keep under review plans for the development and management of

**TABLE 3.** Number of accidents at sea involving artisanal and semi- industrial fishing vessels

| Year | Number off incidents * | Lives lost | Remarks |
|---|---|---|---|
| 1996 | 2 | 2 | Vessel sunk with one survivor found drifting in an ice-box after several days. |
| 1997 | None | | |
| 1998 | 1 | 1 | Man lost overboard |
| 1999 | 3 | 2 | Man lost overboard/12-m fibreglass vessel sank in rough seas but the 4-man crew was rescued. |
| 2000 | 2 | 1 | Man overboard/vessels collided but crew rescued. |
| 2001 | 2 | 1 | Boat lost with one fisher on board from an outer-island, probably due to engine failure |
| 2002 | 1 | 3 | Boat lost from outer-island probably due to engine failure. |
| 2003 | 3 | 1 | One man lost overboard from the outer-island |
| 2004 | 2 | 3 | Vessel disappeared with entire crew, supposedly on its way to Madagascar. |
| 2005 | 4 | 1 | Man overboard, drowned/vessel collision/diving incident involving sea-cucumber fishery. |
| 2006 | 4 | 1 | Boat abandoned but crew rescued/one crew member lost overboard. |

* Note: Only serious accidents have been recorded (mostly involving loss of lives) and more numerous incidents were recorded over the last three to four years than were recalled, dating ten years back.

fisheries. These include: closed seasons, closed areas, gear specifications, fishing methods and gear types, specification of species size or other characteristics of aquatic organisms that are allowed or prohibited to catch and schemes for limited entry into the fishery.

The main legal framework controlling fisheries in Seychelles are the following:-

1. The Maritime Zone Act (1977). This act proclaimed Seychelles as a sovereign state and established and defined the Seychelles EEZ, the baselines, the continental shelves, the territorial waters and the historic waters, etc.
2. The Fisheries Act 1987. This Act defined all the fisheries regulations concerning both the local and foreign fisheries. It established the major fisheries management measures, the fishing licences procedures and the fines for breaching each licence regulation.
3. The Licences (fisheries) Regulations (1987). Defines the various categories of fisheries licences, the conditions and the various fees applying to both local and foreign licences.
4. The Seychelles Fishing Authority (Establishment) Act 1984. The main functions of SFA as defined in Article (5) of the Seychelles Fishing Authority (Establishment) Act are:
   – to promote, organize and develop fishing industries and fishing resources in Seychelles.
   – to assist in the formulation of this policy with respect to fishing development and fisheries resources;
   – to conduct negotiations, engage in meetings, seminars, or discussions with regard to fishing or fisheries and the establishment or operations of fishing industries, whether at a national or international level on behalf of the Republic;
   – to identify the human resources training requirements of Seychelles with regard to fishing and fishing industries.

It has to be underscored at this time that there is presently no fisheries legislation controlling the inspection and enforcement of safety measures for fishing vessels, although projects for adopting such legislation have existed for some time (such legislation exists and is strictly enforced for passenger vessels, hire crafts, big game fishing vessels and cargo vessels). Moreover, since most artisanal vessels are not insured, they do not require surveying and inspection for seaworthiness, for the purpose of security at sea. Hence no safety regulations are enforced for fishing vessels in respect of safety at sea. A legal project, however, has been drafted to that effect for enforcement of security measures on fishing vessels, but it cannot be adopted unless the present law is modified, as Seychelles law at this time does not make provision for enforcement of safety regulations for saving lives at sea on fishing vessels. In this respect the newly created Seychelles Maritime Safety Administration (MSA) pursuant to section 5 of the Seychelles Shipping Act 2006 has assumed the leading role of enforcing safety regulations for small fishing vessels This Authority has already

drafted such regulations entitled "Shipping (Safety of Small Fishing Vessels) Regulations 2006", and is working hard to have it adopted before the end of this year.

The main articles of this regulation states that:

- It applies to all Seychelles fishing vessels of less than 24 m in length.
- A fishing vessel shall not proceed on any fishing trip unless the vessel carries the safety equipment appropriate to its length and construction (decked or open) in accordance with the requirement of the schedule.
- In the event of a casualty or incident involving the vessel resulting in loss of life or the vessel being damaged, stranded or lost, the master of the vessel shall inform the Administration (MSA) immediately.
- The master or owner of the vessel shall submit the report to the Administration, when as a result of a casualty or incident that involves the vessels or the equipment:
  – loss of life or if a person is injured and requires medical treatment beyond first aid;
  – a person disappears from a fishing vessel in circumstances that indicate probable death and injury;
  – damage occurs to the vessel and other property.
- The construction, installation, fittings material and appliances on the vessel shall be of recognized standard in order to be issued a Small Fishing Vessel Safety Certificate. This certificate shall be valid for a period not exceeding one year.
- The Authority may withdraw any valid small fishing vessel safety certificate if the vessel ceases to comply with the specified requirements:
- The following safety equipment shall be required for all decked vessels up to 12 m in length: life jackets, life buoys, parachute flares, fire extinguisher, spare batteries, VHF radio, spare anchor and sufficient chain or mooring rope, bilge pump, navigation light, compass and first aid kit.

There are presently four inspectors working at the SMA to inspect all types of vessels (except for fishing vessels). This number will have to be increased when the Small Fishing Vessel Fishing Regulations come into force.

### 3.6 Boatbuilding and vessel design

In the last 25 years government has made a concerted effort to improve local vessel designs mainly with financial assistance from the ADB, JICA, the Spanish Government and the EU. The main objectives of these programmes were to improve the comfort and safety of fishing vessels, to encourage fishermen to fish further offshore so as to target underexploited species, as well as to encourage the younger generation to enter the fishery. Although this programme has met with a measure of success, in particular in encouraging local boat-builders to switch from wooden to fibreglass built vessels, there are still no accepted standards for the construction of fishing vessels. Furthermore, there are various problems of poor workmanship and design and, to make matters worse, no proper sea trials are carried out on new vessels, and local builders do not give any warranty after the vessel has been launched.

There are presently several types and designs of local fishing vessels involved in the domestic fishery.

In 2004, the following types of artisanal and semi-industrial fishing vessels were in operation:[1]

[1] Source: adapted from the SFA Annual Report 2004.

**TABLE 4.** Main artisanal vessel characteristics

| Vessel type | Length in m | Engine | Typical fishing range/distance | Deck-type | Material | Crew | Length of trip | Equipment (navigation/ communication) |
|---|---|---|---|---|---|---|---|---|
| Whaler | 6–12 | 2–3 cylinder (26-44 hp) | Up to edge of plateau, 70–120 miles | Open for day-trips, some semi-covered | Wooden or fibreglass | 6–8 | Open deck 1 day, semi-covered 6–8 days | AM radio, VHF,GPS |
| L'economy | 6–8 | 1–2 cylinder (13–26 hp) | 40--70 miles | Semi-deck | Fibreglass | 2–3 | 3–4 days | GPS, echsounder, AM radio |
| Schooner | 10–15 | 3–4 cylinder (~55 hp) | 70–150 miles | Decked | Fibreglass (some wooden) | 6–7 | 8 days | VHF, GPS, compass, |
| L'avenir | 9–10 | 3 cylinder (36 hP) | 70–120 miles | Decked | Wooden | 3–4 | 6–8 days | GPS, compass, echosounder |
| Pirogue | 4–8 | None | 1–2 miles | Open | Wooden | 1–2 | 2–5 hours | None |
| Open boat | 5–7 | 25–40 hp | 3–25 miles (inshore) | Open | Fibreglass | 2–3 | Day trips | None |

- 280, 5-m, open fibreglass fishing vessels powered by 25–40 hp outboard engines. These boats were introduced in Seychelles in 1977.
- 30 Lekonomi type vessels, which are 6.5 m fibreglass vessels equipped with an icebox and a one to two cylinder inboard engine.
- 15 L'Avenir type fibreglass vessels, which are basically a larger version of the Lekonomi being approximately 8 to 10 m and equipped with a three cylinder inboard engine.
- 91 whaler type vessels, which are traditional clinker constructed vessels, 9–12 m with inboard engines, which are mostly partially decked and can accommodate a crew of six to seven people. Most whalers are now built of fibreglass and equipped with iceboxes doing trips of three to six days.
- 16 schooners, which are wooden-hull decked vessels usually between 10 and 13 m and equipped with a three- to four-cylinder diesel inboard engine and an icebox of 2 500 to 3 000 kg capacity. Schooners do trips averaging eight days on the edge of the Mahé and Amirantes Plateaux. The larger schooners are still equipped with sails that are mostly used in emergency situations.
- 7 semi-industrial longliners ranging in size from 14 to 22 m that have been constructed in Sri Lanka and Japan. These vessels target mainly tuna, swordfish and sharks and fish mostly outside the Mahé plateau within a range of 150 to 200 nautical miles from port.

Although no boat-building regulations officially exist, local boatbuilders have been discouraged from building vessels with a LOA (length overall) of more then 15 m. This is mainly due to their lack of experience in the installation of electrical and hydraulic systems, installation of large engines and proper layout required for larger vessels. Hence, when the semi-industrial longline fishery was introduced in the mid-1990s, government encouraged vessel operators to purchase their vessels from overseas (mainly from Sri Lanka), which proved to be not only cheaper but also more sturdily built vessels. These longliners range in length from 14 to 22 m and are equipped with modern electronic equipment and monofilament longline spools, and have proved to be very suitable for local weather and fishing conditions

Any attempt to describe the various trials to improve the design and sea-worthiness of fishing vessels in Seychelles would not be complete if it was not mentioned that in 2000 the Seychelles Bureau of Standards (SBS) produced a document in which it outlined the standards for the construction of fibreglass vessels. This document was the result of the work of a committee that was set up to study and set standards in the construction and utilization of fibreglass reinforced plastic (FRP) vessels of various types of hulls of up to 18 m in length. The committee was composed of individuals from government, non-governmental organizations (NGOs), the public and private sectors, and made reference to various manuals and literature on the subject. Emphasis was placed on the importance of the design and quality of the construction material to improve safety at sea for fishing vessels.

It was the intention of the committee that the standards would be implemented under the Port and Marine Regulations for the construction of FRP vessels. The annex of the document describes in detail specifications for the construction of the hull, installation of the engines, the electricity system and cooking facilities. The codes of standards specified in the document however have yet to be incorporated in the local regulations for construction of local vessels.

## 3.7 Other safety issues

### *Availability and use of communication equipments*

In Seychelles, most large decked vessels (approximately 60), in particular those manned by a younger generation of fishing skippers (in the 30–45 year age group), are equipped with VHF radios, EPIRBs and VMS. Most of the larger schooners (12 m) and all semi-industrial vessels are, in addition, equipped with SSB (single sign band). While the VHF radio have a range of approximately 70 to 100 km (up to the edge of the Mahé Plateau) and cost around US$1 000, the SSB radio has a range of up to 400 miles costing US$6000/unit. These are vital pieces of security equipment when fishing off the plateau in oceanic waters. Skippers also utilize these radios to communicate with the owners/home base and with the Coastguard in cases of emergency, such as accidents on board or engine breakdown. For semi-industrial longliners direct communication with the home base (owners) is important to assist in locating fishing grounds (tuna schools) based on satellite imagery obtained from the land stations. SSB radios are also used to communicate with neighbouring fishing vessels to request assistance in cases of accidents and sometimes to share information when carrying out minor repairs to engines and fishing gears at sea.

### *Availability and use of navigational equipment*

Navigational aids such as GPS, echosounders and short band radio (AM) are considered standard equipment on all smaller decked vessels of less than 12 m LOA such as the "Lekonomi" or "L'avenir" type vessels (see Table 4). There are presently an estimated 200 such vessels, also equipped with GPS, which are mainly used to locate fishing grounds as well as navigational aids, in particular when fishing on offshore banks such as on the outlying islands (approximately 150–200 km). One serious constraint, however, is the lack of navigational charts on the market, which presently cannot be purchased from any of the fishing gear outlets. This is mainly due to the high cost of the charts and to the fact that chart paper is easily spoilt on small vessels. One possible solution would be to have the charts laminated in plastic to minimize spoilage. Compasses are considered as standard equipment and are more readily available on the local market costing an average of US$50/unit.

### *Availability and cost of engine spare parts and repairs*

The same is true concerning the availability of engine spares, in particular for outboard motors, which require more frequent maintenance. This situation has resulted in outboard engines being very frequently stolen, mostly to obtain spare parts, to the extent that insurance companies do not insure outboards. The situation for inboard engines is not as bad because they require less maintenance and the spares can be ordered in advance. There are several specialized mechanics that can carry out repairs to marine engines (both outboard and inboard) at a reasonable rate, but again the lack of spares contributes considerably to the relatively high costs of repairs (spares have to be imported at a high price due to foreign exchange constraints).

### *Local production of safety equipment*

Fishers themselves manufacture at least two basic pieces of safety equipment. One is a buoyancy apparatus resembling a life raft (approximately 3x1 m), built from fibreglass and foam, equipped with hand holders, which is stored on top of the wheelhouse on larger vessels. This home-made equipment can allow up to five to six fishers to keep afloat in emergency situation, such as a sinking boat, until they are rescued. The other more essential piece of safety equipment found on all fishing vessels is the grapnel anchors made from 0.5" to 1" iron rods. Besides being used

**TABLE 5.** Availability and cost of safety equipment

| Type of safety equipment | Retail price in US$ | Availability | Comments |
|---|---|---|---|
| Life Jackets | US$50/unit | Fair | Most common equipment on small boats. |
| Life rings | US$45/unit | Poor | Only used on large fishing vessels |
| Parachute/hand flares | US$40/unit | Poor | Used by all vessels |
| Offshore kit (parachute flares, orange smoke, rocket, hand-held flares). | US$600/unit | Good | Utilized by larger semi-industrial vessels or sports charter vessels. |
| Compass | US$50 | Fair | Used by all decked vessels fishing offshore |

to anchor the vessel in emergency situations (engine breakdown), grapnel anchors are utilized by fishing vessels to anchor both during fishing operations and at night when the crew is resting. Usually most fishing vessels carry at least two grapnel anchors with adequate mooring rope. This relatively simple piece of equipment is considered as essential safety gear on all fishing vessels.

### *Use of mobile phones*

Another piece of safety equipment that is becoming a standard feature on small, generally outboard powered open vessels is the mobile phone. The mobile phone has a range at sea of approximately 20–30 km, depending on the position of the relaying tower. Mobile phones are now often used as a replacement for spare engines and are becoming increasingly popular with both professional and recreational fishers going out for day trips and/or overnight fishing trips.

### *Availability and cost of safety equipment*

Although there are specialized maritime electronic workshops that can carry out repairs to most electronic equipment, due to the prevailing foreign exchange constraints, spare parts are not often available and fishing vessels have sometimes to stay longer in port to wait for the necessary repairs (with parts having to be ordered). This problem is more complicated when it comes to the purchase of new electronic equipment, and unless this equipment is available under Grant Aid Projects (or more recently the Tsunami Flash Appeal Fund), it is often not available in the local shops and fishers have to order it directly from overseas. Although most safety equipment is imported duty free, it is expensive and not always available on the local market. Table 5 gives an indication of the cost of safety equipment with relevant comments on its availability.

### *Search and rescue operations*

- Currently, when a fishing vessel that is not equipped with any communication equipment goes missing, after one or two days late in its return scheduled to port, both an aerial and sea patrol are organized. In the case of vessels equipped with radios (VHF or SSB) that are experiencing problems at sea, the vessel's skipper either calls the Coastguard, SFA or the Coast Station giving the vessel's position, and the vessel is either repaired at sea or towed back to port, The Coastguard is generally in charge of search and rescue operations (sometimes with the assistance of the SFA and IDC vessels)
- The aerial search (with IDC planes) and sea rescue patrol for vessels declared to be lost at sea generally lasts for several days, even weeks, with assistance frequently being given by visiting foreign navy ships or from aircraft based in La Reunion and/or Diego Garcia. Because of shifting wind patterns and changing ocean currents it is not always easy to predict the drifting pattern of a fishing vessel. Sometimes the vessel is found after several weeks or even months of being adrift, either by a passing vessel or actually reaching the East African coast.

### *Use of fishing vessels for transport of goods and passengers*

In Seychelles fishing vessels as a rule are not used to transport goods and passengers. The only exception is for the fishing vessels travelling to the three main granitic islands (Mahé, Praslin, La Digue), which is a distance of 25–30 km. Passengers are sometimes transported for special occasion such as for attending a parish feast, a funeral, a sports or political event. There has, however, been no documented case of loss of lives/or accidents at sea involving such practices.

### 3.8 Observations

Without any doubt, Seychelles is the country in the SWIO that has made the most concerted effort to develop its fisheries potential in a sustainable manner while at the same time taking into account the welfare and security of local fishers. The fact that no technical measures have been legislated up to now to ensure the security of fishing vessels, with the specific objective of saving lives at sea, can partly be attributed to insufficient technical and human resources. However, this matter is being given urgent consideration by the newly created body, the Seychelles Maritime Administration (SMA), and new legislation to that effect should be enacted before the end of this year.

There is still, however, a lingering problem of monitoring and enforcement of fisheries legislation, including the proposed new measures for security at sea. No doubt it would be pointless to have updated and comprehensive fisheries legislation if it cannot be enforced. Another shortcoming is that practically no official data on accidents at sea have been recorded and, moreover, very few official inquiries are conducted following accidents at sea, so that the real cause of accidents is sometimes never resolved. This should in principle have been an easy task for a country with a rather good administrative structure and this lack of information defies any rational explanation. The new Authority (SMA), however, is also taking this deficiency seriously, and the situation should definitely improve as of this year.

# 4. MADAGASCAR

## 4.1 General background

Madagascar is a very large island with a surface area of 590 750 km². The coastline is approximately 4 500 km long and there are over 250 small islands and islets. The largest of these are the volcanic island of Nose Bé and the island of Sainte Marie.


Islands are important for their associated coral and lagoon development and also because they provide security for small fishing vessels, in particular the non-motorized oar and sail powered fishing vessels. There is a great disparity in the population density between regions. Nine million (or 65 percent) of the country's population live within 100 km of the coastline.

The continental shelf (20 to 250 m isobaths) covers an area of 117 000 km² and the Malagasy EEZ (1 140 000 km²) is heavily influenced by two major oceanic currents: The Agulhas current in the south and the Somali current in the north.

The fishing fleet in Madagascar is composed of the following:

- The traditional fishery, which is either carried out on foot or in single-hull pirogues, mostly sail-powered but sometimes equipped with outboard engines. This category of vessels makes up more the 99.4 percent of the fishing fleet. These types of vessels are not registered and in 1990 it was estimated that they landed 70 000 tones of marine products and created direct or indirect employment for 500 000 people. In 1990, 40 000 fishers utilizing 22 000 pirogues, practised this traditional fishing activity. These vessels usually carry out day trips leaving early in the morning to return in the afternoon. This traditional fishing activity is usually practised along the west coast of Madagascar.
- The artisanal fishery utilizes small fishing vessels equipped with an outboard engine of 40 hp or less. This fishery is carried out on the continental shelf up to 20–30 km on the western coast of the island and 2–5 km on the east coast. The total area exploited is around 117 000 km².
- The industrial fishery, which utilizes fishing vessels with an engine of more 50 hp, targeting mostly the shrimp fishery; the maximum horsepower permitted is 500 hp.
- The industrial shrimp fishing vessels (75 vessels).
- The industrial tuna fishing vessels composed entirely of foreign owned licensed vessels.

The topography and climatic conditions of Madagascar are the major causes of boat accidents. In addition to having a long coastline with densely populated coastal fishing communities, the continental shelf on the west coast extends to over 30 miles and the sail-powered vessels are at the mercy of changing winds and shifting ocean current patterns. The eastern coast is particularly treacherous since it is almost in a straight line and, contrary to the western coastline, it has very few islands/bays/creeks that can afford shelter to fishing vessels. Moreover the Coastguard or Navy is based in only two ports, Antsiranara (Diego) and Majunga, and their primary objectives are first

and foremost military, then maritime surveillance, and only in rare circumstances do the patrol vessels intervene for saving lives at sea.

### 4.2 Fisheries management and sea safety

The management of the fishing sectors in Madagascar shows a sharp contrast between a high performing industrial shrimp fishery subsector using sophisticated methods and equipment and the other traditional and artisanal sectors that remain unorganized and inefficient.

The good performance of the industrial shrimp fishery subsector (together with that of shrimp farming) is mainly due to the industry's own association called "Groupement des aquaculteurs et pêcheurs de crevettes de Madagascar" (GAPCM). GAPCM has a very small management structure (a Secretary General and a technical assistant); however; it has helped to make Madagascar an excellent example in shrimp resource management.

In contrast, the government fishery administration – the "Ministère de l'agriculture, de l'élevage et de la pêche" (MAEP) and "Directions de la pêche et des ressources halieutiques" (DPRH) – lack regional resources, to the extent that 70 percent of staff are based in Antananarivo, far from the sea.

Perhaps the best example of interaction between fisheries management and safety at sea is a new initiative in the management of the shrimp fishery that is presently taking place on the west coast of Madagascar. A voluntary freeze on the fishing effort has been agreed by limiting the number of smaller vessels (up to 8 m LOA) actually involved in the fishery on the coast from Majunga to Nosy Bé. Sixteen fishing vessel licences belonging to the artisanal fishing company SODEPROMA have been purchased by the industrial fishing company SOMAPECHE belonging to a well-known shipowner. Not only should this make a positive contribution to stock conservation but it will also reduce the cases of collision at sea as most of these small fishing vessels do not display any lights at night. In addition, some of these small vessels sometimes set their fixed nets at night and this leads to incidents of entanglements with large trawlers.

Coastal fisheries are crucial to the coastal population, most of them depending on traditional fishing to sustain their livelihoods. Their numbers are increasing as the local economy rarely offers alternatives. A large majority of small-scale fishers are not organized and not registered, fishing individually or in a family groups. Besides serious depletion of some marine resources such as holothurians and octopus, the general trend of the pre-harvest sector is a decline in catch rates. Several management measures have nevertheless been introduced for the most important marine species ("espèces nobles").

These include:

- For lobsters:
  - The law makes provision that only traps and nets can be used to fish for this species.
  - Only females with carapace length of more then 20 cm can be caught.
  - The lobster fishing season is only opened from 1 January to 31 March.
- For sea cucumber:
  - A minimum size of 11 cm for fresh sea cucumbers and 8 cm for dried specimens.
  - Harvesting is only permitted by free diving, diving tanks being prohibited.
- For squids:
  - A closed season between 15 December to 31 January on the southeast coast and 1 June to 15 July on the east coast.
  - A minimum size at capture of 350 g and only nets with a minimum mesh size of 30 cm allowed.

- For mangrove crabs:
  - As from1 January 2007 the minimum carapace length at capture is 100 cm and capture of moulting crabs (soft shell specimen) is banned.

In view of the wide distribution of the coastal population and poor MCS capability, most of the management measures mentioned above (except for the shrimp fishery and to a certain extent the sea cucumber fishery) are not enforced.

The sea cucumber fishery in Madagascar deserves closer analysis. In view of the amount of money involved, it has given rise to an illegal trade and is a major cause of serious accidents at sea. Each of the main fishing ports for small-scale fishery (Majunga, Tamatave, Morondave) have fast fishing vessels of approximately 7 m LOA (length overall) that are privately owned, being equipped with engines of up to 80 hp. These vessels that target sea cucumber usually belong to one or two owners and in cases of accidents or emergency at sea they organize their own search and rescue operations. According to the Operation Manager of the CSP ("Centre de surveillance des pêches") in Antananarivo fishers practising this fishery do not observe the regulations when utilizing diving tanks since they are not well trained. Again, according to the Operation Manager of the CSP, these fishermen do not follow the decompression procedure when surfacing, which is a major cause of paralysis or even death among divers. This situation is aggravated by the fact that certain unscrupulous businessmen, mostly from the Far East, who are seeking fast profits, provide diving equipment to untrained fishers.

Concerning registration of fishing vessels, the traditional monohull pirogues do not have to be registered, but the larger motor-powered artisanal vessels (with engines of up to 50 hp) have to be registered by the "Direction de la pêche et des ressources halieutiques" (DPRH) and the "Ministère de l'agriculture de l'élevage et la pêche" (MAEP). The licence fee is calculated based on a fee schedule that is determined by the CSP. The fishing operators (fishers), the marketing agent as well as the fishing gears (usually nets) have to be licensed. 'The "Agence portuaire maritime et fluviale" (APMF) is responsible for registering all vessels including fishing vessels and collecting and analysing all cases of accidents at sea, but since they have very limited human and financial resources this responsibility usually falls on the CSP.

In March 2005 government organized the ZAC project ("Zones d'aménagement concerté") as a four-year trial project (ending in 2009). This project is being concurrently run by GAPCM and Ocean Consultant and is being coordinated by the former Fisheries Director for Madagascar, Mr Charles Andrianaivojaona, with the assistance of three French expatriate staff from the "Association française de développement" (AFD) and Malagasy technical officers whose role is to liaise with the local population. This pilot project, which is being financed by the AFD, is concentrated in three coastal areas namely:

- in the northeast, (Baie d'Amborava) east of Sainte Marie;
- in the northeast (Baie d'Antogil) around Nosy Bé;
- in Morondave on the western coast.

The objectives of the project are to organize fisheries management projects in consultation with the local stakeholders/fishers and authorities responsible for local development so as to improve the management of marine resources. It is an attempt to try and decentralize fisheries management from Antananarivo to the coastal region.

Another excellent initiative to develop fisheries management programmes in conjunction with sea safety was an FAO project that took place in Tamatave between 1993 and 1997. The main objective of this project was to demonstrate the technical and financial feasibility of catching high-valued demersal species such as red snappers and groupers to be exported to La Reunion and Mauritius

and even to France (Regis auction market). The former Director of this programme, Mr Charles Andrianaivojaona, explained that since the western coast was particularly dangerous to fishers and was lightly exploited, fishers were provided with security equipment such as life jackets, mirrors and sails to improve security at sea. According to the former Director, this programme is still ongoing with fishers now running the fishery on their own.

Within such marine forums, stakeholders are encouraged to discuss issues and to negotiate solutions to problems. One question being discussed is how to add value to the products through improved sanitary control, traceability and better market access. Another question of serious concern is to reduce the use of mosquito nets to catch fish juveniles (in particular shrimp juveniles), which is a major issue of contention.

Although safety at sea has never been considered as a priority in a developing country like Madagascar, this attitude is slowly changing. The most crucial aspect is to decentralize services from the capital to the coastal towns and ports so as to get the coastal population involved in decision-making and help the fishers to solve their problems themselves with the minimal assistance of the central government and foreign donor agencies.

One of the most important outcomes of the Registration Seminar in Antananarivo (22–23 May 2006) is that the fishers themselves agreed that the system of open access to all marine resources could no longer be perpetuated and there was a need to have better control of the exploitation of the resource. It was unanimously accepted that the first step would be to study ways of registering all fishing vessels no matter what their size or operating range. Not only would this give a better indication of the fishing effort, but also it would give a better idea of accidents at sea and perhaps even help to save lives by improving accountability of small fishing vessels that are lost at sea. It is estimated that every month, in particular during the southeast monsoon, at least a dozen small traditional sail-powered vessels do not return to their fishing village and sometimes end up on the coast of Mozambique (personal conversation with a ZAC *animateur* from Morondave).

### 4.3 Safety programmes

Several sea safety programmes have been organized and implemented in Madagascar in the last ten years. According to this consultant, the most serious and effective programme has been the Centre for Fisheries Surveillance (CSP). This programme was initiated in Tamatave in 1994 as a result of a meeting with artisanal boat-owners to discuss safety at sea. Previously to this date, search and rescue operations at sea were organized by local boat-owners showing good will to help their fellow citizens. Following this meeting, the main ports confirmed that their available vessels could be utilized for search and rescue operations provided that payments for fuel could be guaranteed. Hence a CSP was set up with the assistance of funding from the EU and AFD.

The CSP has been operational since 2002 with its headquarters at Antananarivo and substations at Antisiranana and Majunga. According to the Operation Manager of the Centre, 20 VMS transceivers have been placed on artisanal vessels at Morondave, Nosy Bé and Maintirano. The transceivers are purchased by the boat-owners at a cost of 2 000 euros per set. Although this consultant visited the CSP and witnessed that fishing vessels were indeed being monitored, it is evident that the station is more interested in tracking the larger Industrial fishing vessels then smaller artisanal ones. The manager explained that Madagascar had a large search and rescue (SAR) zone with the main objective of coordinating search and rescue operations through the Aeronautical Rescue Centre (ARCC) based at Ivano airport at Antananarivo. In addition Antananarivo (Ivano airport) has one small plane used for maritime surveillance that can also assist in search and rescue operations but its budget is limited to 110 flight hours annually. Distress signals are transmitted through the Global Maritime Distress and Safety System (GMDSS) network at the ARCC to the regional Maritime Rescue Coordinating Centre (MRCC) based in La Reunion. The manager acknowledged

that La Reunion was working in close cooperation with Madagascar to reinforce the country's limited capability for the surveillance of the country's large SAR zone, which is estimated to cover an area of 2.8million km² (Malagasy SAR area calculated by the SFA MCS Manager).

According to the Operation Manager of CSP, the major source of sea safety accidents is sudden change in wind and ocean current patterns over which the traditional fishermen have practically no control. The other major cause of loss of life at sea is that search and rescue operations are almost non-existent along the coast with only ports such as Majunga and Antisiranana (Diego) having limited search and rescue facilities (seven Zodiacs of 6–7 m are designated for search and rescue in Majunga). In addition the port of Majunga has a subregional base for surveillance and is equipped with two fast search and rescue launches of 40 GRT (of which one is presently undergoing repairs).

Moreover, the Coastguard or navy is based in only two ports, Antsiranara (Diego) and Majunga, and their primary objective is first and foremost military then maritime surveillance and only in rare circumstances do the patrol vessels intervene for saving lives at sea. According to the Operation Managers at the CSPs in Antananarivo and Majunga, the main reason for this is the difficulty in obtaining fuel (or rather the high cost of fuel) for patrol vessels.

In addition to the above maritime rescue facilities, Madagascar also has a "Gendarmerie maritime" (Maritime Police Unit) in the following ports, each being equipped with the following rescue launch:

- Morombe – one vessel
- Tulear – one vessel
- Sainte Marie – one vessel
- Nosy Bé – one vessel

The exact operating range of these vessels was not specified, although it was mentioned that at least one of the vessel was presently undergoing repairs.

According to the major players this consultant discussed with, the most important area for future intervention is in basic training for fishers. In this respect the maritime training school at Majunga, the "Ecole nationale d'enseignement maritime" (ENEM) should be playing a leading role, in particular for training crews for medium to large vessels. Concerning smaller-scale fishing vessels, training could be given at village level with emphasis on sensitizing the fishers to the importance of security at sea and how to cope with the major constraints (credit facilities to purchase safety equipment, good boatbuilding material for fishing vessels, etc.).

### 4.4 Data recording

The agency that should normally be responsible to record data on Search and Rescue statistics is the "Agence portuaire maritime et fluviale" (APMF). Since this agency is more concerned with larger vessels, the CSP is presently discharging this responsibility. Moreover, since this Authority has only recently been created (2002), the data recorded are also very recent.

A good idea of the extent of the security at sea problem that exists can however be obtained through personal anecdotes. Hence, according to personal conversations with Mr Jacques Jao, the ZAC *animateur* based in Morondave on the west coast, the fishers who set out to go fishing in their traditional pirogues are entirely dependent on the wind patterns. On a normal day out, they leave during early morning with the winds blowing offshore and return by early afternoon when wind patterns are reversed. If one or two pirogues do not return by late evening, as often happens during periods of heavy weather, the fishers' families have little recourse but to wait for their

return, in particular if the fishing village is too far from the Coastguard base at Morodave. Even if the authorities are notified, usually there is not enough fuel to organize a proper search and rescue mission. Again according to Mr Jao, at least a dozen traditional fishers around his district are lost at sea every year or are unaccountable.

The Operation Manager of the CSP reported certain specific incidents concerning sea safety:

- In 2004 there were several accidents on the SE coast due to sudden changes in weather patterns – periods of calm weather before the storm. One specific incident occurred at Cap St. Marie during the tropical cyclone "Ernest" when 70 local fishers lost their lives due to a sudden shift in wind patterns brought about by the cyclone.
- In 2006, seven fishers at Manakara in the southeast were lost when their non-motorized fishing vessel was unable to return to land due to a sudden shift in wind patterns.

According to the CSP, these sudden changes in wind patterns are by far the major threat for loss of lives at sea for the traditional fishing vessels equipped with sails. Since the APMF does not presently register this category of vessel, no accurate records can be kept. This Agency definitely feels that if the recommendation from the workshop to register all fishing vessels is implemented and if the regulation is enforced, it will definitely improve the security at sea situation.

Other specific accidents at sea mostly involving the shrimp fishery were reported by Mr Xavier Vincent of the GAPCM.

- In 2000, a fire on a 25-m trawler caused the death of ten of the crew. This incident was mainly due to the lack of safety equipment on board and the crew's inexperience.
- In March 2004, due to the cyclone "Gafilo", a 20-m trawler the "Vega 9" sank off Majunga with loss of lives due mainly to the fact that there were too many people on board.
- In 2006 the fisheries surveillance vessel "Ambry" sank off Majunga, but fortunately only one member of the crew was lost and the other members of the crew were rescued. According to Mr Vincent the main cause for this accident was the crew's inexperience in security procedures.

The Director of the APMF at Majunga however feels that a major cause of accidents at sea around his district is collision between shrimp trawlers and small artisanal vessels with no lights. He explained that it was against the port regulations for vessels to go out at night without lights but the law was not being respected and there was no means of enforcement.

### 4.5 Legislation

In Madagascar, marine and coastal resources/zones are under the jurisdictional control of a multitude of state agencies and ministries. They deal with conservation, fisheries management, urban development, tourism, pollution control and mining. Many of these legal instruments on which control is based are obsolete, contradictory and not wholly consistent with the international conventions ratified by Madagascar. They hamper the effective implementation of an ICZM policy. The legislation on fisheries has serious gaps (e.g. on fish habitat preservation) and is no longer well adapted to the rapidly evolving situation of the sector. This can hamper law enforcement, in particular how the CSP is to protect the interests of the legal operators against the illegal fishing, prevent conflicts between the various types of fisheries, protect specific marine resources from depletion (e.g. holothurians) and assist in search and rescue operations.

In 1990, the Environmental Charter produced the National Environment Action Plan (NEAP), implemented through three successive ambitious Environmental Plans (PE I, II and III) of five

years each (1994–2008). The "Code des aires protégées"( COAP), the Madagascar Protected Area System Management Plan (Plan GRAP) and the Agency for the Management of Protected Areas (ANGAP), all resulted from the implementation of these plans. ANGAP manages 46 protected areas throughout the country. ANGAP, many of whose senior staff have been foresters by discipline, plays a major role in the protection of forest diversity. However, its range of MPAs is limited. It has no areas of protected mangrove ecosystems and no coral reef protected on the western coast.

The Environment and Marine Component (EMC) of the NEAP has been in existence since 1997. National and regional interministerial and intersectoral working task forces have been established to inform policy and planning. The World Bank, UNDP and GEF provided funds. EMC is officially implemented by the National Environmental Office (ONE: "Office national de l'environnement") and national associations such as "Service d'appui à la gestion de l'environnement" (SAGE) have the responsibility of officially implementing the EMC. To a certain extent, Madagascar's approach to ICZM has also benefited from the experience of other countries of the IOC region.

In Madagascar, given the ongoing implementation of the decentralization process, several levels of administration deal with coastal zone and coastal resources management. While the state plays a fundamental role in defining the policy towards ICZM, decentralized institutions, and more particularly communes and local communities, are now key decision-makers for managing renewable natural resources in terms of the "Gestion locale securisée" (GELOSE) law. This law helps local communities to manage their own resources and in many ways it has the same objective as the ZAC project. However, local communities have to face two important constraints: very limited budgets and limited access to skilled human resources. Therefore, the current ICZM policy encourages partnerships between public and private bodies ("3P" policy) with the active participation of NGOs and scientific and research institutions.

The "Ministère de l'environnement et des eaux et forêts"( MEE) is leading the intersectoral ICZM process, involving all key ministries in the design of the new ICZM policy. The National Assembly has approved a draft law. This proposes a new national action plan for marine and coastal zones (MEEF, 2004) that will be implemented through the EMC activities of the PE III (2004–08). The successful implementation of the plan will face many challenges. It must bring together in a coherent manner all relevant governmental policies, for example those dealing with fisheries, shrimp and fish farming, tourism, maritime transport, infrastructure and industrial development. It must also take account of other key programmes, such as the "Document stratégique de réduction de la pauvreté" (DSRP), "Plan de soutien au développement rural" (PSDR) and the National Executive Forest Plan (PDFN). It will have to create a framework within which the Community Development Funds (FDC), and the proposed Integrated Coastal Management and Development Policy (PADIL) can function harmoniously. It must have regard for the outcomes of formal discussions between industrial and traditional fisheries (ZAC). It will have to take account of coastal zone surveillance activities by the CSP, and tourism development (for which there is to be a new Master Plan) and the safety at sea issue.

Finally, the ICZM process will have to be effective at the level of the local management units (the 44 coastal provinces, which include 573 communes, and cover 5.5 million inhabitants.).

In Madagascar, environmental impact assessment (EIA) procedures are derived from the "Mise en conformité des investissements a l'environnement" (MECIE) legislation. Therefore, every significant infrastructure project affecting the coastal and marine zones should submit an EIA to the ONE for its final authorization. The investor or promoter of the project is obliged to undertake, at his/her own cost, any measures necessary for the mitigation of adverse impacts. However, monitoring of such measures is limited and not always effective.

The new policy for the sustainable development of marine and coastal zones of Madagascar aims to help local communities manage natural resources. It aims to build capacity of such communities to manage and to break the isolation of coastal zones. At a technical level, the policy seeks to reduce, and if possible prevent, marine pollution, excess siltation and erosion from inappropriate watershed management, and to maintain marine and coastal biodiversity, in particular in mangroves, reefs and islets.

It is likely that an exercise of considerable political effort will be needed to ensure co-operation between the key administrations involved in CZM: Fisheries, Environment (including ANGAP), Land Reclamation ("Aménagement du territoire") and the Office of the Deputy Prime Minister.

Besides the above policies concerning mostly integrated coastal zone management and the complex implementing process by numerous national agencies, the most important legislation relevant to fisheries issues and sea safety for fishing vessels is:

- The Act of 11 December 1985 proclaiming the Malagasy maritime zone (territorial sea, continental shelf and the EEZ).
- The Act of 4 May 1993 concerning fisheries regulations
- The Law of 3 February 1999 defining the new maritime code.
- The Government Order of 1 December 2000 concerning the re-organization of the Centre for Fisheries Surveillance.
- The Government Decree of 25 January 1994 to create and organize a Fishermen's Training Centre (CFP).
- The Government Order of 18 January 20006 concerning fishing gears used in the traditional shrimp fishery.

1) **The Maritime Zone 1985 Act** (delimits) the EEZ to a distance of 200 miles from a predetermined base line giving it an EEZ of approximately 1.1 million km$^2$. The territorial sea extends to an outside limit of 12 nautical miles and its continental shelf extends to a depth of 250-m isobath.

2) **The Fisheries Act (1993)**
   - Defines "fishing" as any activity leading to the capture by any fishing method of any living marine resource.
   - A "fishing vessel:" is defined as any vessel that has been equipped with the necessary fishing gears and used for any type of fishing operations.
   - Concerning fisheries management the act specifies that each province (or *Faritany*) will nominate a fisheries consulting board composed of the following representatives: producers (fishers), the Ministry responsible for fisheries, all other organizations concerned with fisheries (or aquaculture) and the competent representatives of the province (*Faritany*).
   - Regulations pertaining to fisheries management shall define the following:
     – The zone where fishing is permitted.
     – The open or closed season for each fishery.
     – The fishing gear and type of fishery permitted.
     – The minimum size of capture for each species.
     – The species that are protected.
     – The bait that is prohibited.
     – Any other measures that is necessary to comply with the fisheries Act.

3) **The new Maritime Code (1999)** that gives the following powers to the APMF.
   - The registration of all vessels (except those used in the traditional fishery).
   - These vessels must be registered giving the country of origin and the navigation permit.

- All sailors (including fishers) working on these vessels must be registered through a passport or navigation book. A record of each sailor's name, address and other details is kept in a register at the APMF.

4) **The Government Order (2002)** concerning the establishment of a CSP. This is by far the most important piece of legislation having a direct impact on safety at sea. It specifies that all vessels, including fishing vessels operating in Malagasy waters, must be equipped with a VMS transceiver that is compatible with either Argos or Immarsat-C according to the specification given by the CSP. This gives Madagascar the capability of monitoring all fishing vessels fishing both inside and outside its EEZ and controlling its SAR zone and assist in search and rescue operations in cooperation with La Reunion.

5) **The decree of 25 January 1994** pertaining to the creation and organization of a "Centre de formation de pêcheur" (CFP). The main purpose of this Centre includes:
   - To train fishers in new techniques of production and treatment of products.
   - To collect information concerning fisheries in close collaboration with the Marine Research Institute.
   - To participate with banking establishments to put in place a credit system for stakeholders interested in fisheries.
   - To identify fishing vessels adapted to local conditions.

6) **The Government Order of January 2006** concerning the shrimp fishery. This order concerns the following organizations:
   - "La Direction de la pêche et des resources halieutiques" (DPRH).
   - The ZAC project ("Zone d'amenagement concerté").
   - The PNRC or "Projet national de recherche crevétière".
   - "Le service regional de la pêches et des resources marines".

The order consists of a systematic inventory of all fishing gears used in the shrimp fishery for every village, tagging of all fishing gears surveyed and replacement of all fishing gears as required.

### 4.6 Boat building and vessel design

The southwestern coast of Madagascar suffers from the depletion of timber resources for boat construction. This may also be true elsewhere. Nowadays, valuable trees of sufficient size are mainly found within protected areas, where tree cutting is generally prohibited. Fishers need substitute materials (or credit facilities to acquire other types of boat) if their livelihoods are to be maintained. Solving this problem implies the concerted intervention of the Fisheries service, the MEEF and the ANGAP in the public sector, together with private partners (e.g. banks).

One of the obvious solutions is to shift from wooden boat construction to fibreglass vessels, but again this requires credit facilities made available to artisanal fishers. The 1993–97 FAO sponsored project based in Tamatave was an excellent initiative as it not only assisted fishermen to obtain their own fishing vessels but ensured that basic security equipment was available such as mirrors, white shirts, wooden mast with spare sails, etc. According to the former project manager of this FAO project (presently the project ZAC coordinator) gifts of fishing vessels provided by the Japanese Government have not been very effective (dates and other details were not provided) as they were not adapted to local conditions and were basically too sophisticated for local fishers.

Again according to the ZAC coordinator, the possibility of an FAO technical mission for evaluating the construction and efficiency of the present artisanal fishing vessels in Madagascar with advice on how to improve security at sea would be an excellent initiative. The FAO technical experts

could give advice on such technical details as what types of engines should be used, how to install these engines and fuel tanks for improved security. Practical training and advice on improved boat construction could also be provided by the "Centre de formation des pêcheurs" at Nosy Bé.

## 4.7 Other safety issues

### *Background*

- In Madagascar the traditional fishing fleet is composed of single hull pirogues that are normally sail-powered with only a few artisanal vessels being equipped with outboard engines. This category of vessels makes up 99.4 percent of the fishing fleet or approximately 22 000 pirogues employing 400 000 fishers and landing 70 000 tonnes of marine products. These vessels usually carry out day trips, leaving early in the morning to return in the afternoon, and they do not carry any security equipment depending mostly on changing wind and ocean current patterns for safe return to port.
- The motorized artisanal fleet is composed of small fishing vessels equipped with both inboard and outboard engines of less than 40 hp. The fishery is carried out on the continental shelf, up to 20–30 km on the west coast of the island and 2–5 km on the east coast. A certain percentage of this category of artisanal vessel is equipped with navigational and safety equipment that plays an important role in improving safety at sea. When it concerns safety at sea, however, there appears to be a lack of coordination between the various government agencies such as the Metrological Department, the fisheries agencies, the Coastguard, the navy and the artisanal fishing vessels. There is however a good communications system between the larger deep-water trawlers that are equipped with all modern electronic communication and navigational equipment. Since both types of vessels fish the same grounds this would explain the number of accidents involving collisions between the two categories of vessels. Moreover, since the VMS centres (and this applies to Madagascar as well as to Seychelles) are more interested in tracking larger fishing vessels then smaller artisanal ones, collisions between those two vessels are more prone to happen. This is particular the case since tracking of vessels is mostly done during the day and the VMS centres do not usually operate at night.

The following description gives an outline of the main safety features for the artisanal fishing fleet in Madagascar:

### *Use of navigational and communication equipment*

- For the east coast shrimp fishery, there is a total of 36 artisanal vessels that are all equipped with 2–3 cylinder inboard engines. Most of these vessels are equipped with VHF radios and echosounders and 24 of the 36 vessels are also equipped with VMS transreceivers and monitored by the CPS based in Antananarivo. According to the ZAC national coordinator, however, most of the VHF radios on artisanal vessels have a limited range of approximately 15 km. He also pointed out that according to the fisheries regulations all licensed artisanal vessels must be equipped with navigation equipment including GPS and compass and security equipment such as life jackets and life rings,. These regulations however are very seldom enforced
- Motorized artisanal vessel with outboard of 40 hp or less that target fish and shark resources are not equipped with any navigational or communication equipment.
- On the east coast, however, the hand line fishery is organized by fishing companies and the artisanal vessels are equipped with VHF and echosounders, and seven of these vessels are also equipped with VMS transreceivers.

### *Availability and cost of safety and navigational equipment*

- Vessels involved in the shrimp fishery are equipped with compasses, life jackets and life vests. Distress flares of any type are very expensive and cannot be found in the local market in Madagascar. According to the Operation Manager of the CSP, this almost total lack of safety

equipment only reduces the effectiveness of the Maritime Authorities and makes it impossible to enforce the security regulations. By the same token, motorized artisanal vessels that navigate within sight of land and target fish species have very few or no security equipments. Most of these motorized fishing vessels are reluctant to carry sails as a means of security if there is an engine failure. These vessels do not even carry basic safety equipment such as life jackets, lifebuoys and flashlights. Without flashlights it is harder for the artisanal fishers to repair mechanized vessels, in particular at night.

- The same applies to the fast launches that target sea-cucumber, the idea being that since the crew are all good swimmers, in cases of accidents they are confident that they can swim to shore.
- There are now certain local shops (POLYMA, COMARINE, HENRI FRAISE and FREE TIME) in the main towns/ports, which stock navigational (GPS and echosounders) and safety equipment. Not only is this equipment expensive but the shops are nearly always out of stock. As an example, in January 2006, a life jacket was selling for around US$17/unit. A VMS transreceiver is sold and installed on fishing vessels at a cost of 2 000 euros per set. Again according to the CSP Operation Manager, the main constraint prohibiting the storage (availability) and sale of security equipment is first and foremost the high selling price, and secondly the fact that most fishers consider accidents at sea as "acts of god" and hence inevitable.
- In the early 1980s the Japanese Government (under JICA) provided modern fishing vessels to Malagasy fishers on the east coast (Tamatave), which were equipped with the latest model of communication and navigational aids (GPS, VHF, echosounders, etc.), but this proved to be too sophisticated for local fishers and the project was not effective and could not be successfully implemented.

### *Use of mobile phones*

Members of the crew sometimes use mobile phone for security but this is the personal property of the operator and in any case only the large coastal towns are covered under the GSM network. Hence although the purchase of mobile registration cards is very reasonable (approximately US$8 as of May 2006), the limited network does not permit widespread use of mobile phones, in particular for such a vast country as Madagascar where the communication networks are still not very well developed.

### *Local production of safety equipment*

Concerning the manufacture of security equipment in Madagascar, although there is a ready market and demand for this equipment, according to the Operation Manager of the CSP, as long as the Maritime Code and the standards for security are not implemented and enforced, there will be no interest in investing in this field. There is certainly a strong market for such equipment but most boat-owners are not ready or interested to risk investing in such ventures. This is therefore a need first to sensitize the local population and then enforce the security standards. No doubt, much will depend on the economic development of the country. Certain artisanal vessels targeting shrimp on the west coast are, however, equipped with locally built life rafts but the rest are only content with life jackets or inflatable life vests.

### *Search and rescue operations*

The two agencies with responsibility for conducting search and rescue operations are the Coastguard and the navy, but unfortunately they are based in only two ports; Antisiranana (Diego) and Majunga. Moreover, due to the high cost of fuel, it is only on rare occasions that patrol vessels intervene to save lives at sea. Large companies and boat-owners on the northeast coast usually organize their own search and rescue operation in cases of accidents or emergency at sea. Traditional fishing vessel on the west coast that are usually sail-powered and go out every morning to return by early afternoon can expect very little recourse in cases of accidents at sea. Unless the fishing village is within close proximity of a navy or coastguard base no search and

rescue operation is usually organized and the only recourse is for the boats to be picked up by a larger vessel or drift to the east African coast.

### *Use of fishing vessels to transport goods and passengers*

Fishing vessels are sometimes utilized to ferry passengers and cargo in between the coastal islands mainly on the west coast. In view of the fact that these vessels are often overloaded and no security standards are enforced, there are numerous accidents at sea, in particular between the Comoros and Madagascar. For example, the vessel "Sam Son" sank in March 2004 with the loss of at least two dozen lives, and more recently the vessel "Al Moubarak" sank near Mayotte in September 2006 with the loss of more than 40 lives.

## 4.8 Observations

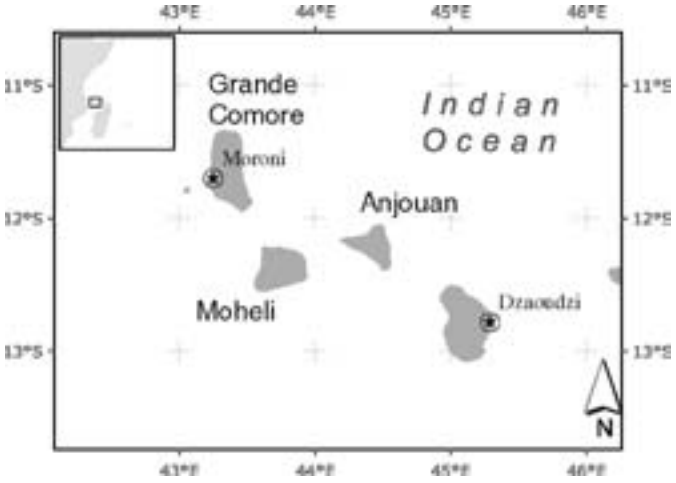
When reviewing the various laws, decrees and regulations concerned with the management of fisheries resources and safety at sea issues, it became evident that responsibility for implementing, monitoring and enforcing the laws is shared among too many agencies, with no specific organization being capable of assuming its mandate fully. Perhaps the only exception to this rule is the CSP that even assumes many of the responsibilities of other organizations such as the APMF by keeping records of accidents at sea for all categories of vessels. There appears to be a consensus between the two agencies mentioned above that security at sea could be improved with basic training programmes for fishers, and there is a need to acquire new building materials for vessel construction such as fibreglass (or credit facilities to acquire other types of boats) if their livelihoods are to be maintained.

Second, it became obvious that most of these agencies lack the financial and human resources requirements as well as the political will to execute their mandate in a satisfactory manner. The fact that most maritime agencies are based in Antananarivo, far from the sea, is an additional constraint. The recent effort by government, however, to attempt to decentralize fisheries management by setting up such projects as ZAC is commendable and should definitely be pursued.

# 5. COMOROS

## 5.1 General background

The Union of Comoros consists of three islands in the Comoros Group: Grande Comores (1 148 km²), Anjouan (424 km²) and Moheli (290 km²). The fourth island in the Archipelago, Mayotte, has decided to be part of French Overseas Territory (TOM) at the time of Independence in 1975.




The island group lies at the northern entrance of the Mozambique Channel. The islands are of volcanic origin with poor soils, and the volcano on Grande Comores is extremely active.

The population in 1995 was between 500 000 and 550 000. In 2002 it was over 650 000 and by 2010 it had risen to over 790 000. The population density has risen to over 300/km² and, with a population growth rate of 2.6 percent, it is among the highest in the SWIO.

Anjouan remains the most densely populated island with 720 people/km² in 2003, while Grande Comores has an estimated population of around 320 people/km². Given the dimensions of the island, the entire population of the Comorian Union can be said to be coastal.

The islanders are generally poor and in view of the islands' topography, they are very dependent on subsistence agriculture in general, and on fishing in particular, for food security. The volcanic origin of the islands means that the shores are steep; with very sharp drop-offs to abyssal depths.

In the Comoros, fishing is particularly important, not only for food security but as a major means of employment. Approximately 32 000 people depend on fishing either directly or indirectly for a living, representing around 5 percent of the total population. The EEZ is estimated to be around 240 000 km² and the continental shelf is very narrow.

Despite the lack of precise data, some reasonable estimates can be made about the size of the artisanal and coastal fisheries sector. Estimates accepted by FAO – and supported by the Fisheries and Aquaculture Department – suggests that there are between 8 000 and 8 500 fishers (2004). There are no women fishers. The data indicate that there are 4 500 fishers from 54 villages on Grande Comores, 1 100 fishers from 22 villages on Moheli and 2 400 fishers from 53 villages on Anjouan.

Fishing techniques in the Comoros are relatively unsophisticated. There are four techniques in use:

- Hook and line fishing: the method most generally employed.
- At Chindini and Mitsamiouli (Grande Comores) and in the western area of Anjouan, cast nets are in use. However, fishermen themselves forbid this technique in many of the zones reserved for them (Iconi, for example). It is also illegal in the MPA on Moheli.
- Fishing from motorized boats around FADs (encouraged by earlier EU-financed interventions).
- Putting out fish traps on foot at low tide.

For a long time the fishing industry was characterized by fishers fishing close inshore, utilizing dugout canoes (Ngalawe) that are paddled by one or two fishers. This renders fishing operations very risky, with a limited number of trips, representing a constraint on the operating range. The small boats, primitive propulsion and lack of good landing places make fishing very dependent on wind and sea conditions. The alternating monsoons ("Kaskasi" from the southeast and "Kussi" from the northwest) are a serious constraint for navigation, first on one coast, then on the other. Other constraints faced by fishermen include lack of fishing gears, safety equipment and a progressive shortage of trees for building canoes.

Larger outboard powered vessels (*Fedawa*) that fish further offshore, using small purse seines, have slowly replaced dugout canoes in the last ten years. The fishing fleet is presently composed of approximately 5 000 fishing vessels, of which 1 500 are outboard-powered.

This development has brought about an increase in fish landings but it must be underscored that this increase in fishing effort and range of operation has increased the risks of loss of lives at sea, from less than three in 1989 to almost 20 at the present time.

This problem has forced the local Fisheries Authorities in cooperation with the National Union for Development of Fishing in the Comoros to be more conscious of the security risks at sea.

### 5.2 Fisheries management and sea safety

The Comoros has a central government ("Union des Comores") and a federal organization with an autonomous government for each of the three islands. The institutions with responsibility for fisheries management and safety at sea include:

- "Le Ministère du dévelopment rural, de la pêche, de l'artisanat et de l'environment" (MDPAE) that is in charge of all general fisheries matters including fisheries agreements. On each of the three islands a minister is in charge of implementing general fisheries policy.
- Within this Ministry the "Direction national des ressources halieutiques" (DNRH) is in charge of fisheries. One of the priorities of the DNRH is to register all motorized artisanal fishing vessels and to look after security at sea for all artisanal fishers.
- The Ministry of Transport in cooperation with the Directorate of Maritime Affairs has the responsibility to register all vessels flying the Comorian flag, including fishing vessels. Because of the lack of clear administrative procedures, however, the Directorate of Maritime Affairs can register fishing vessels under the Comorian flag without informing the DNRH.
- The Ministry of Defense: In principle the national guard from this Ministry can be considered as the agency with the responsibility to carry out search and rescue operations but, because it has no vessels, this responsibility is also shared with the DNRH and other private organizations such as the fishers' union and fishing cooperatives.

No systematic scientific evaluation of marine resources in Comorian waters has ever been carried out to determine the real exploitable stocks. According to the Director of the DNRH, information on productivity rate from similar tropical waters, based mostly on catch rates, gives an estimate of the exploitable marine resources is Comorian waters at 30 000 tonnes, of which approximately 5 000 tonnes are composed of demersal species and 25 000 tonnes of pelagic species.

In 2005, total fish landings stood around 18 000 tonnes, up from 6 000 tonnes in 1987, with more than 80 percent being tuna and tuna-like species. The fact that very little is known of the catch from foreign fishing vessels, at times fishing illegally in the Comoros EEZ, is a serious constraint for fisheries management. This definitely contributes to a serious depletion of large pelagic resources such as tuna. For the time being the Comoros does not have any MCS capacity to monitor this fishery.

The Comoros has a limited lobster fishery, which is practised close to the coast, mainly by traps but also by diving and harpooning at night with lights.

There are also limited resources of squids caught by monohull pirogues within one mile from the coast. These operate primarily around the island of Anjouan.

Beginning in 1984, FAO started a project to put in place a system of fish aggregating devices (FADs) in Comoros waters to attract large pelagic species. These FADs really became operational in 1986–87, being financed by the European Development Fund (EDF). The principal objective of the project was to improve the catch rates around the waters of Anjouan. At the same time the project was to help train fishers from the Maritime Training Centre at Anjouan.

FADs placed in coastal waters are effective for a radius of 20 km, while those placed in deeper waters attract fish within a radius of 2 km. FADs are therefore considered very useful in helping local fishers improve their catch rates and in facilitating fishing operations and, because they are anchored close to shore, they have a positive effect on safety at sea.

Safety at sea has always been a long-standing problem for fishers in the Comoros. This problem has progressively increased in importance with the motorization of single-hull canoes, and in particular due to the increase of flat-hull fibreglass canoes. Fishing vessels equipped with once popular 15-hp outboard engines (Yamaha and Mariner) are progressively being replaced by kerosene outboards, since kerosene is much cheaper then benzene.

In the last two years a new type of fishery has developed with FRP vessels of 8 to 10 m, equipped with two 40-hp kerosene outboards and an icebox of two tonnes capacity. These vessels carry out trips of up to 150 km up to Mozambique waters. The vessels belong to private entrepreneurs and the marketing of the catch is entirely under their control.

According to one local entrepreneur, who owns six of these vessels, while some owners have entered into agreement with the authorities from Mozambique, others fish illegally. In view of the fact that there is a lack of cold storage or freezing facilities on shore, the catch does not fetch a high price and is sold mostly on the domestic market (including hotels and restaurants). These vessels, because they are well maintained by their owners, have so far not encountered any safety problems and no accidents at sea have been reported.

### 5.3 Safety programmes

In 2003, a safety at sea project was conceived for the Comoros funded by the World Bank under an urgent credit scheme. This project consisted of the purchase of VHF radios and GPS sets (see section 5.7).

Unfortunately this project could not be successfully implemented and, as a result, a decision was taken by the Fisheries Administration that in order not to keep the material idle it should be entrusted to the “Syndicat Des pêcheurs” (Fishers’ Union) to be distributed equitably and free of charge to all fishing villages of the Archipelago.

At the present time the material is still left at the fishing cooperatives and only a limited number of fishers are still utilizing it (the exact number was not disclosed).

Another safety at sea project that is being planned and should be implemented by October 2006 is an MCS centre, which will be located next to the DNRH building. This MCS centre is being financed by the EU and is part of an IOC regional project. The designated MCS Director, Mr Youssuf Mohamed, emphasized that it was important to treat the two main components of the

project separately, i.e. the security at sea component and the fisheries surveillance component. The total cost of the project amounts to 166 000 euros with 150 000 euros earmarked for the purchase of VMS equipment and 16 000 euros for the rehabilitation of the present building.

Although Mr Mohamed is very keen about his project and appears certain of its implementation, one serious constraint mentioned was that so far no funds had been earmarked for the running costs of the project (personnel emoluments, administrative costs, etc). This financial component of the project should be provided by the central government, with the centre planning to employ ten people (including administrative personnel and surveillance officers). In view of the recent change of government in the Comoros, it became obvious that unless the project received the full backing of the new government, the chances for its implementation appeared bleak.

Finally, the officials of the Directorate of Maritime Affairs are working on a regional project that would establish the foundation for a proposed safety at sea programme. This programme was first conceived at a conference in Florence (Italy) in 2003 and involves the following southern African countries: Angola, Comoros, Madagascar, Mozambique, Namibia and South Africa. These six countries have signed a resolution at the Florence conference to install a GMDSS in each of their respective countries. Each country must, however, construct a building that will receive equipment purchased from funds from the International SAR (search and rescue) project.

This project would extend assistance to all vessels in distress, including both fishing and cargo vessels, and assist in rescue operations. The building should be completed before December 2006 and an international expert must inspect and evaluate the building structure before sending the required equipment for the operation of the centre. The main constraint presently facing the authorities is the lack of properly trained personnel and they are presently seeking the assistance of regional countries to train their personnel; notably in La Reunion, Mauritius, Seychelles and South Africa. A senior official of the Ministry did not hide his apprehension when he explained that unless they could train qualified inspectors the project could not be implemented, and their objective of "port state control" would not be realized.

### 5.4 Data recording

In the Comoros, as in the other four countries described in this study, there is no specific agency with the responsibility for recording accidents at sea. Although the "Direction des pêches et des ressources halieutiques" is generally informed of such incidents, no records are kept. This is also the case for the "Service de santé militaire", which is also sometimes involved in search and rescue operations.

Due to the fact that there is no official government agency/body that has the necessary personnel or equipment (vessels) to carry out search and rescue missions, this activity is principally carried out by the private sector, i.e. the fishers themselves or the fishers' cooperatives.

In the words of the Director of DPRH, rescue is carried out by "good-hearted persons" who own fast fishing vessels, but the chances of finding a fishing vessel lost at sea are very slim, mainly because search and rescue operations usually start very late. According to him an average of 10 to 20 people are lost at sea every year, although several of these fishers end up on the coast of East Africa (Mozambique) and are eventually repatriated. The main cause of accidents at sea is engine breakdown due mainly to the lack of training of fishers who are unable to carry out simple engine repairs.

## 5.5 Legislation

The present Union government has set out a number of strategic directives on which future development priorities are to be based. The fourth priority aims to promote an improved exploitation of fisheries resources. The second objective within this priority is stated as "the reduction of the exploitation of fish stocks in the coastal zone with a view to the conservation of the stock". The means proposed to achieve this objective include a firm application of legal sanctions against unlawful fishing practices. A new law establishing a code of practice for sustainable fishing and aquaculture has been drawn up and is likely to be in force by the end of 2006.

It is evident, however, that presently fisheries legislation in the Comoros is still inadequate or outdated, and would require a serious and comprehensive review. The first piece of fisheries legislation enacted after independence was the legislation defining the Comorian maritime zones. The maritime zones of the Comoros were initially defined by French legislation before it was formally proclaimed by the decree of 20 July 1978. This decree defines the Comorian EEZ as extending to 200 nautical miles and its territorial sea to 12 nautical miles. This law specifies that all living or non-living marine natural resources found within these zones belong exclusively to the Comoros.

Although an FAO mission in 1981 and 1982 carried out a comprehensive review of the required fisheries legislation at the request of the Comorian Government, it would appear that most of the proposed legislation was never enacted. It is however interesting to review briefly the main articles of this proposed legislation as it is still very relevant for today. For example, the proposed legislation of 1982 makes provision to ban all illegal fishing activity that is still practised to this day. This includes banning the use of underwater spear guns, of noxious substances, explosives and nets of illegal mesh sizes for catching fish. This law also made provision to register and inspect all fishing vessels, with each vessel equipped with safety equipment such as flares, life jackets etc., to improve safety at sea. According to the present Director of the DNRH, the law that includes most of the above-mentioned fisheries regulations has been signed two years back but has not yet been enacted.

Other regulatory measures that should come into force in the near future include:

- The integration of the Comoros in the regional MCS (Monitoring Control Surveillance) programme of the IOC, which is scheduled for the end of 2006.
- The implementation of the national programme to improve safety and security at sea for fishers. This will be implemented by creating a maritime police brigade with the necessary technical and human resources logistics to carry out search and rescue operations at sea.
- Setting up a Vessel Monitoring Centre (VMS) under the jurisdiction of the DNRH that will become operational by October 2006.
- The effective implementation of a strategy for fisheries development in the Comoros and a law pertaining to a code on fishing and aquaculture in the Comoros.

Concerning fishing agreements, the Comoros has signed a six-year agreement with the EU in 2004, which in many ways is similar to the agreement signed with other western Indian Ocean countries. The important points in the agreement include:

- Granting a fishing licence to 40 tuna purse seiners (down from 44 for the previous agreement) and 17 longliners (down from 25 vessels for the previous agreement).
- Authorization to catch 6 000 tonnes of tuna (an increase of 50 percent from the previous agreement) in its EEZ.
- A licence fee fixed at 35 euros per tonne by the ship-owners instead of 25 euros and 65 euros by the EU instead of 75 euros for each additional tonne caught above the agreed quota.

- Each EU vessel must take on board at least one Comorian sailor when the vessel is fishing in the Comorian EEZ. Should the ship-owners fail to comply with this condition they will pay a fee of US$20 for every day that the vessel is fishing in the Comorian EEZ

A major constraint with this agreement is that since the Comoros do not have an MCS centre, it is presently impossible for the authorities to calculate the catch in their EEZ or the number of days a vessel has spent in its EEZ. They will therefore have to rely on the figures provided by the ship-owners.

### 5.6 Boatbuilding and vessel design

A new vessel design was introduced in the Comoros in 1983, when the Japanese International Aid Agency (JICA) donated 50 FRP fibreglass vessels (BLC30) of 9 m LOA. These vessels were equipped with an inboard diesel engine of 10 to 15 hp and an icebox of 400 kg capacity and could carry out fishing trips lasting several days. The vessels, which had an operating range of 50 km, had the real possibility of exploiting large pelagic resources in Comorian waters in the same way as they operate in the other Indian Ocean islands such as Sri Lanka, Indonesia and, more recently, Seychelles. In 1998, a second consignment of 37 fishing vessels of the same model as the BLC30. locally known as "Japawa", was given to the maritime training school in Anjouan and to private fishers.

The main problem encountered, however, was the lack of qualified and trained crew to maintain these vessels as well as the utilization of proper fishing techniques (such as drifting gillnet and longlines) capable of exploiting large pelagic resources. The lack of proper training and monitoring in the operation of these vessels meant that it was a lost opportunity for the Comorian fishing industry. Today, most of these vessels have been abandoned and several abandoned vessel hulls can be found on certain beaches of the Comoros.

The traditional fishing fleet in the Comoros is composed of around 5 000 single-hull canoes; of which around 1 500 are powered by outboard engines, the majority being flat bottom G18 Yamaha-type vessels. Moreover, the traditional dugout canoes are fast disappearing due to the scarcity of tree trunks of the required diameter to build such canoes.

Between 1987 and1991, an EU financed project was implemented that had the objective of modernizing the artisanal fishing fleet by increasing the number of motorized vessels. Since the year 2000, there has been a new development with the construction of fibreglass reinforced plastic (FRP) vessels of 18 to 23 feet by local boatyards. Two of these boatyards are located on Grande Comores and two are located on the island of Anjouan. According to available statistics, it appears that fiberglass vessels of 18 feet (5.10 m), locally known as "Fedawa 1" make up between 20 to 26 percent of the fleet of motorized vessels. These are equipped with either a kerosene or benzene outboard engine.

Meanwhile, the Yamaha G18 type vessel is slowly being replaced by a V-hull shaped canoe of 6.20 m powered by a 15-hp outboard engine, which is locally called "Sogawa". The main reason for this change is due to easier credit access to fishers who have grouped themselves together to create cooperatives and enjoy an improved social status. The general characteristics of motorized fiberglass vessels in the Comoros are given in Table 6.

Although there has been a concerted effort to modernize the fishing fleet in recent years, which has lead to an increase in the fishing effort (days spent at sea) and an increase in total fish landings, there are still many problems that have yet to be resolved concerning the fishing fleet. In fact, one only has to observe closely the present fishing vessels to understand that they are not adapted for the offshore fishery extending over a period of several days. This is mainly due to their limited size,

**TABLE 6.** General characteristics of motorized fibreglass fishing vessels in the Comoros

| | Fedawa1 | Fedawa2 | Yamaha G18 | Yamaha W 23 | Japawa | Sogawa |
|---|---|---|---|---|---|---|
| Length | 5.10 m | 7.10 m | 5.40 m | 7.10 m | 9.50 m | 6.20 m |
| Weight | 100 kg | 200kg | 160 kg | 250 kg | | 1.75 m |
| Engine | 5 to 8 hp outboard | Up to15 hp outboard | 8 to15 hp outboard | 15 to 80 hp outboard | 13 hp diesel | 15 hp outboad |
| Capacity | 350 kg | 500 kg | 500 kg | | 400 kg | 550 kg |
| Crew | 1 to 2 | 2 to 3 | 2 to 3 | 3 to 5 | 3 to 6 | 2 to 3 |
| Manufacturer | FED project | FED project | Private | Private | JICA | Private |
| Cost price of vessel (new) | 800€ | 1 500€ | 3 000€ | 5 000 € | 6000 € | |

Source: Table adapted from Jean Gallene "Performances et contraintes des pecheries artisanales et perspectives d'un developpement technologique responsable en Union des Comores". FAO, 2002.

the absence of iceboxes (for the majority of vessels) and the absence of sails (as a security measure) that would have allowed the vessels to return to the Comoros in cases of engine failure, instead of drifting for several days towards the East African coast.

## 5.7 Other safety issues

### *Background*

Until the early 1980s the fisheries sector in the Comoros was dominated by the traditional fishing technique and carried out entirely on a subsistence level utilizing old-fashioned fishing vessels that represented a risk to navigation. These vessels operated close inshore and were totally lacking in any safety equipment. It was not until 1984 that the first international fishing project was introduced by FAO, consisting of placing fish aggregating devices (FADs) around the island of Anjouan. Although this was followed by other foreign aid projects (IOC), no emphasis was given to safety at sea until 2003 when a World Bank project was conceived, which consisted of the following:

### *Availability of navigation and communication equipment*

In 2003 a World Bank-funded project was conceived to purchase communication and navigation equipment with the objective of improving security at sea for artisanal fishers. This included the following equipment:

- purchase of 200 VHF radios and 100 GPS sets;
- setting up a main receiving station (CROSS station) on each of the main islands with relay stations on each island. Each cross station is equipped with a Maritime Radio Communication Centre (MRCC).

The main problem encountered was the cost of the material for the fishers; a GPS + VHF radio was valued at 1 000 euros but it was proposed that this material be sold to the fishers at 500 euros. Unfortunately, the fishers still considered the equipment to be too expensive and difficult to manipulate. One positive outcome of this unfortunate project was that the authorities decided that, from now on, local fishers should utilize only simple and easy to use safety equipment (such as compasses, life jackets, flares, whistles and mirrors), and there was no point in investing in sophisticated projects that were beyond the scope of ordinary fishers who could neither read nor write. Moreover the authorities realized that any safety at sea equipment had to be cheap enough for the ordinary fishers to afford.

Another important lesson learned was that for any fisheries-related project to be successful, it had to involve the private sector and notably the Fishers' Union and the fishers' cooperatives.

A case in point for the Comoros is the very limited use of mobile phone by the local population, in particular by fishers. Contrary to the other countries visited, mobile phone registration cards

in the Comoros are expensive, costing an average of 50 euros, hence being beyond the means of ordinary fishers.

### *Availability and cost of safety equipment*

The fisheries administration (DNRH) is presently giving its full support to a fisheries project with the principal objective of reducing loss of lives at sea. This project was apparently conceived and is being implemented by a private entrepreneur, M. Ali Msa, with the full support of the National Union for Fisheries Development in the Comoros. The project consists of making available basic life saving equipment to fishers at a price they can readily afford. These would include life jackets, flares, compasses and mirrors. According to Mr Ali, the expected results of the project would include the following:

- improve the current safety at sea situation by reducing the number of accidents at sea by 80 percent;.
- reduce the current high costs of search and rescue operations;
- encourage the younger generation to enter the fishing industry;
- improve the professionalism of the fishing sector.

**TABLE 7.** Cost of the project

| Safety equipment | Quantity | Unit price (euro) | Total |
|---|---|---|---|
| Life jackets | 2000 | 30 | 60 000 |
| Reflecting mirrors | 2000 | 26 | 26 000 |
| Parachute flares | 2000 | 15 | 15 000 |
| Smoke flares | 2000 | 8 | 8 000 |
| Compasses | 2000 | 37 | 37 000 |
| TOTAL | | | 116 000 |

The project basically consists of ordering directly from the manufacturers large enough consignments of basic safety equipment to be sold at cost price to the fishers. The estimated cost of the project to equip all motorized vessels in the Comoros is given in Table 7.

### *Availability and cost of engines, spare parts and repairs*

There are very few local outlets that sell engines and spares in the Comoros and as a rule no stocks are kept. The two main engines on the market are Yamaha and Mariner that are ordered mostly from Canada and Belgium. The costs of new engines as of June 2006 are as follows:

15 hp Mariner ---------- euros 2 000
25 hp Mariner ---------- euros 2 300
40 hp Mariner ---------- euros 2 800

Mariner kerosene outboard engines are preferred due to the low cost of kerosene fuel (euro 0.35/ litre compared to euro 1.20/litre for benzene). In view of the fact that kerosene fuel is of poorer quality, it leads to more numerous engine breakdowns and a greater need for repairs with higher maintenance costs. There are few qualified mechanics or repair workshops with the end result that engines that are supposed to last five to six years last only an average of two years. According to one boat-owner who owns three fishing vessels, in future there is a need for government to intervene so as to help boat-owners to acquire more reliable inboard engines as well as to help the Fishers' Union to build a proper mechanical workshop to repair marine engines.

### *Organization of search and rescue operations*

Concerning search and rescue operations, there are no organized operations as such. When a fishing vessel is declared lost at sea, either the fisheries authorities or the Fishers' Union attempts to requisition a fast vessel and obtain enough petrol to mount a search and rescue operation. The chances of locating the lost vessel are however very remote, although the vessel sometimes end up on the coast of Mozambique and the fishers are eventually repatriated. According to the local FAO Representative, since the present search and rescue operations are not effective, there is a need to find new solutions to resolve this problem. He feels that perhaps the best alternative would be to allocate this responsibility to the army (marine unit) who are in a better position to carry

out search and rescue operations than ordinary civilians. Although an army commanding officer explained that his men had the will to carry out such search and rescue missions, at the moment they lack the resources (in particular boats) to carry out this mission

### *Local production of safety equipment*

According to the fisheries authorities, due to the lack of technical know-how, financial investments and poor interest by government, the possibility of manufacturing local equipment is very remote. They feel that there is the need to have technical assistance from an international organization such as FAO in order to give the necessary support to such a project. This assistance could even help to revive the use of sails as a security measure, which has been almost entirely neglected in recent years. In short, there are many good ideas on how to improve the security at sea situation but there is a need to mobilize all available resources and someone (most likely from the private sector) to turn these ideas into concrete projects.

### *Use of fishing vessels for the transport of goods and passengers*

In the Comoros there is a serious safety problem related to the use of fishing vessels for transport of goods and passengers. According to the army commander for civil security who is also involved in search and rescue operations, there are two main reasons for accidents at sea: one is the negligence of the fishers but the other is related to overcrowded fishing vessels ferrying illegal immigrants to Mayotte. He feels that although there is a possibility of eventually resolving the first problem through a safety at sea awareness programme, it would be more difficult to resolve the second one due to the prevailing socio-economic situation in the Comoros. Again, according to him at least ten people are lost at sea every month due to the factors mentioned above. He further explained that it was almost impossible to have an accurate count of accidents at sea, as most vessels are not registered and family members do not report the disappearance of relatives to the police or other concerned authorities.

No doubt the best way of resolving the present situation is to appoint a sole agency with the full responsibility to keep records of all accidents at sea.

## 5.8 Observations

The Comoros has made considerable progress in improving the design, size and autonomy of their fishing vessels, although the safety factor has yet to be considered as a priority. The acquisition of simple safety and navigation equipment that most fishers can afford should be considered as an important option for the future, in particular since fishing vessels have a tendency to travel further offshore in search of increasingly depleting resources.

Although the policy of the fisheries authorities to allow the private sector to take most fisheries related matters into their own hands has its merits, a minimum of government intervention is recommended. For example, when it involves delicate interventions such as organizing search and rescue operations, government should be in a better position to acquire the appropriate vessels and trained crew to carry out this mission successfully. Moreover, problems will arise in the foreseeable future when it comes to enforcing fisheries regulations if the fishing community has been accustomed to a “laisser faire” attitude by the Fisheries Authorities.

# 6. KENYA

## 6.1 General background


Kenya straddles the equator and has an overall surface area of 582 650 km². The country is entirely fringed by coral reefs with the continental shelf ranging in width from 5 km to 22 km offshore. Two major rivers (Tana and Galana) run into the sea. The South Equatorial Current, which moves offshore from around the Tana River/Lamu area depending on the monsoon, influences the coastline. Mangroves occur in most estuaries and bays along the coast, such as Lamu and the Tana River, over an area of 560 km². Marine protected areas cover 4.6 percent of the coastal area with only 13 percent of this area being fully protected.

The coastal land area is about 32 447 km² and lies in a semi-arid zone. With a total national population of about 30 million and a total area of 582 650 km² Kenya has a national population density of about 50 people/km². The coastal area with 2.5 million people has a higher population density of 77 people/km². Most of that population is concentrated in urban areas, which are virtually all located along the coastline. The major urban district of Mombassa, which covers 282 km², has a population density of 2 482 people/km². At national level, the coastal area is food-deficient and is the second poorest of Kenya's eight provinces.

Kenya has a coastline length of some 650 km, which expands to around 880 km when all of the bays and inlets are measured. The coastline forms part of the western border of the Indian Ocean. The country lies within the tropical zone, extending from Kiunga in the north at about 1°41'S to Vanga in the south at about 4°40'S, and is approximately inclined in a northeast/southwest direction.

The most distinctive feature of the coastline is the almost continuous fringing coral reef that runs parallel to the coast but breaks adjacent to openings of creeks, bays and estuaries of large perennial rivers. The reef occupies the shallow inshore zone extending offshore to a depth of about 45 m, and at a distance of 500 m to 2 km from the shore, except where river systems enter the sea creating conditions of low salinity and high turbidity, which limits coral growth.

The coast forms the baseline for an exclusive economic zone (EEZ) measuring some 230 000 km², including a narrow continental shelf of about 3–5 km in width with a total area of around 19 100 km², some 11 000 km ² of which are said to be trawlable. South of Malindi, the shelf is only about 5 km wide, whereas to the north of Malindi on the North Kenya Banks, the edge of the shelf is about 60 km offshore. Bottom topography is mainly rough coralline formations and the bathymetric nature of the coastal marine system is delineated by the 200 m depth continental contour.

Rich inshore marine fishing grounds are found in and around the Lamu Archipelago, Ungwana Bay, North Kenya Bank and Malindi Bank. This area is where the south-flowing Somali Current

meets the north flowing East African Current during the northeast monsoon season (November to March) causing upwelling and enrichment. The area is also where two major Kenyan rivers, Tana and Sabaki, empty into the sea, bringing enrichment from the land. It is in these areas that prawn trawling is carried out, and where trawling surveys in the past have yielded reasonable catches of demersal fish.

### 6.2 Fisheries management and sea safety

The main inshore fishery is located in the waters inside the fringing coral reef all along the Kenyan coastline. Artisanal fishermen using simple boats and gear including gillnets, shark nets, hook and line, beach seines and traps take the bulk of marine fish landed. The most productive fishing areas are on the north coast in the Lamu area including Kiunga, Kizingitini and Faza, Tana River delta and Malindi, and on the south coast around Majoreni and Vanga.

In the early 1990s, there were about 15 000 fishermen on the coast, operating some 4 800 boats, over 80 percent of which were non-motorized. By the late 1990s, the number of fishers was reduced to about 6 500, and the number of boats to 2 400. In a little less than a decade the fishing effort on the coastal fishery has been reduced by half.

The cause of this decline in the traditional or artisanal fishery is not clear, but one suggestion is that the tourism sector, which grew very rapidly through the early 1990s, first overshadowed and later marginalized the traditional sectors such as fishing. With tourism came residential and commercial development, bringing hotels, restaurants and modern settlements. In addition, there was increased urbanization and new industrial sites to what were previously areas characterized by shore-side fishing villages and agricultural plots.

Fishing villages have historically provided the nuclei of urbanization on the Kenyan coastline. Their organization encouraged investments from early traders and some were chosen as administrative centres. With enhanced diversification of economic opportunities they lost their important symbolic role as fishing villages. Artisanal fishers living next to the sea have the following advantages:

- make more efficient use of the tide cycles so that they can optimize their catch;
- conveniently guard their crafts and gear against theft;
- minimize spoilage of their catch by avoiding travelling long distances without adequate preservation methods.

With the changes came displacement of fishing villages inland, which seriously disrupted the fishermen's lifestyle and culture. Today, few shore-side fishing villages remain and fishers are forced to commute sometimes long distances to get to their boats. These changes brought large amounts of alternative employment in the new industrial developments, in the service industries in the hotels, restaurants, shops, curio markets, safari businesses and other places. The alternative economic opportunities attracted more and more people to the coast, but also pulled people away from the traditional sectors including fisheries. Finally, employment in the fishing industry suffered a sharp decline in social status. Money could be made faster and for much less effort by ferrying tourists to the marine parks and reefs compared with the hard work of daily fishing with poor equipment and simple technology. Youths came to consider fishing as a last-choice career and most preferred other occupations.

The annual inshore catch depends mainly on the limited amount and quality of effort that is applied in the fishery. Effort is limited for many reasons including the following:

- lack of information on fisheries potential;

- very little, if any, institutional support for any form of fisheries development;
- no capital to develop;
- low level of interest in developing the sector because of poor returns for effort compared with alternatives employment such as taking tourists out on the reef;
- poor markets for fish;
- the traditional vessels are small, mostly un-motorized, wooden planked canoes that are poorly designed, being propelled by paddle or sail and therefore difficult to manoeuvre even in moderate seas. These vessels in fact represent a safety hazard when there are sudden changes in weather patterns;
- fishers employ very simple gear, and can only fish in near-shore waters, all of which limit their ability to catch fish. Again, the most adventurous fishers are faced with security problems at sea when venturing further offshore;
- for a significant part of the year (May–September), fishing is difficult and dangerous for small artisanal vessels because of rough seas and high winds;
- the potential for further production is largely unknown because very few fish stock assessment surveys have been carried out;
- the infrastructure for the marine fisheries sector is quite limited.

In addition to these factors, it is believed that fishers lack a sense of ownership of the fisheries resources. To address this concern, the Government has created Beach Management Units (BMU) made up of people from the fishing communities to play a number of roles in fisheries management; including ensuring registration of all fishing vessels that are in operation, preventing the use of banned and destructive fishing gear, protection of fish breeding and recruitment grounds, monitoring and control of illegal and migratory fishers, gear and fishing techniques, collection of fisheries data, and resolution of conflict among fishers.

This consultant can confirm that the local fishing community in Kenya is taking the creation of their local BMU seriously as it was evident by the way all local fishers were mobilized to vote for membership of their BMU on the day he visited Malindi. Certain government fisheries officials are adamant that the marine sector has to work towards a holistic approach in fisheries management, i.e. adopt the Integrated Coastal Management Project (ICAMP) in order to work together and make the best use of all available resources so as to avoid conflicts. The BMU should play a key role in promoting this objective.

There is little information on Kenyan offshore marine resources. However, the offshore parts of the Kenyan zone are well known to foreign fishers who have been visiting the area since the 1950s in pursuit of tunas, billfishes and pelagic sharks. This foreign interest continues but has changed in nature from fleets of vessels fishing with pelagic longline gear to include also tuna fleets mostly from EU countries using the more efficient purse-seine techniques. The region hosts several dozen of these vessels, still almost all foreign owned. Many of those vessels operate in the Kenyan zone with licences issued by the Government. Information on foreign catches in the Kenyan EEZ is rare because of poor reporting by foreign vessels and lack of a MCS centre for monitoring foreign fishing vessels activities. In over 12 years of foreign fishing, catches were only reported in 1996 (3 831 tonnes of tunas), and 1997 (1 059 tonnes). It is likely that the level of reporting in these years was incomplete and that actual catches were much higher.

For over a decade, there has been a high level of interest on the part of foreign fishers in securing licences to fish in the Kenyan EEZ. For example in 2002, Kenya licensed 38 large foreign purse seiners; in 2003, 36 such vessels were licensed to fish for tunas in offshore waters. All of these licences were issued for the second half of the year in response to requests from the foreign vessel owners, which could be taken as a sign that the country's offshore waters contain substantial tuna stocks that represent a significant potential to the purse seining fleet. The large purse seiners that have sought Kenyan licences can only really economically function where fish stocks are present

in relative abundance and therefore the high level of interest in taking out these licences probably indicates the presence of substantial tuna stocks in the Kenyan EEZ, at least in the months of May/June to December.

In Kenya it is the Fisheries Department that has the responsibility for fisheries development. However for the most part, this institution has yet to come up with a clear developmental strategy for marine fisheries with focused developmental projects or programmes. In particular, its efforts in the marine subsector are very limited; instead it has concentrated most of its efforts on inland fisheries and aquaculture, which account for about 95 percent of the total national fish landings. Even now, the institution has dedicated only limited financial and human resources to marine fisheries. In addition, the staff working in the marine sector are not well trained to obtain the right skills required to promote and manage the development of commercial marine fisheries. These institutional shortcomings need to be addressed for development of marine fisheries in Kenya. There appears to be a complete contradiction to what government fisheries officials claim to have achieved and the programmes that have actually been implemented.

From personal conversations with private fishers they claim that there is a lack of political will, with government officials neglecting the small artisanal fishers in favour of the large entrepreneurs.

One of the problems experienced by small artisanal fishing vessels in Kenya is collisions between artisanal vessels and large industrial vessels, in particular prawn trawlers. One of the major reasons for this is that both of these types of vessels sometimes share the same prawn fishing grounds, in particular in the Malindi-Ungwana Bay area. According to the existing Fisheries Act, commercial trawling within five nautical miles of the coast is prohibited. However, the criterion for delimitating the five-nautical-mile no-trawl zone is not documented, neither are there supporting studies for the area to provide evidence, with the end results that trawlers do not respect the regulation.

In fact, according to both fisheries officials and the private fishers' associations, trawling should only be allowed in Ungwana Bay from five nautical miles offshore. Restricting the trawlers to this area would separate the area of operation of the artisanal and industrial prawn fishery and reduce considerably the risks of collisions as well as destruction of artisanal fishing gear by industrial vessels.

Modalities of fitting VMS on commercial trawlers need to be taken more seriously so as to ensure that they can be effectively monitored. It is also clearly demonstrated from a recent survey that the destruction of artisanal fishing gear and/or collisions with larger industrial vessels can be significantly reduced when trawling is restricted to day-time hours, and it was recommended that this should be made mandatory through legislation (Current Status of the Trawl Fishery of Malindi-Ungwana Bay, KMFRI, December 2002).

According to the Director of the Malindi Marine Association, sea safety issues have been entirely neglected in most fisheries management measures and any initiative in this field has to be taken by the fishers themselves. This is one reason that explains why fishers do not venture further offshore, in particular during the rough weather between June and September. The Director mentioned, for example, that one of the main methods utilized by local fishers for improving security at sea is the increasingly widespread use of mobile phones (see section 6.7).

As a result of low levels of development, marine fisheries catches account for only 5 percent of the total annual national fish landings, the rest being derived from freshwater. Socio-economic data on the marine fisheries sector are given in Table 8.

Artisanal fishers contribute about 60 percent of the annual marine fish landings, the rest being derived from commercial trawlers operating in the inshore prawn fishery. The total annual marine

catches showed a higher upward trend between 1984 and 1992, followed by a significant general decline between 1993 and 2003 when the increase in catches was lower (Fisheries Department Annual Report, 2003).

## 6.3 Safety programmes

In Kenya there are two main factors affecting the security of vessels at sea:

- the climatic conditions (unpredictable weather patterns);
- aggression at sea mostly by Somali vessels that come to Kenyan waters to fish.

**TABLE 8.** Socio-economic profile of marine fisheries of Kenya

| | Marine fisheries | Kenya |
|---|---|---|
| 1. | Artisanal annual catches (tonnes) | 9 600 |
| 2. | Industrial annual catches (tonnes) | 2 400 |
| 3. | Number of artisanal fishermen | 6 500 |
| 4. | Number of registered industrial fishing vessels | 4 |
| 5. | Contribution of marine catches to national fishery (%) | 5 |
| 6. | Inshore and offshore (within 12 nautical miles) potential yields (tonnes) | 34 000* |
| 7. | Contribution of national fisheries to GDP (%) | 0.04 |
| 8. | National GDP (billions US$) | 10.4 |

Source: South West Indian Ocen Fisheries Project – Profile of Kenya Marine Fisheries.

* This figure is in fact mainly an estimation of inshore fisheries potential. It does not include for example estimates of the Kenyan potential catch from the very large offshore/regional catch of pelagic tunas, billfishes and sharks, or from other offshore resources including deep bottom finfish and sharks, or even from the abundant coastal pelagic fish species, all of which could add 90 000 to 100 000 tonnes to the overall potential.

Although the second of these two factors affects mostly larger fishing vessels, according to fisheries officials certain artisanal vessels have also faced such incidents.

According to the Ag. Director of the Kenyan Marine Research Institute (KMRI), a double standard exists when applying the regulations for vessel safety. The tourists hire vessels because they can meet the required standards to have all the required safety equipment and be easily granted licences. On the other hand, the traditional canoes and small fishing craft that do not meet the required standards are not granted a licence but the authorities cannot stop them from going out to sea, as it would otherwise becomes a political issue. In short, this means that artisanal fishing vessels are allowed to go to sea without the prescribed safety equipment and hence represent a security risk at sea.

There are presently no official safety programmes that have been set up to assist fishers that go to sea. although the new Kenya Marine Authority (KMA) that was set up in 2005 has been designated to take over this responsibility. The authorities presently admit that they have no control over fishers that go out to sea with not even a metrological broadcast to warn them of impending storms. Officials admit that in most cases fishers have to depend on their own instincts to decide whether they go to sea or not. The fact that more then 90 percent of the artisanal vessels are propelled by paddles or sails increases the safety at sea problem.

According to a senior fisheries official, there is a need for artisanal vessels to be equipped with simple safety equipment that is not battery powered. He admitted, however, that this equipment is not presently available on the market. One interesting proposal that was made by a senior fisheries official is the possibility of manufacturing basic sea safety equipment locally, using local materials, instead of importing them from South Africa or the United Kingdom of Great Britain and Northern Ireland. The problem, however, is that since government was not prepared to take this initiative, it would have to come from the private sector.

The KMA that was created in 2005 is the authority with the mandate to establish safety programmes for vessels at sea. The Authority has the mandate to register all fishing vessels, but according to its Ag. Director they only register vessels above 25 net registered tonnes (NRT). According to him, the major cause of accidents at sea for small fishing vessels is the negligence of the fishers and their lack of training. He explained that a new Maritime Rescue Coordinating Centre (MRCC) had recently been set up in Mombassa (with substations in Seychelles and Dar es Salaam). The station, which will coordinate all search and rescue operation in the region, will be fully equipped with

IMMARSAT, VHF and HF radios, and has been fully funded by the IMO through grants from Norway, Japan and the Netherlands. The Kenyan navy and Coastguard will be working closely with the Centre to carry out search and rescue missions.

### 6.4 Data recording

In Kenya, the authority with the official mandate for recording data on accidents at sea is the newly created KMA. It appears, however, that this Authority is not prepared or organized to fulfil this mandate, as the Ag. Director explained that very few accidents at sea are reported to him. Accidents are sometimes reported to the local village chief, who generally does not inform the authorities. Another constraint mentioned was that, even if fishers have to register their vessels with the Fisheries Department, very few do, and no national register of the number of fishing vessels actually in operation is kept.

Usually most accidents occur during the poor fishing season, which coincides with the heavy winds of the southeast monsoon between June and September. Fishing vessels equipped with sails are particularly vulnerable during that period of the year, as they are dependent on the shifting wind patterns and, when the wind are blowing offshore, they have difficulty in returning to their base. According to the District Fisheries Officer in Mombasa, on average one or two fishers are reported missing during that period of the year. Another major cause of accidents, according to her, are collisions between artisanal fishing vessels and large shrimps trawlers (see section 6.2, last paragraph). This is mainly due to the fact that most artisanal fishing vessels are not equipped with lights at night, although there is a law that specifically prohibits fishing vessels to go out at night without lights. Several incidents of industrial vessels entangling with fishing nets at night have been reported but fortunately no deaths have been recorded.

Specific incidents of accidents at sea mentioned by the authorities include:

- five fishers lost at sea in Mombasa in 1999;
- at least two fishers drowned in the tsunami in December 2004;
- one fisher killed in 2005 when his vessel collided with a prawn trawler at night;
- two fishers reported drowned off Malindi in 2005 when their boats capsized.

The incidents mentioned above have never been recorded and were only accounts by individuals or officials through word of mouth.

### 6.5 Legislation

The Fisheries Department is empowered to manage Kenya's fisheries resources as mandated by the Fisheries Act 1989 (Cap 378). This Act provides for a wide range of activities including fisheries development, fisheries management, exploitation and utilization of fisheries resources, and conservation of fisheries for connected purposes. However, in protected areas, such as the country's marine parks and reserves, the fish and fisheries fauna are managed under the Wildlife (Conservation and Management) Act by Kenya Wildlife Service (KWS). The regional body, the Coastal Development Authority (CDA), is also empowered in the management and exploitation of fisheries resources by virtue of its mandate to plan, coordinate, gather and disseminate information for the management, sustainable exploitation and development of coastal resources as empowered by the Coast Development Authority Act (Table 9). Other institutions that provide synergy in the management of the fisheries resources operate in the fields of surveillance, environmental management and research.

Marine protected areas are areas of coastal waters designated as marine parks or marine reserves, which are protected under the Wildlife (Conservation & Management) Act by the

**TABLE 9.** Institutions with a mandate for involvement in management of marine fisheries in Kenya

| Institution | Mandate | Empowerment |
|---|---|---|
| Fisheries Department | Manage and develop fisheries resources<br>Licence fishing vessels<br>Promote aquaculture<br>Enforcement of Fisheries Act | Fisheries Act |
| Kenya Wildlife Service | Protect and conserve marine parks and reserves<br>Enforce Wildlife Act | Wildlife Conservation & Management Act |
| Coast Development Authority | Promote sustainable economic exploitation of coastal and marine resources | Coast Development Authority Act |

Kenya Wildlife Service. In marine parks, no form of resource exploitation or extraction is allowed, whereas in marine reserves limited human activity including exploitation of resources is allowed. Kenya has a total marine protected area of 760 km$^2$ of which 54 km$^2$ form the total area of marine parks while the rest is found in marine reserves. The marine parks and reserves, which are of different sizes, are located at various intervals along the entire Kenyan coastline.

There are four marine parks (Mombasa, Malindi, Watamu and Kisite/Mpunguti) and six marine reserves. The plan is for each marine park to be joined to a marine reserve. Currently, there are two marine reserves (Chale-Diani and Kiunga) that are not adjoined to marine parks. Although the policy goal of creating protected areas is for the conservation and management of flora and fauna for tourism purposes, the protected areas also act as habitat refuge for stocks that would otherwise be open to exploitation through fishing activities in unprotected areas. However, unprotected overfished areas also have a capacity to recover when fishing is controlled as evidenced from the creation of Mombasa Marine Park and Reserve, which was earlier an area that had been overfished but later recovered to show high fish densities. Mombasa Marine Park and Reserve was created to boost the tourism hotel industry along the Nyali-Bamburi-Shanzu shoreline. Guidelines are required on how to create linkages between protected and unprotected areas in terms of fish biodiversity to achieve optimal recruitment and efficient utilization of the fisheries resources with minimal conflicts between stakeholders.

A particular problem is that Kenya's artisanal fishermen believe that the protected areas have been exclusively created for the advantage of the tourism industry because they are not allowed to fish in the parks. Resolving this dispute would appear to be very difficult because fishermen and tourists have opposite and competing interests towards the fisheries resources.

There is no doubt that the Kenyan marine fisheries legislation is outdated and needs to be revised and updated. There have been many proposals for amendments to the Kenyan Fisheries Act (1989) that is silent on many issues, including safety at sea issues and on new fisheries policies. A survey of key national fisheries issues was carried out by a working group in 2003 and the committee was supposed to produce a first draft with the objective of turning it into law, but so far nothing has been done. The main problem according to a prominent NGO is that most government technicians are political appointees and lack the political will to carry a programme to the stage of implementation. Perhaps the same is true of the legislature that was to turn the legislation creating the KMA into law. Although this Authority has been created since 2005 the law giving its official powers still has to go through parliament to be enacted.

### 6.6 Boatbuilding and vessel design

Construction and design of new vessels is left entirely in the hands of the private fishing community, i.e. the fishers themselves. Government officials recognize that there is a need to switch from wooden vessels and build more fishing vessels from fibreglass. In any case they recognize that good timber for vessel construction is becoming scarce as forests are being depleted. According to the

Ag. Director of KMRI good timber for vessel construction is presently being imported from the United Republic of Tanzania or even from the Republic of the Congo. Boat builders are currently using timber that lasts five to ten years, whereas vessels built with good timber should last up to 20 years. Mango trees that are usually used to build dug-out canoes are no longer readily available, and other tree trunks that are being used have a lifetime of less than five years. Traditional skills for boatbuilding, in particular for building canoes, are being lost in Kenya; the only district that still has skilled traditional boat builders is Lamu. According to the KMFI Director, one solution would be to build a training school to teach the traditional boatbuilding skills, so that they can be transmitted to the younger generation.

There are no government subsidies for building fishing vessels, yet the need for designing larger and more comfortable vessels should be considered as a priority by government if it wants fishers to move away from exploiting uniquely the inshore resources and target more the offshore pelagic resources.

The Malindi Marine Association is of the opinion that government should subsidize the construction of a large boatyard and workshop with the necessary facilities and equipment and let the fishers do the construction of their own vessels. They feel that FAO could intervene by giving advice on vessel construction.

A programme for the construction of new vessel should definitely be a priority in any new government policy for the development of the marine fisheries sector. At the same time, fishers should have access to subsidized safety equipment, which is presently too expensive for them to purchase or is simply not available on the local market.

According to the District Fisheries Officer in Mombassa, another aspect of the fishing industry that needs to be developed in Kenya is the construction of a proper fishing port. Mombasa is a commercial port and is too congested, leading to many accidents involving fishing vessels in Mombasa harbour. Fish should be kept away from port workers and a proper fish auction centre should be built to enable fishers to sell their catch.

Again, according to this particular District Fisheries Officer, in future all efforts should be geared towards building fishing vessels from fibreglass. She explained that an FRP fishing vessel prototype has already been built with the financial support and advice of USAID, and that the Coastal Development Authority (CDA) is coordinating this project. The vessel is 35 feet long, is equipped with an inboard engine and an auxiliary outboard engine, which should allow fishers to travel further offshore and target large pelagic species.

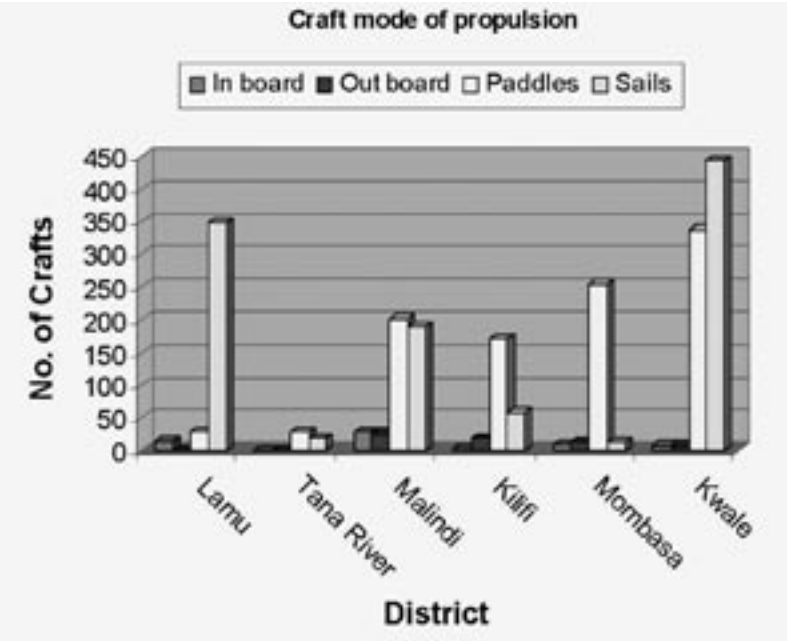
Another example of a foreign-built fibreglass vessel was observed while visiting Malindi. This 8.5-m fibreglass vessel, which is equipped with a 15 hp diesel engine and a 500 kg icebox, is a Swedish-designed vessel built in Somalia under a Swedish SIDA funded project. According to the Malindi Marine Association, three of these vessels were sold to Kenyan entrepreneurs by Somali fishers who had actually sailed the vessel to Malindi. Again according to the Director of the Malindi Marine Association, the vessels have proved to be well suited for local conditions, being extremely popular with local fishers (they are very sea-worthy), thus allowing them to fish further offshore to target large pelagics. The Association pointed out that this was the type of project that the Kenyan Fisheries Authorities should be negotiating with foreign donors if they were serious in wanting to develop the offshore fishing industry in Kenya.

According to the Association, FAO could be of assistance in providing advice on vessel design as this international body should be aware of the existing problems, having already sent boatbuilding consultants to Kenya in 1985. Moreover, there is also a need to train fishing crews, as it is pointless to build new vessels without properly trained crews.

## 6.7 Other safety issues

### *Background*

From the latest marine frame survey carried out on the artisanal fishery (in 2004), there were 2 233 artisanal fishing crafts and 9 017 fishers. The majority of the active fishing crafts operating in marine waters, i.e. 1 072 (48.0 percent of fishing vessels) were found to use sails while 1 023 (45.8 percent of fishing vessels) used paddles. The rest, 135 fishing craft (approximately 6 percent of fishing vessels), were motorized. The majority of the motorized craft were found in Malindi District (56 craft) followed by Mombasa District (24) and Kilifi with 22. Lamu and Kwale Districts had 16 motorized craft each while Tana River had only one. From the motorized fishing craft, 66 were propelled by inboard engines while 69 were propelled by outboard engines (Report on the Marine Waters Frame Survey 2004. Kenya Fisheries Department).




Moreover the survey indicates that the marine artisanal fishery in Kenya is inshore, mostly inside the fringing coral reefs, within a range of 3 to 5 km from shore.

### *Communication and Navigational system utilized*

The results of this study indicate that more then 95 percent of the artisanal fishing vessels operating in Kenya's marine waters are not equipped with any navigational or communication equipment. The only notable exception to this rule is the widespread use of mobile phones by a large number of fishers. Indeed, not only is the mobile phone network very effective in Kenya but the mobile registration card is relatively cheap compared to the other three countries concerned in this study (a registration card costs around US$6). Moreover, the fact that the operating range of artisanal vessels is very limited (up to 5 km) makes the use of mobile phones particularly effective as far as a safety at sea equipment.

### *Organization of search and rescue*

There is presently no official government policy concerning search and rescue operations for artisanal fishing vessels. Although the new Kenyan Maritime Authority (KMA) was created in 2004 to fulfill this mandate, according to the Ag. Director the Authority is only concerned with vessels larger the 25 GRT. He further explained that in most cases very few accidents at sea are reported to him but instead are generally reported to the local village chief who generally does not inform the Authorities. According to the Director of the Malindi Marine Fisheries Association,

for most cases of accidents at sea the private boat-owners volunteer to organize search and rescue operations. The Association or other private boat-owners purchase enough fuel for carrying out the search and rescue operations. The fact that most artisanal vessels fish within a close vicinity to the shore facilitates such operations.

### *Availability and cost of safety equipment*

According to a senior fisheries official, safety equipment is not readily available in the local shops and most large fishing or sports fishing vessels order it directly from overseas, either from South Africa or the United Kingdom. At the time of this consultant's visit to Kenya this information could not be confirmed.

### *Availability and cost of engine spare parts*

The same problem arises when it comes to the availability of engines and spare parts. These are sometimes available in shops in the main towns (Mombassa, Malindi, Lamu) but as a rule only a limited range of spare parts is stocked. Repairs are carried out by semi-skilled mechanics that lack professional training. Again, according to the Malindi Marine Association, there would be a need for government to subsidize the construction of a large workshop and the private sector would equip and run the workshop to carry out the necessary marine engine and boat repairs.

### *Local production of safety equipment*

Although local production of such equipment does not exist at present, according to one senior fisheries official there is a strong interest in manufacturing basic safety equipment locally using local materials instead of importing them. The problem, however, is that since government is not prepared to take the initiative it would have to come from the private sector. The Marine Fisheries Association expressed the same interest; however, they emphasized that the private sector could not undertake such a project and they would need the assistance of the government or foreign donors.

### *Safety related to the use of fishing vessels for transport of goods and passengers*

Since most of the artisanal fishing vessels in Kenya are small they do not as a rule carry passengers or goods along the coast. Larger cargo vessels and dhows that ply along the east African coast carry out these operations.

## 6.8 Observations

When discussing with the various agencies involved in the fisheries sector in Kenya, it became evident that there should be one agency with the overall mandate for fisheries development, and this agency should be coordinating the various efforts towards achieving this objective. Moreover, there should be a better cooperation between the private and public sectors and both sectors should be working closely together to solve the numerous problems, in particular the sea safety issues, facing the marine fishing industry in Kenya. At the moment there is a lack of trust of the public sector by the local fishers' organizations, which complain that there is a lack of government officials involved in policy-making decisions. According to them the main concern of government officials is to look after the interests of large (mostly foreign owned) fishing companies, leaving the small artisanal boat-owners to fare for themselves.

Given the importance of inland fisheries in Kenya it is understandable that the marine fisheries sector is not considered a priority. Nevertheless, the sector has the potential for increased development and necessary measures should be taken to optimize the exploitation of the country's largely unexploited marine resources. In any case there is no reason that would justify government lack of interest towards the artisanal marine fisheries sector, in particular when it comes to improving security so as to save lives at sea. This is obviously an important issue that needs to be resolved in the future.

# 7. CONCLUSIONS AND RECOMMENDATIONS

The six major themes covered in this survey are the relation of fisheries management to sea safety, safety programmes, data recording, legislation, boatbuilding and vessel design and other safety issues. Where the study had useful findings or recommended action on the six themes, they are included in each national section of this report.

When considering future work on safety at sea, it is evident that certain topics covered in the scope of this study should deserve special priority due to their potential impact on future work on sea safety programmes. These topics include the following:

## 7.1 The importance of including fisheries management in safety at sea

The concept of including safety of sea issues as an objective of fisheries management is not common for most countries covered in this study. Safety at sea is generally considered when formulating management plans, but the concept of making provisions for saving lives at sea is generally not considered as a priority item.

The main reasons which could explain this are:

1) In most countries the primary objectives of fisheries management are limited to biological and economic issues. Hence when discussing options for sustainable management of the resource the emphasis is placed on sustainable exploitation and economic viability. Safety issues are thus not considered as a priority.
2) Another reason is the actual definition of fisheries management in the legislation itself, where it is considered as the management of fish stocks through regulations of fishing gears, closed and open seasons, species and size of fish to be caught and schemes for limiting access to the fishery (quotas, licences, permits, etc). In short, most fisheries legislation is more concerned with survival of fisheries resources than safety of the fishers themselves.

As marine resources become under increasing fishing pressure in the future, emphasis will continue to be placed on fisheries management rather than fisheries development. This being the case it is recommended that fisheries managers ensure that safety issues be included as a legitimate and important objective of fisheries management.

## 7.2 Registration of fishing vessels and fishers

A national register of all types of fishing vessels and all active fishers should be kept and updated annually. This would permit national authorities to have precise data on the number of people active in the fishing sector, assist in evaluating training requirements and help in safety at sea by improving accountability. Such a register would also be extremely useful for fisheries management, as it would give a more precise indication of the fishing effort and how it is distributed. Another equally important function of a national register is to help in determining the financial impact of the fishing sector on the national economy so as to obtain a more accurate evaluation of the budget necessary for fisheries development, of which safety at sea should be considered as an important component. In order to encourage fishers and boat-owners to register they should benefit from certain incentives such as fuel rebates, tax concessions, etc.

## 7.3 Focusing more importance on small-scale fishing vessels

Small fishing vessels although more vulnerable than larger ones, account for a greater percentage of national fish landings. Yet in most cases they have received the least attention in terms of safety regulations, construction standards, enforcement and monitoring strategies and training

programmes for their crews so as to improve safety. It is therefore recommended that more emphasis be placed on the various safety interventions for small vessels of less then 24 m LOA, which are likely to grow in numbers and importance

There are in place or being developed international instruments that may be used as a guide for those competent authorities that are concerned with framing national laws and regulations on the safety of fishing vessels. Among available instruments are the FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, 2005. The revised version of the Guidelines applies to decked fishing vessels of 12 m in length and over, but less than 24 m in length.

FAO, ILO and IMO are currently developing safety standards for small fishing vessels that are not covered by the revised Guidelines, with a target completion date of 2009. These standards, which are provisionally entitled "Safety recommendations for decked fishing vessels of less then 12 m in length and undecked fishing vessels", will contain requirements for the design, construction and equipment for these vessels. Further information on the development of the safety recommendations, including the most recent draft of these recommendations, is posted on the following Web site, which is hosted by the Icelandic Maritime Administration: http://www.sigling.is/fvs-iscg

### 7.4 Recording and analysis of accidents at sea

The appointment of a national agency for recording data on accidents at sea is of crucial importance. The analysis of accidents data can have a positive effect in two important areas: (a) formulating and improving sea safety programmes; and (b) determining the cost of sea accidents in terms of lives lost and formulating a government budget for future interventions. It is therefore recommended that each respective country appoint an agency with the full mandate to record and analyse all accidents at sea.

### 7.5 Engine spares and life-saving equipment

In all four countries covered in this study engine spares, life saving and communication (radios, EPIRBs, etc) equipment are often unavailable on the local market. It is therefore recommended that countries should consider this as a priority to ensure the availability of engine spares, communication and life saving equipments to the fishing community.

### 7.6 Education and training programmes

Training programs should be organized for fishers in the use, maintenance and repair of marine engines, and of basic navigational and communication equipment. In this respect an appraisal of the programmes of the various regional maritime training centres should be carried out with a view to assisting in the improvement of these existing programmes. It is therefore recommended that the regional Maritime Training Centres be properly funded and organized so that they can fulfil their proposed mandate and be a real asset in fisheries development, including training of fishers in safety at sea programmes.

### 7.7 Public awareness

Most fishers as well as the general public show a lack of awareness of the importance of safety at sea programmes. It is important that the community as a whole, and fishers in particular, be constantly sensitized on these issues (through the local press and radio programmes). It is therefore recommended that the local fishing community be more exposed to safety at sea programmes so that they will be better sensitized on the issues involved. One of the major conclusions of this

study is that education through public awareness campaigns, repeated and reinforced on a long-term basis and backed by an adequate supply of safety equipment and spare parts and training seems to offer the best chance for improving safety at sea for small-scale artisanal fishers.

### 7.8 Regional safety at sea workshop

As a follow-up to this study it is recommended that a regional workshop aimed at improving safety of fishing vessels through improved data collection, legislation, design and construction of fishing vessels, etc. be organized. The ultimate objective would be to create a regional register and/or database of all types of fishing vessels and all active fishers in the region. This workshop could be co-sponsored by SWIOFC/FAO/SID.

## 8. CONTACTS

### Seychelles

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