FAO Fisheries and Aquaculture Report No. 873 **SFS/R873 (En)**

ISSN 2070-6987

SOUTH WEST INDIAN OCEAN FISHERIES COMMISSION

Report of the

WORKSHOP ON BYCATCH, PARTICULARLY IN PRAWN FISHERIES, AND ON THE IMPLEMENTATION OF AN ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT

Maputo, Mozambique, 15–24 November 2005

Copies of FAO publications can be requested from:
Sales and Marketing Group
Communication Division
FAO
Viale delle Terme di Caracalla
00153 Rome, Italy
E-mail: publications-sales@fao.org
Fax: (+39) 06 57053360
Web site: www.fao.org

FAO Fisheries and Aquaculture Report No. 873 SFS/R873 (En)

SOUTH WEST INDIAN OCEAN FISHERIES COMMISSION

WORKSHOP ON BYCATCH, PARTICULARLY IN PRAWN FISHERIES, AND ON THE IMPLEMENTATION OF AN ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT

Maputo, Mozambique, 15–24 November 2005

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Subregional Office for Southern Africa
Rome, 2009

ISBN 978-92-5-106169-5

PREPARATION OF THIS DOCUMENT

This is the final version of the report of the Workshop on Bycatch, Particularly in Prawn Fisheries, and on the Implementation of an Ecosystem Approach to Fisheries Management held in collaboration with the Mozambique Fisheries Research Institute (IIP), Maputo, Mozambique, from 15 to 24 November 2005. The country reports appear as presented by the authors/participants.

FAO South West Indian Ocean Fisheries Commission.
Report of the Workshop on Bycatch, Particularly in Prawn Fisheries, and on the Implementation of an Ecosystem Approach to Fisheries Management**.** Maputo, Mozambique, 15–24 November 2005.
FAO Fisheries and Aquaculture Report. No. 873. Rome, FAO. 2009. 47p.

ABSTRACT

The Workshop on Bycatch, Particularly in Prawn Fisheries, and on the Implementation of an Ecosystem Approach to Fisheries Management was attended by participants from Kenya, Madagascar, Maldives, Mauritius, Mozambique, Seychelles, South Africa, Somalia and the United Republic of Tanzania. The workshop was also supported by resource persons from Italy, Nigeria and the United States of America.

The workshop received from the countries national reports and reviews concerning bycatch, sea turtle distribution, critical habitats, main sources of natural and man-induced mortality and conservation efforts. The use of turtle excluding devices (TEDs) and interactions between sea turtles and fisheries in shrimp trawling was discussed.

It was concluded that two workshops about turtle and fisheries should be set up, the first for collecting data on turtle occurrence and mortality and the second for presenting these results to managers, fisheries associations and industry in an attempt to find the best solutions and exchange knowledge.

Information about the countries implementation of the ecosystem approach to fisheries (EAF) management effort was reported. Two different methods of identifying ecosystem approach to fisheries issues and risk analysis in order to prioritize the issues were presented and tested. Obstacles on implementing the EAF were considered by the workshop and as a way forward it was concluded that a risk assessment for sustainable fisheries (RASF) approach should be applied in order to implement EAF in the region. This could be done in national case studies.

CONTENTS

INTRODUCTION

1. Within the framework of the South West Indian Ocean Fisheries Commission (SWIOFC)[1] and the technical support of FAO,[2] a regional workshop was organized by the Fisheries Research Institute of Mozambique (IIP). The workshop was structured into two distinct components:

- Bycatch, with emphasis on reducing bycatch from shrimp trawling
  (Tuesday 15 November to Saturday 19 November)

- Implementing an ecosystem approach to fisheries
  (Monday 21 November to Friday 25 November)

2. This is the report of the second component on implementing an ecosystem approach to fisheries.

3. The need for an ecosystem approach to fisheries is globally accepted and has been emphasized in the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem, the Plan of Implementation of the World Summit on Sustainable Development, and the Convention on Biological Diversity. It is also totally compatible with the FAO Code of Conduct on Responsible Fisheries. The challenge is to implement an ecosystem approach in national and regional fisheries around the world.

4. In order to assist countries in moving towards an ecosystem approach to fisheries, FAO developed a set of technical guidelines on ecosystem approach to fisheries (EAF) to help governments and stakeholders to understand what is intended by EAF and how countries can begin to implement it. The approach being followed by FAO is an evolutionary one that aims to build on and extend traditional fishery management practices so that they also address the broader, critical impacts of the fisheries on the ecosystem and of the ecosystem on the fisheries in order to ensure optimal and sustainable use of marine ecosystems.

5. The guidelines therefore focus strongly on the assessment and management processes, emphasising the steps and tasks involved in an ecosystem approach to fisheries management. This component of the workshop provided an opportunity to discuss, at a regional level, the concept and practice of EAF and to consider the way forward in implementing EAF in the southwest Indian Ocean region.

OPENING

6. A workshop on bycatch, particularly in shrimp trawling, and the ecosystem approach to fisheries management was held at the VIP Hotel, Maputo, Mozambique 15–24 November 2005 and organized by the Instituto Nacional de Investigação Pesqueira (IIP).

7. The workshop was attended by participants from Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, South Africa and the United Republic of Tanzania. The

[1] With the support of FAO/Sida project "*Facilitating a regional fisheries arrangement for the management of sustainable non-tuna fisheries in the South West Indian Ocean*".
[2] With support of a GEF-funded project "*Reduction of environmental impact from tropical shrimp trawling".*

list of participants is in Appendix B. Resource persons from Nigeria, Italy and The United States of America also supported the workshop.

8. Mr Rodrigues Bila, Permanent Secretary, Ministry of Fisheries, Mozambique and Chairperson of the SWIOFC welcomed the participants to the first workshop held under the framework of the Commission. He emphasized that Mozambique continued to address the issue of bycatch as one of the countries with the largest shrimp fisheries in the region. He noted that some of the discussion on bycatch and on EAF would be brought to the Scientific Committee in August 2006. Finally he wished participants a pleasant stay in Maputo, and opened the workshop. The full statement of Mr Bila is attached as Appendix C to this report.

9. Mr Peter Vandor, FAO Representative for Mozambique, made some remarks before the opening of the workshop. He outlined FAOs regular programme and other related extrabudgetary projects addressing bycatch including reduction/utilization technologies and change management. He placed these in context of poverty and the food security of coastal communities, important issues that need to be continually addressed. The following week, he noted, the workshop would address the ecosystmen approach to fisheries management so that by the end of the workshop participants would a good understanding of the approach, its relevance and how it could be implemented in their respective countries and in the region. He highlighted the importance of the shrimp fishery to Mozambique and thanked Mr Bila for his wise leadership of the Commission. His statement is attached as Appendix D.

10. The Senior Fishery Officer of the FAO Subregional Office for Southern and East Africa welcomed participants to the second component of the workshop on the morning of 21 November 2005. The Agenda of this component is in Appendix A. He explained that firstly the issue of sea turtle mortality due to fisheries would be discussed following which the workshop would proceed with some case studies and a trial exercise to more broadly identify the EAF issues in the SWIO, estimate the risks involved, and how these could be prioritized in a way that they could be addressed in a methodical manner by fisheries management.

INTERACTIONS BETWEEN SEA TURTLES AND FISHERIES AND FAO's RELATED ACTIVITIES

11. The FAO Secretariat provided an overview of FAO's activities related to interactions between sea turtles and fisheries. It was noted that the workshop components, i.e. bycatch, marine turtle/fisheries interactions formed part of the ecosystem approach to fisheries and reflected a change in fisheries management. From a focus solely on the target fishery resources, fisheries management is now increasingly required to consider the wider effects of fishing on ecosystems, and in particular, on vulnerable species.

12. The twenty-fifth session of the Committee on Fisheries (COFI, 2003) requested that FAO organize a Technical Consultation to: review the current status of sea turtles and the main sources of mortality; review the development of new fishing gear techniques; produce appropriate guidelines and consider assistance to developing countries. In response FAO organized an Expert Consultation on Sea Turtles and Fisheries within an ecosystem context (Rome, March 2004) followed by a Technical Consultation on Sea Turtles Conservation and Fisheries, Bangkok, December 2004.

13. At the Technical Consultation most participating countries recognized the urgent need for national as well as regional management action in those fisheries that caused

serious mortality to sea turtles. Guidelines that could be immediately adopted to reduce sea turtle mortality due to fisheries were produced. The recommendations of the Technical Consultation were endorsed by COFI (2005).

14. FAO was implementing a project "Interactions between Sea Turtles and Fisheries within an Ecosystem Approach to Fisheries Management"[3] that had two main aspects:

- review of the status of sea turtle populations, population declines, direct and indirect impacts of fisheries, the relative importance of fishery as compared to other impacts, and identification areas/ecosystems in need of urgent action.

- implementation of responsible fisheries management and related ecosystem approaches to fisheries, to help the conservation of sea turtles while improving socio-economic benefits.

15. Much of the first aspect was addressed through the Expert and Technical Consultations. It was noted that the current workshop would assist identify how the SWIO region could benefit from the project activities over the period 2004–2009.

REVIEW OF SEA TURTLES DISTRIBUTION, CRITICAL HABITATS, MAIN SOURCES OF NATURAL AND MAN-INDUCED MORTALITY AND CONSERVATION EFFORTS

16. Five species of sea turtles occur in the Western Indian Ocean. Green and hawksbill turtles are the most abundant, while loggerhead, olive ridley and leatherback occur less frequently. Charts of the distribution of nesting sites and migration routes obtained from IOSEA (http://www.ioseaturtles.org) were presented as well as the population status, major threats and recommendations of the FAO, March 2004 Expert Consultation. Reference was made to "A Strategy to conserve and manage the sea turtle resources of the Western Indian Ocean Region" (Mortimer, 2002) and "Proceedings of the Western Indian Ocean Marine Turtle Conservation Workshop, Mombasa, Kenya" (Okemwa *et al.,* 2004). The green and hawksbill turtles pose the greatest concern, particularly around the island states of the Western Indian Ocean and East Africa. Coastal fisheries are believed to represent a major threat for both species (FAO, 2004). A summary, by country, of proposed actions to reduce fishery-related mortality, reflected in the documents above, is attached (Appendix G: Table 1).

17. In the discussion that followed it was noted that harvest and use of sea turtles have an important cultural role and symbolic value in the lives of the people of the Mosquito coast of eastern Central America and the Torres Strait, Australia. The primary characteristic of a true cultural role was that turtles or parts of turtles are not traded but shared at important cultural occasions such as birth, rites of passage, and death in the community. The question of whether there were traditional fisheries for turtles in the South West Indian Ocean since turtles had been harvested in some parts of the region for hundreds of years, was discussed but not resolved. The strong cultural association mentioned in the two examples from elsewhere was not evident in the region. It was noted however that, irrespective of whether there is a tradition of harvesting, the degree of dependence of a community on turtles as a source of food security or income was an important factor to consider with respect to the approach taken towards conservation and management.

[3] Funded by the Japanese Government.

18. Several participants reported that capture and retention of turtles was illegal in their countries but that this regulation was difficult to enforce in more remote regions. Within the region, eggs and meat are consumed and turtle products used as medicines in some areas.

19. On the use of circle hooks and turtle excluder devices (TEDs) as means to reduce the bycatch of turtles, the observation was made that generic methods needed to be treated with caution. In long-lining, there is considerable variability between areas in the size of hooks, depth fished and bait used in order to avoid turtle bycatch and still catch the target species effectively. It was therefore necessary to test and identify the best hook size and fishing strategy for the particular area. Similarly in shrimp fisheries, the size, the type and the installation of TEDs also depends on the fishing area.

COUNTRY CONTRIBUTIONS ON SEA TURTLE CONSERVATION STATUS

20. This part of the workshop aimed to assist in a review of information available on sea turtle conservation status and fishery related mortality and identify priority actions required in the region. Country reviews were presented by participants from Kenya, Madagascar, Mauritius, Seychelles, Somalia, South Africa and United Republic of Tanzania. The country reviews are in Appendix 5. A summary overview of the country contributions is in Appendix 7: Table 2.

THE USE OF TEDs IN THE SHRIMP TRAWLING COUNTRIES OF THE REGION

21. Mr Thomas Moth-Poulsen, FAO, reviewed regional experience in the use of TEDs discussed at bycatch component of the workshop, in the previous week.

22. Kenya legislated for the mandatory use of TEDs in the shrimp trawl fishery in 2001. However, implementation is not yet effective because of lack of surveillance and inadequate penalties.

23. Tanzania has a record of research and of data collection on turtle mortality. Action plans for Zanzibar and mainland Tanzania (1999) have provided mandatory use of TEDs in the shrimp trawl fishery, but the legislation is yet to be put in place.

24. Mozambique legislated for the mandatory use of TEDs in 2004 for trawlers >10m (semi-industrial and industrial). The law was not implemented as industry claimed unacceptable shrimp loss when deploying the TEDs. Seasonal large catches of jellyfish, may provide an incentive to adapt the use of TEDs in order to exclude the jellyfish. A deadline of January 2006 has been set for implementation of TEDs.

25. South Africa has a small shrimp trawl fishery with eight licensed boats operating off Durban. They do not use TEDs but some success has been obtained with the use of TED like grids to exclude large sharks and rays.

26. Madagascar made the use of TEDs mandatory this year apparently with a 100 percent compliance in the industrial shrimp trawler fleet. The industry has played a major role in the development and introduction of TEDs. Starting in 1999, a company experimented with TEDs in order to obtain certification for an environmental friendly

fishery. Madagascar developed a TED tailored for their particular fishery, and is seeking US approval for this design. IFREMER helped in the optimization of the TED rigging with tests in their Boulogne flume tank. Even with much goodwill and the expertise of industry and IFREMER, it took 6 years to develop a model that was accepted by the industry. The Madagascar experience showed that legislation on its own was not enough to implement the use of TEDs by industry. For successful implementation, the industry needs encouragement and guidance in use of TEDs in a way that minimizes shrimp loss.

27. It was not that many of the countries in Africa that have mandated the use of TEDs lack funds and mechanisms to monitor and enforce their use at sea. Trawlers may have the TEDs mounted in port, but the TEDs are not used on the fishing grounds. Monitoring at sea with full observer coverage is very expensive and cannot be afforded by most states.

28. TEDs are simple devices but their proper use is complex and they are difficult to rig correctly. The industry often encounters difficulties at first. Shrimp loss when using TEDs that are not optimally rigged can easily reach 50 percent, thus undermining their acceptance or the economic sustainability of the fishery.

29. The workshop was informed that FAO would be assisting Nigeria through a TED rigging workshop at a Danish flume tank in February 2006. At the workshop gear technologists and the fishing industry would jointly develop an optimal TED rigging that has minimal shrimp loss.

30. Through the current project FAO will be producing a design manual for the fishing industry with detailed descriptions and suggestions for optimal rigging of TEDs.

WHAT IS THE ECOSYSTEM APPROACH TO FISHERIES?

31. FAO resource staff provided an overview of the concept of EAF, its implications and approaches for its implementation. EAF was explicitly endorsed in the Reykjavik Declaration in 2001 and the World Summit on Sustainable Development (WSSD) Plan of Implementation encourages its application by 2010. The basic principles of the EAF are implicit in the FAO Code of Conduct for Responsible Fisheries. However, the EAF provides a framework for a broad encompassing application of these principles, as compared to a piecemeal approach.

32. The approach to EAF promoted by FAO starts with the existing knowledge and information and strives to build incrementally on the existing management approach in each case. The process should be iterative and include:

- agreeing on goals;
- identifying key ecological, socio-economic and governance issues for a given fishery or other operational unit;
- prioritizing the issues identified ;
- for priority issues, setting operational objectives, reference points and identifying suitable indicators;
- determination of suitable management rules (measures) to achieve the objectives (e.g. gear regulations, closed areas and/or seasons, effort limitations, catch limitations);
- adjustment of MCS systems to accommodate and enforce new measures;

- implementation; and
- review and revision as necessary.

33. An operational approach to implementing EAF is described in the FAO Technical Guidelines 4.2 "The ecosystem approach to fisheries" which was available to workshop participants.

CASE STUDIES

a) The Benguela ecosystem

34. The FAO Secretariat described a project being undertaken jointly by the Benguela Current Large Marine Ecosystem project, United Nations Office for Project Services (UNOPS) and FAO entitled "Ecosystem Approaches for Fisheries (EAF) Management in the BCLME". The objectives of the project are to: "investigate the feasibility of EAF management in the BCLME region through examining the existing issues, problems and needs related to EAF; and using the best available scientific and other relevant information, to evaluate different management options for achieving sustainable management of the resources at an ecosystem level".

35. The project is: reviewing the implications of existing management objectives and strategies (strengths, weaknesses, consequences); considering objectives, management measures and strategies at both the national and regional levels; the provision of scientific support and information on implementation of EAF; and some activities aimed at facilitating implementation, including cost-benefit analyses, methods of decision-making, the use of incentives, priority research and institutional requirements.

36. The project is progressing well and risk analyses have been undertaken in all countries to identify the issues related to EAF that are not being addressed within the current management strategies, prioritization of those issues and the preparation of preliminary considerations of the management responses required to address the higher priority issues. These reports will be refined, in combination with cost-benefit analyses, during the next stage in the project.

b) The Philippines

37. The FAO Consultant, Mr Patrick Christie, presented the ecosystem approach to fisheries management in the Philippines. Fish stocks in the Philippines at the time were 10 percent of what they were in the 1940s. He had looked a various definitions for EAF globally from such as from LMEs, multipurpose use zoned areas such as in the Great Barrier reef, Alaskan fisheries management and the Philippine projects that were led by Non governmental organizations (NGOs). He noted that the explanation of EAF by FAO captures the important elements well: "An ecosystem approach to fisheries strives to balance diverse societal objectives by taking account of the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions, and applying an integrated approach to fisheries within ecologically meaningful boundaries". Ecosystem based fisheries management in the Philippines was a paradigm that was encouraged by external funding partners. There was genuine interest among some government resource managers. In a situation of collapsing fish stocks, it became clear that difficult decisions on the level of fishing effort and on interactions between fisheries had to be taken whilst at the same time meeting hard ecological targets. EAF called for a scale up

of management efforts. The FAO consultant proceeded to give examples of various projects that had been undertaken and the lessons that had been learnt. Barriers may be placed on EAF if it is perceived as favouring ecosystem function over immediate societal needs and services; if there is a lack of understanding and constituency for EAF; and if institutional structures and laws are not appropriate. It is important to understand and adapt EAF to the existing national context and in relation to other management models in place. There should be demonstrable improvements in fisheries that justify costs. A system of incentives should be available to assist institutional and societal acceptance. Political will was extremely important and this should have a legislative support. Available data and research capacity are also important. He noted that often the EAF model portrayed in literature was neither sensitive to, nor presented at a scale, that resource users and policy makers operate at nationally.

COUNTRY REPORTS ON THEIR IMPLEMENTATION OF THE ECOSYSTEM APPROACH

38. At this part of the workshop programme, participants reviewed the implementations of the ecosystem approach to fisheries in their countries. Reviews were presented by participants from Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, South Africa, Tanzania and are included in Appendix F.

TRIAL IDENTIFICATION OF EAF ISSUES AND PRIORITIES

39. The FAO Secretariat described the methods used in identifying the EAF issues and for risk analysis in order to prioritize the issues. Both methods are those recommended in the FAO Technical Guidelines and are based on the "National ESD Reporting Framework for Australian Fisheries: the "How To" Guide for Wild Capture Fisheries" (www.fisheries-esd.com). The method consists of two steps. In the first, participants start from any existing high level policy goals for the fishery or ecosystem under consideration and break those down into detailed issues (problems) relevant to EAF at an operational level. They are guided in this process by the use of "hierarchical trees" which start from the three primary components of most fishery policies (ecological wellbeing, human wellbeing and the issues related to governance or the "ability to achieve") and indicate typical operational issues under each of those headings. These trees help to ensure that participants consider issues across the full range of potential problems, rather than focussing on particular aspects which may be more familiar to them.

40. In the second step, participants estimate the risk value of each issue. Risk value is defined as:

Risk value = Consequence x Likelihood

Consequence = the severity of the issue (its negative impact on attempts to achieve the objectives) if it is not satisfactorily addressed; and

Likelihood = the estimated likelihood of the issue occurring under the existing governance system.

41. Workshop participants split into three groups with each group considering one of the following SWIO fisheries:

- coastal shrimp fisheries;
- artisanal fisheries;
- purse seine fishery for tuna.

42. The exercise was done primarily for training purposes, and each fishery was considered from a regional perspective, which meant that detailed differences between countries and local areas within countries were not considered. In addition, participants at the workshop were almost entirely scientists and did not necessarily have expertise in the fishery under consideration. The results of the exercise are therefore preliminary and are presented here for illustrative purposes only and in further detail in Appendix H to this report.

43. In the trial exercise, a total of 54 issues were identified for the shrimp fisheries, 47 for the artisanal fisheries and 40 for the tuna fisheries (Figure 1). These totals are not directly comparable as the different groups worked independently and adopted different approaches. For example, the shrimp group included all the target shrimp species into a single category whereas the artisanal group listed individual species. In a real exercise, focusing on one country or one ecosystem, the degree of discrimination of species will depend on a number of factors, including individual species dominance and the capacity to identify and monitor the taxonomic composition of catches. Demonstrating the diversity of artisanal fisheries in the region, the artisanal group identified the highest number of issues for the *Retained species* category. The *Retained species* category also contained the highest number of issues within the regional artisanal fishery analysis. All three working groups identified a relatively high number of issues within the category *Governance – management* (Figure 1). The shrimp fishery identified a large number of issues within the category *Governance (Ability to achieve) – other drivers*.

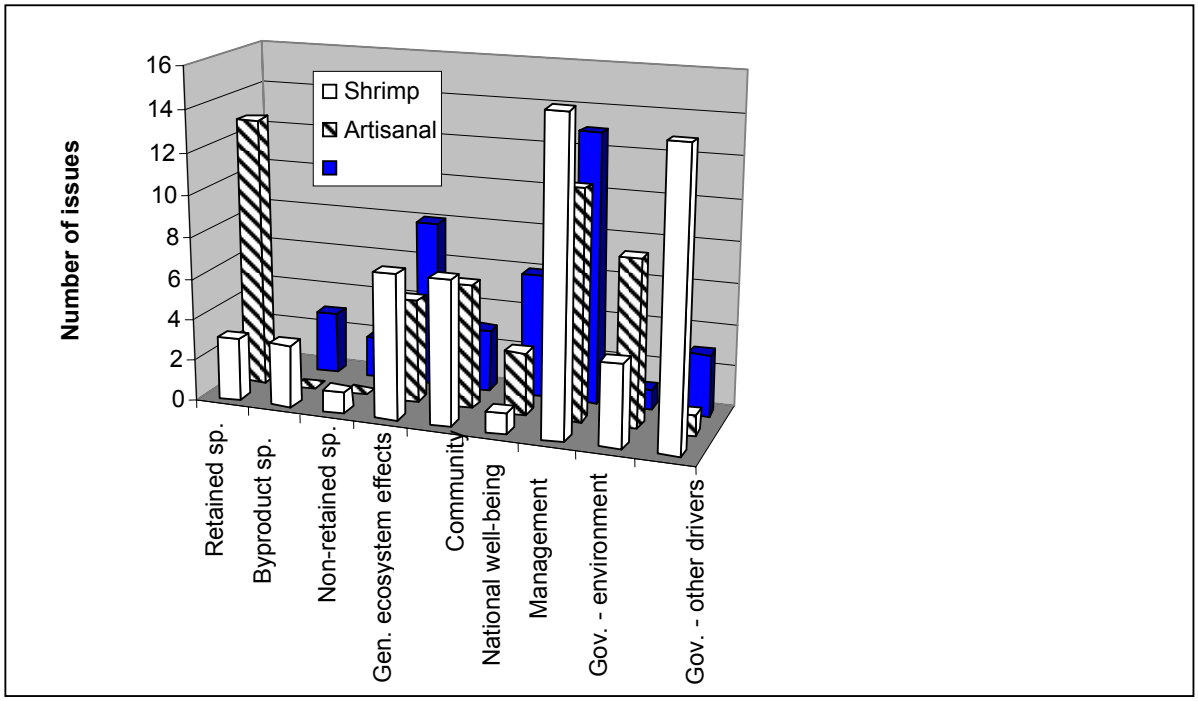

Figure 1. Number of issues by major category for the three fisheries considered at the workshop.

Shrimp fisheries

44. The working group on the shrimp fisheries of the region identified some extreme risk issues within the category *General ecosystem* (Appendix H part a). These included the landings of juvenile fish, particularly in semi-industrial trawl fisheries, the high incidence of discards and a probable disruption of the ecological balance of fishing grounds because many of the species caught, though of low value and often not consumed, play an important ecological role in the systems. The impact of trawling close to shore on spawning and feeding grounds was also considered an urgent concern. Within the category *Human well-being*, the high incidence of poverty within fishing communities was considered the most urgent issue and, amongst other problems, is leading to greater pressures on natural resources. Safety at sea was also considered an extreme risk issue. A number of serious problems affecting *Governance* were identified, including lack of or low levels of enforcement and compliance, deficiencies in policy, legislation and research and monitoring. Excess fishing effort, resulting from illegal fishing and open access fisheries were considered to be extreme risk issues, exacerbated by high population growth rates. A long list of external threats to *Governance* was identified by this group, demonstrating the problems faced by management from matters beyond their control and the need to manage fisheries within a broader context. The high prevalence of HIV/Aids was the primary external threat to the *Ability to achieve* which, apart from its devastating impact on human well-being in general, impacts the ability to utilize aquatic resources optimally and sustainably by increasing production costs and lowering the productivity of fishers. The impact of coastal erosion and siltation on the coastal shrimp fishing grounds was also listed as an extreme risk issue in the *Ability to achieve* category.

Artisanal fisheries

45. The working group on artisanal fisheries considered that the threats to some species were of very high risk, in particular to dugongs, lobster, some shark species, sea cucumbers and sea horses (Appendix H part b). As with the shrimp fishery, the catch of juveniles was also an important ecological issue. Within the category *Human well-being*, the threat to the food security of the artisanal fishing community caused by overexploitation of resources was a serious concern. It is closely linked to other extreme risk issues, those of poverty and the low technical capacity within the communities, including high levels of illiteracy. The open-access nature of the fisheries was the primary threat related to *Governance*. This working group also identified a number of external threats to the ability to manage the fisheries but none of those were ranked as of most urgent concern.

Tuna fisheries

46. The workshop recognized the mandate of Indian Ocean Tuna Commission (IOTC) for regulating tuna fisheries and also that this workshop did not include many of the experts and stakeholders who would best be able to contribute to a formal risk assessment exercise for this fishery. The analysis was performed for training purposes only. The greatest ecological risk within this fishery was considered by the working group to be the impact of the fishery on turtles, some populations of which are estimated to be declining (Appendix H part c). The impact of illegal, unreported and unregulated (IUU) fishing on resources, and associated under-reporting of catches, was an additional threat. Under the category of *Governance*, problems in the quality of data reporting and the need for improved data on bycatch were identified as extreme risk issues as were reported problems related to limited control measures undertaken by port States.

47. After identification of the issues and the assessments of risk, the three working groups prepared sample Performance Reports for some of the extreme priority issues taking examples from each of the three primary categories: *General ecosystem effects*; *Human well-being* and *Ability to achieve* (*Governance*). In a formal exercise, this would be a complex and often quite lengthy procedure, requiring examination of the best available information, possibly scientific analyses, and consultation with the different stakeholders. This was not possible within the constraints of the workshop. The Performance Reports have therefore not been included in this report but some examples, selected to demonstrate the nature and application of the performance reports, are included in Appendix I**.**

OBSTACLES TO IMPLEMENTING EAF IN THE SWIOFC REGION

48. Following the development and review of lists of issues and their prioritization, the workshop considered the obstacles that could be anticipated in the implementation of EAF in the region. There was widespread agreement that the process presented at the workshop had been very useful and that if applied formally and thoroughly at national and regional level it could contribute to progress towards achieving sustainable fisheries.

49. As to implementation, it was recognized that reaching agreement between the different stakeholders on common objectives would be a significant problem. This could be expected within countries, between different stakeholders and between countries, where there are differing capacities, priorities and management approaches. Fishery bodies such as SWIOFC and IOTC have a critical role to play at the regional level.

50. A participant pointed out that countries had differing amounts and quality of data and that more should be done in the region to obtain and use relevant data. However, absence of good data should not be an excuse to postpone decision and fisheries management should take action on the basis of the best available information. It was suggested that there was a need to develop a regional apex for collation of data. Another participant stressed the importance for biologists not to be afraid to give advice when required while also pointing out the potential implications of uncertainty. It was noted that stakeholders often try to use uncertainty to promote their own objectives and that scientific advice is essential and should be objective and unbiased.

51. The FAO consultant suggested the collection of data for conventional management can sometimes be very time consuming and impractical. Local fishers may have information on the species of interest, their distribution and biology that can exceed or complement what is available in the form conventional scientific knowledge. Procedures exist to check the quality of local knowledge. Capture of reliable local knowledge and information should be used as much as possible.

52. Concern was expressed that insufficient political will exists for progress on EAF. For example in many or most cases there are suitable policies and laws at national and regional levels but these often cannot be enforced. There is a need for a regional monitoring and enforcement system to address IUU fishing in the region. The Commission de l'océan Indien (COI) is looking at this issue for francophone countries and considering extending it to other countries in the future.

53. There was agreement on the critical importance of involving communities in initiatives to implement EAF and sustainable fisheries. For example, fishers and

communities sometimes do not report catches of dugong and sea turtles because they know it is illegal, but they nevertheless catch and eat them. In order to address this there is a need to work more closely with them and also to increase their awareness of relevant fishery management and conservation issues.

THE WAY FORWARD

54. This section summarizes the way forward suggested from the discussions throughout the week of the second component of the workshop.

Priority regional actions to assess or reduce sea turtle mortality due to fisheries

55. Discussions highlighted that it was very important to have information on the various causes of sea turtle mortality (such as predation, habitat destruction, hatchling success, coastal development etc.) at different stages of their life history. It was also noted that recent development in dynamic modelling of the turtle populations can use such data for robust assessments of the impact of different sources of mortality on turtle populations.

56. The workshop also recognized that action should be taken to reduce sea turtle mortality even in the absence of robust estimates of turtle stocks in the region.

57. Initiatives that could be undertaken within the framework of the project "Interactions between sea turtles and fisheries within an ecosystem approach to fisheries Management" were identified. Two regional workshops should be organized. The first would aim at collating available data and information on sea turtle occurrence and mortality, by major source, in the region. An attempt would be made to quantify the relative importance of various sources of mortality, including the fishery-related mortality through some preliminary modelling of the existing situation. Recommendations on management measures to reduce fishery-related sea turtle mortality, where relevant, would result from the first workshop. The second workshop would present the results to a meeting of managers and representatives of industry and of fisher associations. This workshop would also offer the opportunity for managers and industry to exchange views and experiences in implementing sea turtle by catch reduction measures. The experience gained by Madagascar in implementing TEDs would be of particular relevance.

58. The workshop identified Zanzibar as the venue for the first workshop (April 2006) and contact persons were identified to develop the objective and programme for the workshop and to make sure that relevant partners (e.g. NGOs) were involved.

Ecosystem approach to fisheries management

59. The risk assessment for sustainable fisheries (RASF) approach should be applied at both regional level and at national level in one or two "case studies" in order to facilitate the implementation of EAF in the region. An advantage of addressing it at national level is that since many issues and resources are national and it will be possible to explore them in greater detail.

60. The FAO Secretariat informed the workshop the SWIOFC Scientific Committee (SC) provides advice to the SWIO Commission and that meets at least 3 months before the Commission meeting. The report from this workshop would be sent to the Scientific Committee, in April 2006, which will make recommendations to the Commission. A

review of fisheries management across SWIO presented to the previous Commission meeting included a recommendation for the Commission to address EAF.

61. A participant from Kenya, referred to Lake Victoria and the East African Commission, and enquired whether SWIOFC could develop a protocol to apply EAF, as a binding instrument. The protocol could include data collection and dissemination. The FAO Secretariat responded that this would not be appropriate as SWIOFC is an advisory Commission. It is a matter that could be taken up over the longer term, with the agreement of the Commission members

62. The urgency of resolving the problems of IUU fishing in the region was raised and it was suggested that there needs to be agreement on a regional strategy to address this as soon as possible.

REFERENCES

FAO. 2004. Report of the Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context. Rome, Italy, 9-12 March 2004. *FAO Fisheries Report*. No. 738. Rome, FAO. 37p.

FAO. 2005. Report of the Technical Consultation on Sea Turtles Conservation and Fisheries. Bangkok, Thailand, 29 November–2 December 2004. *FAO Fisheries Report*. No. 765. Rome, FAO. 31p.

FAO Fisheries Department. 2003. The ecosystem approach to fisheries. *FAO Technical Guidelines for Responsible Fisheries*. No. 4, Suppl. 2. Rome, FAO. 112 p.

Mortimer, J.A. 2002. A strategy to conserve and manage the sea turtle resources of the western Indian Ocean region. Report for IUCN, WWF and the Ocean Conservancy.

Okemwa, G.M., Muthiga, N. A., Mueni, E.M. (eds). (9 November 2005). Proceedings of the Western Indian Ocean marine turtle workshop, Mombasa, Kenya, September. IOSEATurtles. The workshop was organized by KWS and KESCOM. 16-17 2004

APPENDIX A

Agenda
Implementing an ecosystem approach to fisheries

Opening

Interactions between sea turtles and fisheries and FAO's related activities

Review of sea turtles distribution, critical habitats, main sources of natural and man-induced mortality, and conservation efforts

Country contributions on sea turtle conservation status

The use of TEDs in the shrimp trawling countries of the region

What is the ecosystem approach to fisheries?

Case studies:
- The Benguela ecosystem
- The Philippines

Country reports on their implementation of the ecosystem approach

Trial identification of EAF issues and priorities

Obstacles to implementing EAF in the SWIOFC region

The way forward:
- Priority regional actions to assess or reduce sea turtle mortality due to fisheries
- Ecosystem approach to fisheries management

APPENDIX B

List of participants

KENYA

KIMAKWA Edward
Fisheries Officer
Fisheries Department
PO Box 58187
Nairobi, Kenya
Tel.: (254) 20374234
E-mail: kimakwa2001@yahoo.com

Ms MWAKA Barabara
Fisheries Officer
Fisheries Department
PO Box 90423
Mombasa, Kenya
Tel.: (254) 0412315904
E-mail: barabaraside@yahoo.co.uk

MWATHA Gerard
Fisheries Scientist
Kenya Marine & Fisheries
Research Institute
PO Box 81651
Mombasa, Kenya
Tel.: (254) 41475157
E-mail: gmwatha@kmfri.co.ke

Ms SHILAHO Evelyne
Fisheries Officer
Fisheries Department
PO Box 58187
Nairobi, Kenya
Tel.: (254) 203742349/20
E-mail: eshilaho@yahoo.com

MADAGASCAR

Ms ANDRIAMISEZA Olga
Chief of Service
Fisheries Department
BP 1699
Madagascar
Tel.: (261) 202252460
E-mail: olgamiseza@yahoo.fr

RAHERILALA Harija
Seaman (Captain)
Fisheries
Madagascar
Tel.: (261) 206223285

RANDRIAMBOLA Tiana
Chief of Service
Fisheries Dept. Surveillance
PO Box 60114
Antananarivo, Madagascar
Fax: (261) 2049014
Tel.: (261) 320703954
E-mail: csp-soc@blueline.mg

XAVIER Vincent
Project Coordinator
GAPCM–Groupement des aquaculteurs et pêcheurs de crevettes de Madagascar
Villa Lot Valobe Tsiadana
Antananarivo, Madagascar
Fax: (261) 202232184
Tel.: (261) 202262829
E-mail: gapcm.co@netclub.mg

MAURITIUS

BEEHARRY Sunil
Scientific Officer
Ministry of Agro Industry & Fisheries
Belle Vue Cugnet, Colodine
Grand Gaube, Mauritius
Fax: (230) 2133222
Tel.: (230) 2821457

DHUNNOO Sunil
Technical Officer
Albian Fisheries Research Centre
Scool Lane Camp de Masque Pavê
Mauritius
Tel.: (230) 4165618
E-mail: gurudutt@yahoo.com

MOZAMBIQUE

Ms ABDULA Sílvia
Biologist
Fisheries Research Institute
PO Box 4603
389, Mao Tse-Tung av.
Mozambique
Fax: (258) 21492121
Tel.: (258) 21490536
E-mail: silvia@moziip.org

BJORDAL Åsmund
Senior Adviser
Fisheries Research Institute
PO Box 4603
389, Mao Tse-Tung av.
Mozambique
Fax: (258) 21492112
Tel.: (258) 824101417
E-mail: aasmund@imr.no

Ms CHAÚCA Isabel
Technical Officer
Fisheries Research Institute
PO Box 4603
389, Mao Tse-Tung av.
Mozambique
Fax: (258) 21490307
Tel.: (258) 824753950
E-mail: ichauca@moziip

FAIFE Jorge
Technical Officer
IDPPE
PO Box 2473
Marginal av. Parcela 141/8
Maputo, Mozambique
Tel. : (258) 21490807
E-mail: jfaife@idppe.org

LOPES Simeão
Director
IDPPE
Parcela141/8 Marginal av.
Maputo, Mozambique
Fax. : (258) 21496664
Tel. : (258)21490807
E-mail: slopes@idppe.org

Ms JAMISSE Açucena
Technical Officer
IDPPE
PO Box 2473
Marginal av. Parcela 141/8
Maputo, Mozambique
Tel.: (258) 822691810

Ms MASQUINE Zainabo
Fisheries Research Institute
PO Box 4603
389, Mao Tse-Tung av.
Mozambique
Fax: (258) 21492112
Tel. : (258) 21490536
E-mail: zainabo@moziip.org

SÁ J. Russo de
Director
Fisheries Research Institute
PO Box 4603
389, Mao Tse-Tung av.
Mozambique
Fax: (258) 21492112
Tel.: (258) 21490406
E-mail: russo@moziip.org

Ms SOUSA Maria Lizette de
Head of Department
PO Box 4603
389, Mao Tse-Tung av.
Mozambique
Fax: (258) 21492112
Tel.: (258) 21490536
E-mail: lsousa@moiip.org

SEYCHELLES

AZEMIA Roland
Fisheries Biologist
Seychelles Fishing Authority
PO Box 449
Beau Belle, Mahe Seychelles
Fax: (248) 224508
Tel.: (248) 670343
E-mail: razemia@sfa.sc

CEDRAS Allen
Senior Park Officer
Seychelles Centre for
Marine Research(CR)
Marine Parks Authority
PO Box 1240
Victoria, Seychelles
Fax: (248) 224388
Tel.: (248) 225114/517221
E-mail: a.cedras@scmrt-mpa.sc

SOUTH AFRICA

BROKER Rob
Fishery Control Officer
EKZN Wildlife/ Marine and Coastal
Management
3 Elton Place Congella
Durban
Fax: (27) 0312741174
Tel.: (27) 0312741150
E-mail: brokerr@kznwildlife.com

FENNESSY Sean
Senior Scientist
Oceanographic Research Institute
PO Box 10712
Marine Parade 4056
South Africa
Fax: (27) 313288173
Tel.: (27) 313288188
E-mail: seanf@ori.org.za

NENE Benedict
District Conservation Officer
Ezemvelo KZN Wildlife
3 Elton Place, Congella 4013
Durban, South Africa
Fax: (27) 312741174
Tel.: (27) 312741150
E-mail: brokerr@kznwildlife.com

SOMALIA

SABRIYE Ali Salad
Fishery Expert
Ministry of Fisheries
Tel.: (252) 1594583
E-mail: ali-sabriye@yahoo.com

UNITED REPUBLIC OF TANZANIA

Ms KUBOJA Bigeyo
Research Officer
Tanzania Fisheies Research Institute
PO Box 9750
Dar-Es-Salam, Tanzania
Tel.: (2585) 787504415
E-mail: lebige2001@yahoo.com

MATOLA Hakimu
Research Oficer
Tanzania Fisheries Research Institute
PO Box 9750
Dar-Es-Salam, Tanzania
Tel: (255) 773061205
E-mail: matolakim@yahoo.com

MAKAME Nassor
Principal Fisheries Officer
Dept. Of Fisheries &
Marine Resources
PO Box 774
Zanzibar, Tanzania
Tel.: (255) 74741030
E-mail: wwfmenai@zitec.org

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

HARRIS Aubrey
Secretary SWIOFC
FAO Subregional Office for Southern
and East Africa
PO Box 3130
Harare, Zimbabwe
Tel. : (263) 4253655/51
E-mail: aubrey.harris@fao.org

COCHRANE Kevern
Senior Fishery Resources Officer
FAO
Viale delle Terme di Caracalle
00153 Rome
Italy
Tel. : (39) 0657056109
E-mail: kevern.cochrane@fao.org

THIELE Wilfried
Senior Fishery Industry Officer
FAO
Viale delle Terme di Caracalle
00153 Rome
Italy
Tel. : (39) 0657055836
E-mail: wilfried-thiele@fao.org

Ms BIANCHI Gabriella
Fishery Resources Officer
FAO
Viale delle Terme di Caracalle
00153 Rome
Italy
Tel. : (39) 0657053094
E-mail: gabriella.bianchi@fao.org

MOTH-POULSEN Thomas
Fishery Industry Officer
FAO
Viale delle Terme di Caracalle
00153 Rome
Italy
Tel. : (39) 0657055034
E-mail: thomas.mothpoulsen@fao.org

TEUTSCHER Frans
FAO (Retired)
Via Ragoli 61
00124 Rome
Italy
Tel.: (39) 065090178
E-mail: md1186@mclink.it

CHRISTIE Patrick
Assistant Professor
School of Marine Affairs
University of Washington
3707 Brooklyn Ave
NE Seattle, WA 98105-6715
United States of America
Fax: 1 206-543-1417
Tel.: 1 206-685-6661
E-mail: patrickc@u.washington.edu

OGBONNA James
Assistant Director
Ministry of Agriculture
FMA & RD Area II
135 Garki Abuta
Nigeria
Fax: (09) 3144665
Tel.: (09) 3144663
E-mail: jamescogbonna@yahoo.com

APPENDIX C

Opening address by Mr Rodrigues Bila, Permanent Secretary, Ministry of Fisheries, Mozambique, and Chairperson of the South West Indian Ocean Fisheries Commission

The Director of IIP,
FAO Technical Officers,
Workshop participants,
Ladies and Gentlemen,

Welcome to Maputo and welcome to the workshop on bycatch and on the ecosystem approach to fisheries. Bycatch especially of shrimp fisheries is a matter that we continue to address in Mozambique, as one of the countries, together with Madagascar, with the largest shrimp fisheries in the region.

This is the first workshop held under the framework of the South West Indian Ocean Fisheries Commission. The Commission was established last year and had its first session in April this year. During the session in April, a review was undertaken of the regional management of fisheries which among other things noted that increasingly an ecosystem approach should be taken.

It is in this context that, today, I have the pleasure to officiate at this workshop in the capacity of Chairman of the Commission. The workshop will provide an opportunity to update on the progress made on reducing and utilizing bycatch by the different countries as well as to experience first hand bycatch reduction devices that have worked in other regions. It will also allow us to have a better understanding of the ecosystem approach to fisheries management, what major areas may have to be addressed, and how it could be put into action. Some of your discussion here will likely find its way to the Scientific Committee in April next year and to the Commission meeting in August 2006.

I wish all participants useful and important exchanges of information and views during the workshop and trust that it will assist you make important contributions to the management of fisheries in your countries.

I now declare the workshop open

APPENDIX D

Welcome address by Mr Peter Vandor, FAO Representative in Mozambique

The Principal Secretary, Ministry of Fisheries
The Director of IIP
Participants, Ladies and Gentlemen

On behalf of the FAO, it is my pleasure to welcome participants from some 8 southwest Indian Ocean countries to this regional workshop on bycatch and the ecosystem approach to fisheries management.

Bycatch, particularly when fishing for shrimp, is a significant feature of the fisheries of Mozambique, Madagascar, Tanzania, South Africa and Kenya. In other countries, bycatch features to a lesser extent in their fisheries.

Shrimps necessarily have to be caught by trawling with nets of small mesh sizes. Shrimp fishing grounds are usually in shallow waters that can also be the spawning or nursery grounds of other fishes.

Shrimp trawling therefore catches large amounts of fish as well as shrimp. This can seriously affect other fisheries that target these fish species. Many juvenile fish as well as other animals may be needlessly killed and discarded at sea. Shrimp trawling can also have a physical impact on the sea-bottom and in some areas this may affect the benthic biodiversity. Also, the incidental catch of protected animals such as sea turtles may represent a threat to their populations that is unacceptable to many consumers or overseas export markets. We are thus all aware of a growing pressure for commercial fisheries to improve their practices and reduce the impact of trawling.

FAO has a priority entity of its regular fisheries programme to reduce the environmental impact of tropical shrimp trawling through the introduction of bycatch-reduction technologies and change of management. Under this programme, FAO's activities and projects have have demonstrated these technologies and supported some countries in the development of the necessary legal framework. Many of these findings are relevant to this region and will be presented at the workshop. This workshop will also take into consideration that poverty and the food security of coastal communities are critically important issues that have to be continually addressed in this region. Initiatives to use bycatch for food and to reduce conflicts that can arise from discarding of dead fish, will also be examined. Towards the end of the week, participants will have practical, at-sea experience of some of the recent available bycatch-reduction technologies.

Next week, the workshop will move into the broader area of the ecosystem approach to fisheries management which is totally compatible with the FAO Code of Conduct for Responsible Fisheries and has been emphasized in several key international conferences, such as that in Reykjavik, Iceland, a couple of years ago. The approach of the FAO to ecosystem management of fisheries is an evolutionary one that builds on and extends traditional fisheries management practices so that they also address the broader, critical impacts of the fisheries on the ecosystem, as well as of the ecosystem on the fisheries. The week will start with a mini-workshop focused on the effect of fishing on the turtle populations of this region. By the end of the workshop, participants should have a much better understanding of ecosystem-based

approaches, its relevance, and ways that it could be implemented in the fisheries management action in the South West Indian Ocean region.

Mr Bila, Principal Secretary, it is fitting that this workshop is held in Mozambique. Between 8 000 and 10 000 tonnes of shrimp are caught in Mozambique each year representing well over US$100 million of export revenue. In addition, Mozambique currently chairs the South West Indian Ocean Fisheries Commission and has the stewardship of the Commission in its earliest and critical years. With the wise leadership and direction of your country, Mr Principal Secretary, FAO looks forward to a Commission that grows with the strong support of its members, and by ensuring sustainable fisheries, benefit the region and its people for many years to come.

Finally, I wish participants an enjoyable and rewarding workshop.

APPENDIX E

Country reports on sea turtle conservation status

Kenya

Mr Gerald Mwatha presented the status and conservation of sea turtles of Kenya on behalf of Ms Gladys Okemwa of the Kenya Marine and Fisheries Research Institute who is also the Vice Chair- Kenya Sea Turtle Conservation Committee.

Kenya hosts five of the seven species of sea turtles known to occur in the world. Of these three (the green, hawksbill and green turtles) nest in Kenya (with green turtle nests comprising 94percent of nestings sighted), while documented literature suggest that leatherbacks and the loggerheads use Kenya's waters as foraging grounds. Estimates of the population abundance have indicated 200–300 nesting turtles and a more abundant foraging population of about 500–700 turtles.

Being a signatory to a number of international instruments related to the conservation of sea turtles, Kenya is committed to promoting the conservation of these endangered species. Towards this goal, the Kenya Sea Turtle Conservation Committee (KESCOM), established in 1993, coordinates sea turtle conservation activities along the Kenya coast using an integrated approach which incorporates global conservation objectives within the framework of the Convention of Migratory Species focusing on four key areas: (1) development and implementation of research and monitoring programmes (2) development and implementation of targeted awareness programs (3) capacity building of turtle conservation groups and local communities (4) networking with governmental and non governmental conservation partners at national, regional and international level. KESCOM partners with the Kenya Wildlife Services (KWS), Kenya Marine and Fisheries Research Institute (KMFRI) and the Fisheries Department and various nongovernmental organizations provide technical support towards meeting the goal of conserving sea turtles in Kenya.

Initial tagging research has confirmed movement of turtles between Mayotte, Seychelles, Tanzania, South Africa and Kenya. During migration, sea turtles encounter a gauntlet of fishing fleets on both the high seas and coastal waters, interacting with pelagic long-line gear on the high seas, and seine nets, gillnets, hand lines and shrimp trawl gears in coastal waters. These interactions can lead to death, most frequently through drowning, after becoming hooked or entangled in the fishing gear.

Mortality related to fishing activities is possibly the most important threat to the conservation of sea turtle populations in Kenya. Data collected by KESCOM's Turtle Conservation Groups (TCGs) indicates that 85 percent of turtles incidentally captured in artisanal and shrimp trawling fisheries are either slaughtered for local consumption or traded. The national monitoring program estimates that 10 percent (in areas with efficient monitoring programs) to over 50 percent (in areas with none or inadequate monitoring programs) of nesting females and nests are poached annually. Other threats include the degradation of nesting habitats through the upsurge in coastal developments and construction of seawalls. The survival of the turtle population in Kenya is thus critically jeopardized.

Mitigation of fisheries impacts on sea turtles could be much more effective if knowledge gaps were addressed. During the Western Indian Ocean Sea Turtle Workshop held

2004, it was observed that although there are ongoing local and/or national sea turtle research and monitoring initiatives, there is a general lack of detailed information on the magnitude of fisheries/sea turtle interactions. The need for quality research on issues relating to bycatch and utilization of sea turtles and the need to build capacity for sea turtle conservation and management in the region was identified. The workshop learnt that there had also been a study of the bycatch from shrimp trawling which had been reported in the last bycatch workshop in Mombasa, 2003. There was need to follow up this work with further monitoring to ascertain the performance and use of TEDs in areas close to the nesting beaches.

Madagascar

Four of the five species of sea turtles are found in Madagascar. The green turtle is the main and most commonly found species. Numerous small islands around Madagascar coastline are the nesting sites for these turtles.

The main sources of mortality in small scales fisheries is capture in gill nets, and hunting with spears. There is a lack of data on these catches but the practice is substantiated from the presence of numerous carcasses and bone remains in fishing villages. Turtles caught for their meat and eggs, are shared in the village or sold in the market place. The largest and smallest turtles are also used as ornaments.

The Marine Institute (IH-SM) based in Toliara monitors the status of sea turtles in Madagascar and also promotes their protection.

Shrimp trawl fisheries have a conservation program that was presented in the earlier part of the workshop on bycatch. This program includes measures to reducing fishing effort as well as to reduce bycatch. Turtles are considered as an “undesired” bycatch in this fishery. Data collection is aimed at evaluating the impact of the fishery and to develop improved management measures. Activities include:

– Monitoring of turtle bycatch by observers programs as part of Monitoring Control and Surveillance activity undertaken by (CSP), by scientific observers managed by PNRC (National Shrimp Research Program) and by volunteer crew on the fishing vessels. These aim to provide a set of basic indicators by area and season, for the responsible management of the sector. The programs also collect information on the nature of fishing operations, catch rates, distribution and other biometrics of sea turtles that can be used to cross-validate information collected by some of the fishing companies.

– Tagging of sea turtles takes place on some fishing vessels using titanium tags. This is a collaboration with WWF who will undertake collation of the information. Research and other information available to environmental NGOs will be used to validate these data.

– Mapping of the trawl grounds and fishing activity using VMS. This will provide an information database to facilitate discussion and implementation of Marine Protected Areas.

As TEDs are implemented for the industrial fleet (up to 69 vessels) on the west coast, the monitoring and tagging programs will not be providing more results. For the five vessels

operating on the east coast research is continuing for identifying an operational TED system. Alternatively, specific management measures may be proposed, also for artisanal vessels.

Catch data provided by the fishermen should be, in the near future, crosschecked with the data provided by the surveillance (CSP) observers to increase reliability before being used for scientific purposes.

Mauritius

The important nesting ground of marine turtles is situated at about 430 km from Mauritius Island on the Chagos Carajos Shoal commonly known as St. Brandon located on the Mauritius-Seychelles ridge. St Brandon comprises 28 islets which are mostly sandy cays. The islets are protected by a belt of coral reef on the east coast and calm lagoon on the western side. St. Brandon is one of the few marine areas which is still in pristine conditions. Only one of the islets known as Raphael is inhabited. The National Coast Guard (NCG) and the Meteorological Services each has a station on the islet. One private company has lease over a few of the islets and has been exploiting the inshore resources since 1901. The company has self imposed quota to exploit fishery resources at a sustainable level and cooperates on the protection and conservation of turtles and birds nesting the islets.

The main species visiting the islets for nesting are the hawksbill, the green and the loggerhead turtles. Nesting is frequent in the summer months from October to March. Assessment of the number of turtles calling on the islets has not been carried out due to the distance of the islets from the main island and the difficulty of access the islets.

It is believed that mortality due to fishing in the waters of St. Brandon may be negligible as the only authorized fishing gears are handline and basket trap. However, longliners and purse seiners operating in the EEZ may be incidentally catching turtles. No record is available on any bycatch from these vessels. Logbooks from the vessels make no mention of the bycatch of sea turtles.

Poaching used to be a major threat to turtles in the recent past. Fishermen and beach hawkers used to catch them to transform the shells into ornaments and even stuff the animal as wall decorations. However, poaching is now under control due to the presence of NCG officers in St. Brandon and the strict monitoring of fishing boats operating in St. Brandon.

The Integrated Coastal Zone Management Committee under the Ministry of Environment set up under the legal framework on the Environment Protection Act makes recommendations on the management and protection of the coastal zones and Marine Protected Areas (MPAs). The Ministry of Fisheries is responsible for the monitoring of the MPAs. A few sites have been identified for the designation of MPAs in St. Brandon and the implementation is expected by 2006.

Sensitization programmes are ongoing on fisheries-related matters which includes turtles.

A blueprint on St. Brandon was prepared in consultation with various Ministries and Departments, private operators and NGOs. Some of the recommendations included:

– no major development and infrastructures should be allowed at St. Brandon;

– a proposed ecotourism project should not be approved;
– assessment of the turtle population should be carried out;
– MPAs should be established.

There is also a need to assess the impact of industrial fishery, foreign longliners and purse seiners on the turtle population as well as natural mortality, in respect of eggs and juveniles due to birds and fish.

Seychelles

The sea turtles are listed as an endangered species by the International Union for the Conservation for Nature and Natural Resources (IUCN). The history of turtle legislation in Seychelles provides a very interesting case study and perhaps an example for other countries. Over many decades, several management programs have been implemented that were intended to limit the level of intentional harvest. Finally, however, the Seychelles decided there was a need to provide complete legal protection of all sea turtles through the Wild Animals (Turtles) regulations (1994).

Occurrence of sea turtles

Five species of sea turtles are found in the Seychelles archipelago, the loggerhead, olive ridley green, hawksbill and leatherback turtles, but only the hawksbill and green turtles nest in the Seychelles. Both nest all year round but hawksbills have a peak period of nesting from October to February and characteristically nest during the day.

Population trends

Green turtle nesting populations are increasing on Aldabra Atoll but are probably decreasing or stable elsewhere in the country. Hawksbill turtle nesting populations are increasing on several small islands (Aride, Bird, Cousin, Cousine, Curieuse), are probably stable or decreasing on most of the outlying islands (such as of the Admirantes Plateau and islands to the north east of Madagascar), and definitely decreasing on the main granitic islands of Mahe, Praslin, and La Digue.

Presence of sea turtle habitats

There are approximately 500 to 800 hawksbill nesting sites on the inner granitic islands of Praslin, La Digue, Cousin, Aride, Silhoutte, Curieuse, Ste Anne with a few sites on the southern part of Mahe. There are more than 800 green turtle nesting sites on the outer coralline islands (such as Aldabra, Cosmoledo, Assumption, and the Amirantes groups).

Main sources of mortality.

Poaching occurs at all the sites although most of the Marine Protected Areas are patrolled by Parks Rangers. The most vulnerable sites are those located adjacent to the most densely population coastline of the main island Mahe.

Egg clutch mortality is relatively high in some areas due to:

• ghost crab predation inside nests;
• turtles digging up each other's nests in densely nested areas;
• cats and dogs can damage nest (cats still an issue on Aldabra):
• natural predators such as birds, fish and sharks;
• erosion of beaches;
• coastal development.

Traditional use of sea turtles

Seychellois consider the meat a delicacy but its consumption is now illegal. Traditionally green turtles were harvested for meat and sold on the local market. Green turtle calipee was exported in large quantities to Europe prior to 1968. Egg consumption is of minor importance.

Historically (1700 to 1994) important export revenue was derived from export of raw hawksbill turtle shell. A local curio industry also worked the carapace shields into bracelets and various ornaments (picture frames, butterflies etc) for sale to tourists. Large numbers of hawksbill turtles were stuffed and sold to tourists and local resident as wall hangings. A few cases of attempted international trade have been reported since enactment of legislation in 1994.

Marine turtles are culturally/traditionally significant. Seychellois value marine turtles as a symbol of their culture.

Mortality due to fisheries

Fishing gear known to cause sea significant turtle mortality, such as demersal trawls, dredges and driftnets, are prohibited in Seychelles. Gillnets for sharks have been banned and night fishing with nets is not allowed. Longlining by foreign licensed vessels is the main source of sea turtle mortality. For the industrial fisheries, several voluntary modifications or changes to gear types have been implemented in an effort to reduce bycatch of turtles. The long-line fishery is slowly shifting from the use of "J" hooks to circular hooks, which are less likely to catch turtles. The purse seine fleet has started to modify the design of FADs. Traditionally, most FADs are made of a bamboo raft covered with a piece of netting, on which turtles are often caught. A new design, which is being tested, consists of a device (200 l plastic drum) that stays a couple of metres under the surface, preventing turtles from climbing on top and getting caught.

Existing sea turtle conservation programmes

The Seychelles Government formally established Nature Reserves at the following sites and these are managed by organizations indicated:

- Aldabra by a parastatal, the Seychelles Islands Foundation (SIF).
- Aride by the NGO, Island Conservation Society (ICS).
- Cousin by the NGO, Nature Seychelles (NS).
- Curieuse and Ste Anne Marine Parks by the parastatal, Marine Parks Authority (MPA).

All the above sites also have turtle monitoring programmes.

There are private sector programmes on privately-owned islands (e.g. Bird, Cousin, Denise, Fregate, Grand Soeur) and by hotels adjacent to beaches (eg. Banyan Tree, Mahe; Lemuria, Praslin etc.). Seychellois can participate in the Turtle Monitoring and Stranding network by telephoning the Ministry of Environment's "Green" environmental hotline. Several NGOs take responsibility for wider monitoring programmes and conservation activities in the form of wildlife school classes; the Marine Conservation Society of Seychelles (MCSS) is funded by the British High Commission to assist turtle stakeholders produce a centralized turtle database and strategic action plan for Seychelles.

Public awareness campaigns

There are public awareness campaigns during hawksbill turtle nesting season. "Spot on" is a radio/television programme of the Seychelles Broadcasting Co-operation that informs listeners on the general threats to turtles. The TV, radio and newspapers reports on poaching incidents usually with a commentary from law enforcement and Ministry of Environment and Natural Resources officers on the seriousness of the offence. Information is disseminated through an Education Information and Communication section of the Ministry through seminars, a Turtle March, and printed publicity material. The SUBIOS (Sub-Indian Ocean Underwater Film Festival) featured sea turtles as its theme in 2004.

Somalia

The participant from Somalia informed the workshop that fishing for turtles is legal in Somalia. He did not have any further information to add on what had already been presented in the regional review.

South Africa

Nesting habitats in Northern KwaZulu-Natal are closely protected and monitored by Ezemvelo KwaZulu-Natal wildlife (formerly Natal Parks Board) on behalf of the Department of Environment and Tourism (DEAT).

There are three known possible sources of incidental capture of turtles in KwaZulu-Natal. These are by the shrimp trawling and long line fisheries as well as the protective shark (gill) nets.

Shrimp trawling

- Data only available for shallow water shrimp trawling on the Tugela Banks. No data available for the offshore trawls
- Shallow water trawls occur in less than 50 m
- Data from April 2003 to May 2005
- 16 turtles caught on 178 observed trawls
- All turtles caught were loggerheads
- No mortalities indicated. Average trawl duration 4 hrs (long) therefore mortality likely to be high
- Catch data shows all turtles caught between March and May and in July
- Total number of trawls per year – data only available for 2003 in which 322 trawls occurred
- There is a closed season from November to February

Longline and shark net fisheries

Longline data is unavailable at present although observers are on board ships. Data can be acquired. Data from KZN shark nets is comprehensive and long term, and can also be acquired if necessary.

Comments and recommendations

- Get data for Shark nets and Long line fisheries
- Get turtle nest data if possible from EKZNW

United Republic of Tanzania

The current status of turtles in Tanzania was presented by Mr Hakimu Matola based on some of the available reports.

The incidental capture in nets has been documented for the Mafia Island gillnet fishery by the Society for Environmental Exploration and the University of Dar-es-Salaam. The study estimated that in the 1990s, annual capture rates were estimated to be approximately 200 per year.

More recent estimates for the whole Mafia area by Tanzania Turtle and Dugong Conservation and Research Programme (TTDCP) suggest annual capture rates of between 1000 and 2000 turtles. A turtle catch monitoring programme was initiated by TTDCP in April 2004 in Mafia Island Marine Park indicated that turtles are caught on 45–60 percent of fishing trips by gillnet fishers in and around Chole bay on the east side of the island. These preliminary results suggest that gillnets, particularly bottom set nets, pose a significant threat to turtles.

Commercial trawling

Turtles are caught in commercial trawling for shrimps but no data were available to the workshop on the incidental capture of marine turtles in trawlnets on Tanzania coast.

Sea Turtle Conservation Programmes

In January 2001, the Mafia Island Turtle (& Dugong) Conservation Programme (MITDCP) was initiated on Mafia and its associated islands to promote the long term survival of sea turtles through proactive community protection. One of the most important achievements in efforts to conserve turtles in Zanzibar was the establishment of the Zanzibar Sea Turtle Conservation Committee (ZSTCC) in February 2002 as a recommendation of the sea turtle recovery plan for Zanzibar.

A private turtle conservation initiative has been on-going since 1996 on Mnemba Island, located off the northeast coast of Unguja. The island has a circumference of approximately 1.5km. Activities include turtle nest protection, tagging, eco-tourism and education/awareness. At Misali Island (approximately 0.9 km²) on Pemba, information on nesting activity has been collected since 1998. The island is actively managed by the Misali Island Marine Conservation Area (MIMCA) Management Committee established under Legal Notice No. 48 of 1998 in the exercise of power conferred to the Minister under Section 7(1) and 32 of Fisheries Act No. 8 of 1988.

In 1993, the first committed turtle conservation project on the mainland coast of Tanzania was initiated. This, the Mkwaja Green Turtle Conservation Project, was established by the Fox family at Madete, a 5 km stretch of beach 13 km south of Mkwaja village in Bagamoyo district. The project ended in 2002. In the mid 1990s, Frontier-Tanzania, a collaborative venture between the University of Dar es Salaam and the UK-based Society for Environmental Exploration, collected opportunistic data of turtle nests in the Songo Songo archipelago and Simaya Island (southern Rufiji) and recorded incidental net captures in both Songo Songo and Mtwara as part of marine biological and resource use surveys (Darwall, 1996).

In May 2004, the scope of the programme was scaled up to include the entire mainland coast of Tanzania, using Mafia as a successful working model. TTDCP has now initiated community-based turtle conservation and monitoring activities in 5 coastal districts– Pangani, Bagamoyo (including Madete beach), Temeke, Mkuranga and Mafia and plans to start similar initiatives in the remaining coastal districts in 2005/6. The Marine Parks & Reserves Unit (Ministry of Natural Resources & Tourism) has been monitoring turtle nesting activity in the Dar es Salaam Marine Reserves of Bongoyo, Mbudya and Pangavini islands with the help of Honorary Wardens since 2002. In April 2004, a turtle monitoring and conservation programme was established by the Mnazi Bay – Ruvuma Estuary Marine Park (MBREMP) in Mtwara District using experiences from Mafia.

APPENDIX F

Country reports on their implementation of the ecosystem approach

Kenya

Kenya has a coastline about 640–880 km long. The continental shelf is narrow (3–5km in width), measuring 19 100 km^2, extending to 64 km in the northern bank and Ungwana Bay. Some 11 000 km^2 of this continental shelf is said to be trawlable. Reefs are typified by a fringing reef located 100–2000 m from the shore. There is a 12 nautical mile zone of territorial waters and a 200 nautical mile Exclusive Economic Zone (EEZ) measuring 230 000 km^2. The coast line has a system of river plains, estuaries and deltas, lagoons and creeks, beaches, salt marshes, rocky shores, mangroves, drowned shelves, shelf edges and parts of continental slopes. Several types of marine fisheries exist, namely a traditional inshore reef fishery, commercial inshore shrimp trawl fishery, demersal offshore fishery, pelagic offshore fishery, crustaceans, molluscs and sports fishery. They are all at varying degrees of exploitation with the reef fishery showing indication of overexploitation. The offshore fishery is mainly exploited by the distant water fishing fleets with high cases of illegal, unregulated, unreported (IUU) fishing.

The fisheries sector plays an important role in the national economy. The overall policy objective for the fisheries sector is to promote sustainable utilization of the fisheries resources for optimal benefits while considering environmental concerns. The Government through various strategic plans has recognized the fishing industry as one of the priority areas for national development and economic growth. Conventional fisheries management has been based on the principle of command and rule, where key elements of the ecosystem were not considered. Sector performance until recently has been very poor, with little involvement of key stakeholders in the decision-making process and management of fisheries resources. Fish stocks continue to decline, while fishing environments are getting degraded. Increase in resource use conflict has been experienced, especially the commercial trawlers versus the artisanal fishers.

The paradigm shift towards sustainable marine fisheries management, therefore, requires the knowledge, skills, and technologies of a wide variety of disciplines. Ecological and societal aspects of sustainable resource use, equitable distribution of benefits and incentive measures must be integral of the management regime, requiring an ecosystem approach. Some of the current marine fisheries management measures among others include; active involvement stakeholders in fisheries management, observing a closed season in the shrimp fishery, five nautical mile restriction on trawling, mandatory use of turtle excluder devices (TEDS) on trawl nets, closed areas (gazetted fishing breeding areas), restrictions on fishing gears/methods, size restriction on some species, controlled introductions, creation of marine protected areas (MPAs), installation of vessel monitoring systems, strengthened monitoring, control and surveillance. There are considerable national, regional and international initiatives promoting the concept of an ecosystem approach, namely the Eastern Africa Marine Ecoregion (WWF), Integrated Coastal Area Management (ICAM), Indian Ocean Tuna Commission Tuna Tagging Project, Western Indian Ocean Fisheries project, Western Indian Ocean Land based project (WIOLAB) among others.

For successful implementation of ecosystem approach in Kenya, the following is recommended; enhancing stronger community participation, creating sustainable funding

mechanism, identifying alternative livelihoods for fishers, strengthening national fisheries institutions for law enforcement, research, monitoring, control and surveillance; supporting policy and legal reforms, and providing an enabling environment for sustainable investments in the fisheries sector. There is a considerable presence of regional and international initiatives on ecosystem conservation. Therefore, there is need to develop synergies among the various Conventions, UN agencies and other development/conservation agencies in the region.

Madagascar

The priority needs have been identified as:

- to apply a precautionary ecosystem-based approach to the management of fisheries;
- to improve further the existing research on fisheries;
- to reduce overall fishing effort in the fisheries to sustainable levels; and
- to establish and effectively manage Marine Protected Areas.

Existing problems include damage to coral reefs caused by demersal fish trawling and the impact on the sea bottom by the demersal shrimp trawl. Pollution by used oil and plastics, the use of non-selective beach seines in traditional fisheries and ghost fishing are also particular problems. Damage to the ecosystem by non-fishing activities that is impacting fisheries includes the destruction of mangroves that form important nursery areas for shrimp, crabs and other species, sedimentation and pollution.

A number of measures have been taken to try to address these and other problems. The number of demersal fish trawl licences has been limited and the use of tickling chains is being suppressed. Fishing vessels are also required to collect their used oil in barrels and to retain non-biodegradable garbage. There are restrictions on the selectivity of gear and the height of otter boards and fishing gear is identified for the small scales fisheries. Some protected areas have been established for protection of nurseries and appropriate land use practices are being promoted to combat erosion.

Mauritius

At present, the ecosystem approach to fisheries management is mainly focused in the lagoon of Mauritius. Large nets and gill nets have always been known to be detrimental to the marine ecosystem and thus the phasing out of the net fishery is underway. A closed season for the use of nets during the spawning period of some of the commercial fishes in the lagoon is currently applied. Cast nets have been banned since 2000 and sand mining since 2001, with regular monitoring of the four ex-mining sites to observe the conditions of the seabed. Two marine parks have been established and are delimited into different zones to control permissible activities.

The Fisheries and Marine Resources Act also prohibits certain activities to protect the marine ecosystems such as fishing of marine turtles or any marine mammals, the use of poisonous substances, spear gun or explosives, fishing with the aid of artificial light, fishing of undersized fish, fishing berried crabs and lobsters, and nets with mesh size smaller than nine cm for large nets and eleven cm for gillnets.

All applications for coastal projects are examined through an environmental impact assessment and the recommendations are forwarded to the Department of Environment.
The Ministry of Fisheries facilitates consultative meetings between promoters and fishers in connection with coastal area development projects. The Fisheries Protection officers (Enforcement system) effect patrols at sea and on land and all catches are unloaded under their supervision. Undersized fish as well as fish deemed toxic are monitored at fish landing stations and data on catch are recorded. The National Coasts Guards are the agents for the surveillance and protection of the coastal zones.

Monitoring of chemical parameters (chemical oxygen demand, nitrate-nitrogen and phosphate) at various sites in the lagoon, analysis of trace metals (Cu, Zn, Pb, Cd, Hg) and pesticides (Atrazin, Diuron, Hexazinone) are effected regularly. The level of total coliform and faecal coliform bacteria in sea water at selected public beaches and the two marine parks is also monitored. For the long–term monitoring of the coral reef ecosystem, ten sites have been established all round the island and data on substrate cover are collected regularly. Mangrove propagation, mainly in the western region on the mudflat, is monitored.

Water samples are also collected and analysed in cases of alleged pollution and fish mortality and in relation to specific issues pertaining to the marine environment and coastal water development projects.

Mozambique

The objectives of the fisheries sector in Mozambique are (Decree 06/2000):

- to secure a responsible harvest production, to protect and conserve the fishing resources and, among others, to set up a dynamic co-management system;
- to secure production and conservation of the marine resources and sustainable exploitation of the fish resources;
- to promote and develop the quality of fishing activities and connected operations;
- to promote and develop fish production within Mozambique water judiciary, directed towards both domestic consumption and export;
- to promote increased competence in the sector so as to improve the standard of living in fishing communities.

Mozambique has a coastline of 2 770 km that can be divided into the following regions: the coral coast, swamp coast; delta coast and parabolic dune coast. The main fisheries are: shallow water shrimp; deep water shrimp; lobster; line fish; tuna and others; demersal and pelagic fish and kapenta (inland waters).

In relation to EAF, TEDs have been obligatory on all trawlers since last year but this has still not been implemented. Some particular concerns are the use of mosquito nets by artisanal fishermen fishing in nursery grounds such as river mouths and estuaries, and mangrove destruction.

Seychelles

The fisheries sector is one of the pillars of the Seychelles economy, and as such the issues of bycatch and discards need to be addressed, either by promoting means of reducing or adding value to bycatch. The artisanal fisheries sector, which is a multi-vessel and multi-gear

fishery, is considered to contribute comparatively little to bycatch. The main fisheries that contribute substantially to bycatch are the industrial purse seine and long-line fisheries, with much of the bycatch discarded at sea. However, since tuna fisheries are managed at a regional level by the Indian Ocean Tuna Commission (IOTC), all decisions regarding bycatch have to be taken by the Commission.

An ecosystem approach to fisheries management is still new to Seychelles but is recognized as an important direction that needs to be fully integrated in future management plans. All of the current and planned fisheries research projects integrate an ecosystem approach, but there is need for improvement in national capacity to address this issue.

There are some problems related to bycatch. At the fisheries level, semi-industrial and sports fishers identify industrial long-line and purse seine fisheries (largely foreign fleets) as being responsible for perceived declines in target species, including billfish and tunas and tuna-like species. In some cases, trap fisheries land juveniles of species targeted as adults by demersal line fisheries. Other problems include reports from licensed sea cucumber fishers of targeting of sea cucumbers by lobster and octopus fishers. Fishers with net licenses for mackerel and sardines often conflict with trap fishers by targeting Siganids and other reef fishes.

A lot of concern has been expressed by fishery managers and conservation/ environmental groups that bycatch and discards may be contributing to biological overfishing and altering the structure of the marine ecosystem but the absence of bycatch records in the Indian Ocean purse seine fishery makes it very difficult to assess the full extent of the impact of this fishery on the pelagic ecosystem. The Indian Ocean Tuna Commission encourages member countries to develop scientific observer programmes to collect information on bycatch.

Gears known to have significant impact on benthic habitats, such as demersal trawls and dredges, are prohibited in Seychelles. The impacts of hand-line and drop-line gears on ecosystems are not well known, but are expected to be minimal by comparison. Anchor damage to reefs by artisanal boats is reported but un-quantified. Damage by trap and net fisheries has been implicated in habitat degradation, but is considered to be minor in comparison to degradation caused by coral bleaching and sedimentation. Traps lost may cause extensive local damage but rapidly break down due to their bamboo construction. Long-lines set for sharks by artisanal vessels are known to have damaged habitats. Gill nets set for sharks were prohibited in 1998 due to substantial bycatch of turtles but long-lines set for sharks may also impact turtles. Turtles and marine mammals are the main endangered species impacted by artisanal fisheries.

Sedimentation is a chronic problem in the coastal habitats of granitic islands, with land-based run-off resulting from inadequate coastal zone management and land-use practices. Recovery of coral reefs following the coral bleaching in 1997/98 may be impacted by poor water quality. Acute sedimentation arising from extensive land reclamation has also contributed to habitat degradation. The development of tourism infrastructure, which has increased rapidly in the last 5-years, has modified the coastal zone and places additional stress on ecosystems. Eutrophication can result in poor water conditions in local areas near to centres of population and tourism developments. However, wastewater treatment is improving considerably and agricultural practices have been developed to mitigate against

eutrophication. Point source pollution (oil, heavy metals, organic pollutants) is a concern in harbours, bays and near landfill sites, but is localized.

Somalia

Somalia, which has had no central government, has also had no coast-guard or Navy since all Navy patrol boats were looted or destroyed, with the direct consequence that monitoring, control and surveillance (MCS) of the Somali coastline was halted. This has meant an escalation and entrenchment, since the onset of the bloody civil war, of (i) illegal fishing activities, (ii) dumping of industrial harmful wastes and (iii) piracy. Further, since September 11th, 2001, additional problems have been experienced, which have been intensifying and also becoming entrenched without solutions in sight. These are: (iv) influx of illegal fishing vessels; and (v) influx of illegal arms.

Illegal fishing activities for more than a decade are believed to have already caused the total destruction of the Somali's marine resources and it seems that highly organized criminals are further destroying the marine environment, through dumping of nuclear and industrial waste. Together, these activities are believed to be enough to cause the destruction of the marine resources and its environment and addressing them will require regional and international cooperation, including through SWIOFC.

South Africa

In terms of commercial value, the fisheries in South Africa are dominated by four major sectors, namely the demersal trawl, purse seine, long line and rock lobster fisheries. The fishing sector is currently undergoing a series of policy changes with the allocation of long-term fishing rights being addressed. The majority of these sectors face common, "generic" objectives with a few specific additions as required. In terms of stock status, only the hake fishery has obtained marine stewardship certification, although stocks of anchovy and pilchards are also considered to be healthy for the short term. Stocks of west coast rock lobster and certain endemic reef fish, however, are severely depleted.

South Africa has stated in its government policy to adopt an EAF approach to fisheries management by the year 2010. Unfortunately, the effects of the various fisheries on the ecosystem are largely unknown, although issues such as benthic disturbance of demersal trawling, bycatch discarding by all sectors, and the capture of illegal fish sizes are clearly detrimental. The fisheries are also being impacted on by external factors. The offshore extraction or prospecting for oil is a threat largely to the offshore fisheries at this stage, while issues such as the degradation of estuaries and coastal regions affect the inshore line fisheries. The political will and availability of resources for monitoring and enforcement of fisheries compliance are relatively good, although substantial information is required if South Africa wish to obtain their objective of implementing an EAF approach fisheries management by 2010.

United Republic of Tanzania

Tanzania has a coastline that extends for 800 km along the Indian Ocean. Its territorial waters and the Exclusive Economic Zone (EEZ) have an area of 223,000 km^2. In Tanzania the fisheries are still largely traditional with artisanal fisheries contributing 95% of total marine production while the industrial fisheries contribute only 5%. Artisanal fisheries involve dug-

out canoes, outrigger canoes, dhows and planked boats most of which are sail driven. A few use engines for propulsion. The fishing gears include gillnets, ring nets, hand lines, trolling lines, traps, weirs and some pointed sticks. Industrial fisheries use trawlers and target shrimps with fish caught as by catch. These vessels are restricted to shallow waters in delta areas exploiting shrimps.

The objectives for the fisheries sector are:

- to put into efficient use available resources in order to increase fish production so as to improve fish availability as well as contribute to the growth of the economy;
- to enhance knowledge of the fisheries resource base;
- to establish national strategic research programmes that are responsive to the fisheries sector;
- improving utilization of fisheries products and their marketability;
- to develop national training and educational programmes based on assessed needs and optimize the use of national and international training institutions;
- to protect productivity and biological diversity of coastal and aquatic ecosystems through prevention of habitat destruction, pollution and overexploitation.

A fundamental problem being encountered is that marine resources are often considered as common property, leading to over-capacity and resource depletion. Despite the numerous regulations set for trawler operators, conflicts between the artisanal and industrial sub-sector continue to occur over a number of issues such as the destruction of artisanal fishers' fishing gear by trawlers, and the failure of trawler operators to observe some of the regulations including fishing in waters shallower than five meters deep and fishing in zones not allocated to them. Incidence of dynamite fishing is another problem leading to destruction of coral reefs which provide very important habitat. The impact of bottom trawling on important sea grass habitats is a further problem. Management measures that should be set and implemented to address problems such as these include establishing marine parks and reserves to protect coral reefs and proper management of estuaries and mangrove areas. Mangrove forests are receiving some attention through the Mangrove Management Project.

Bycatch is considered a problem, especially in the shrimp fisheries, and can include many finfish species targeted by artisanal fishers as well as species such as sea turtles. There are mesh size regulations and other controls on gear design and construction to allow escape of small individuals or non-target species. Many shrimp management regimes now require bycatch reduction devices (BRDs) to be used. An observer programme has been introduced and every fishing vessel is obliged to record both shrimp and bycatch data.

Other activities outside the fisheries sector also pose threats to marine ecosystems. These include oil spills from tankers, the main oil refinery and other sources, the mining of sand, stone, limestone and clay, coastal zone development and land-based pollution.

APPENDIX G

Table 1. Overview of proposed actions to reduce sea turtle mortality due to fisheries in the South Western Indian Ocean[1]

Country	Proposed actions, Mortimer (2002)	Proposed actions, Okemwa *et al.* (2005)	Proposed actions, IOSEA meeting (March 2005)
Kenya	1. Reduce mortality due to trawls, driftnets and other entangling gear. 2. Increase public awareness (communities, politicians, government pers.). 3. Develop legislation.		
Madagascar	1. Introduce TEDs. 2. Develop awareness.	1. Assess the impact of longlining and purse seining on sea turtles (independent observers).	
Mauritius	1. Assess fishery-related threats. 2. Increase public awareness.	1. Assess the impact of longlining and purse seining on sea turtles (independent observers). 2. Develop and test eco-friendly long-line gear.	
Mozambique	1. Assess fishery-related impacts (artisanal and industrial). 2. Implement TEDs. 3. Increase awareness.		
Seychelles	1. Reduce turtle poaching. 2. Enhance awareness in all sectors of society (including government and enforcement personnel, decision-makers). 3. Reduce accidental harvest from gillnets, longliners and trawlers. 4. Develop and implement legislation.	1. Assess the impact of longlining and purse seining on sea turtles (independent observers). 2. Develop and test ecofriendly longline gear.	
Somalia	1. Reduce overharvest at Zeila. 2. Implement CITES. 3. Address turtle mortality in fisheries. 4. Public awareness.		

[1] based on Mortimer, 2002; Okemwa *et al.*, 2005; and IOSEA, 2005.

Country	Proposed actions, Mortimer (2002)	Proposed actions, Okemwa *et al.* (2005)	Proposed actions, IOSEA meeting (March 2005)
South Africa		1. Assess the impact of longlining and purse seining on sea turtles (independent observers).	
United Republic of Tanzania	1. Minimize accidental mortality from entanglement in fishing gear. 2. Mandate observer programmes on board industrial vessels. 3. Increase public awareness.		
Regional	1. Regional priorities (fishery related). 2. Accidental mortality in regional fisheries (African coastline and Madagascar). 3. Implement TEDs . 4. Prohibit driftnets. 5. Mandate observer programmes on national and international vessels. 6. Conduct workshops and training programmes on ways to minimize accidental mortality, improve national legislation, enhance public awareness.	1. Assess the impact of gillnets (including driftnets and shark nets) on sea turtles in selected sites. 2. Test the effectiveness of various management measures such as seasonal or permanent area closures to fishing. 3. Design and develop appropriate TEDs and BRDs building on existing experiences. 4. Establish an observer programme on commercial vessels.	1. Urge the IOTC to require member States to collect data and report on marine turtle bycatch through observer programmes and other appropriate and reliable methods. 2. Request the IOTC and other countries in the region to develop and implement appropriate combinations of hook design, type of bait, depth, gear specifications and fishing practices in order to minimize bycatch or incidental catch and mortality of marine turtles. 3. Offer to collaborate with the IOTC on the type of data that should be collected and ways in which fisheries could assist in the conservation of marine turtles.

Table 2. Overview of the information contained in the country contributions

Country	Occurrence	Essential habitats	Main source of mortality	Traditional use	Data on sea turtles/fisheries interactions	Conservation programmes
Kenya	Green, hawksbill, olive ridley (nesting) Leatherback and loggerheads (foraging)	Foraging grounds and nesting sites	10 to 50% of nesting females and nests poached	used for food and ornaments		KESCOM
Madagascar	Four species found, the most common is the green turtle	Nesting sites at small islands around Madagascar	Hunting (mainly with spears, for local consumption)	used for food and ornaments	Taken in shrimp trawl fishery	Marine Institute (Toliara)
Mauritius	Green Turtle, hawksbill and loggerhead	Nesting grounds at Chagos Carajos Shoal (green, hawksbill and loggerhead), October to March			No data available. Bycatch in small scale fisheries believed to be small, catches in longlines should be estimated.	Establishing MPAs at the Chagos Carajos Shoal from 2006
Mozambique						
Seychelles	Five species found, loggerhead,olive ridley, green, hawksbill and leatherback	500-800 hawksbill nesting grounds (granitic islands) >800 green turtle nesting sites on the coralline islands	Poaching Predation (crabs, birds, fish, sharks) Beach erosion Coastal development	Green turtles traditionally used for their meet and carapace. Use now banned. Turtles have culture value.		Natural reserves, managed by the Seychelles Islands Foundation, the Island Conservation Society, Nature Seychelles
Somalia				Turtle use legal		
South Africa		Nesting habitat in northern KwaZulu-Natal			Shallow water trawl fishery (Tugela Banks) Logline KZN shark nets	Ezemvelo KwaZulu-Natal wildlife, on behalf of DEAT
Tanzania					Gillnet fishery (Mafia)	MITDCP MIMCAS ZSTCC Mkwaja Green Turtle Conservation Project

APPENDIX H

Results of issue identification and prioritization

a) Coastal shrimp fishery

	ISSUES AND RISK VALUES				
Category	**Issue**	**Conse-quence**	**Like-lihood**	**Risk value**	**Comments**
Retained species	Declining catches	3	5	15	Many countries lack adequate data on stocks, improve current management
	Growth overfishing	4	4	16	Harvesting of small sized individuals, improve on the current management measures
	Inadequate knowledge on the status and distribution of stocks	3	5	15	Need for research, improvement on the current research initiatives
By-product species	Landing of juvenile finfish	5	6	30	Mainly in semi - industrial trawls, such as rays,catfish, soles; substantial additional management is needed
	Landing of low value fisheries	3	6	18	Mainly in semi - industrial trawls, such as rays,catfish, soles; improve on the current management measures
	Loss of valuable biodiversity	2	5	10	Highly valuable but threatened/endangered species, seaturtles
Non-retained species	High incidences of discards	4	6	24	Jelly fish, sharks and many other marine organisms
General ecosystem effects	Degradation of bottom habitat	3	6	18	Disruption of benthic life
	Disruption of the ecological balance	4	6	24	Although of low value/non consumption, most discarded species play an important ecological role in ecoystems
	Pollution	2	5	10	Gas, oil leakages from fishing vessels
	Dredging	2	5	10	Construction jetties/harbours, expansion of channels
	Loss of valuable species	2	6	12	Seaturtles, dugongs, sharks,whales
	Destruction of spawning/feeding grounds	4	6	24	Near shore trawling
	Destruction of coastal forests	2	5	10	Fuel for smoking fish, destruction of spawning areas
Human well-being: community	Increased incidences of resource use conflicts	3	4	12	Multiple resource users
	Safety at sea	5	5	25	Drowning, piracy, accidents, lack of life saving facilities
	Poor infrastructure	4	4	16	Landing beaches, healthcare, electricity, water, sanitation
	Lack/poor infrastructure	3	4	12	Poor roads,
	Discard of usable fish	1	4	4	Mostly in industrial trawl fishery because of the low value, limted storage capacity and transport of cost

	ISSUES AND RISK VALUES				
Category	**Issue**	**Conse-quence**	**Like-lihood**	**Risk value**	**Comments**
	Post harvest losses	2	5	10	Lack of cold storage facilities; continue with current arrangements
	High levels of poverty	5	6	30	Many fishers live below poverty line thus a driving force to extract more from the environment.
Human well-being: national	Emphasis on production for export market				A threat to national food security
Governance management	Lack of enforcement	4	6	24	Illegal fishing
	Low level of compliance	4	6	24	Illegal fishing
	Inadequate/ineffective legislation	4	6	24	Poor sector performance
	Lack/ineffective policy	4	6	24	Poor sector performance
	Increased fishing effort	5	6	30	Increase in illegal fishing, open access; substantial management needed
	Poor gear technology	3	6	18	Need for research, increase selectivity, reduce operational costs
	Uncoordinated fishing industry	2	4	8	Lack of an institutional apex to coordinate the relevant players in the sector
	Inadequate regional collaboration in the fisheries sector	2	6	12	Implementing MCS, stock assessments, negotiations, management and legislation
	Inadequate funding of the fisheries sector	4	4	16	Increase budgetary provisions/support
	Inadequate research and resource monitoring	4	6	24	Research mostly not demand driven
	Lack of political will	3	6	18	Uninformed decisions or failure to implement programmes
	High population growth rates	5	6	30	More pressure to the fishery for livelihood
	Inadequate involvement of key stakeholders	4	4	16	Ownership and sustainability concerns
	Lack of alternatives	3	4	12	High dependency on capture fishery
	IUU fishing	3	6	18	Expansive EEZ, Inadequate capacity to monitor/surveillance
Ability to achieve - environment	Climate change	2	6	12	Global warming and its effects
	Drought	3	5	15	Reduction of habitat
	Floods	3	5	15	Destruction/ creation of habitats, destruction of infrastructure
	Cyclones, tsunami, earthquakes	3	2	6	Threat to fishers and disruption of ecosystems
Ability to achieve - other drivers	High prevalence of HIV/AIDS	5	6	30	Increases production costs, lowers productivity and performance

	ISSUES AND RISK VALUES				
Category	**Issue**	**Conse-quence**	**Like-lihood**	**Risk value**	**Comments**
	Substance use (drugs, alcohol)	3	6	18	Influence safety at sea
	Civil strife/insecurity	2	5	10	Less involvement in fishing activities
	Market conditionalities	3	4	12	Limits access to external markets e.g European Union, United States of America
	Subsidies	2	6	12	Internal and external subsidized fisheries products distorts market prices
	Lack of incentives	2	6	12	Poor investment in the sector
	Lack of investiments	2	6	12	Limits sector growth and performance
	High cost of production inputs	2	6	12	Increase production, lowers profit margins
	Uncertain market prices	3	4	12	Lowers profit margins
	Social/cultural values	1	6	6	Gender disparities in the fishing industry
	Uncontrolled physical development	2	5	10	Housing, hotels, industries
	Pollution	2	5	10	Oil spills from tankers, oil drilling, mining activities
	Waste discharge	2	4	8	Effluents from hospitals, hotels, sewers
	Siltation/coastal erosion	4	6	24	Unsustainable landuse, mangrove destruction, mariculture

b) Artisanal fishery

	ISSUES AND RISK VALUES				
Category	**Issue**	**Conse-quence** Range 0-5	**Like-lihood** Range 1-6	**Risk Value**	**Comments**
Retained species	Dugong (threatened)	4	6	24	Almost extinct, incidental catch
	Lobster	4	5	20	Overfishing has been reported for some localized areas. In some countries, the fishery has been closed
	Shark (threatened)	4	5	20	Meat for local consumption, Fin for export
	Sea cucumber	4	5	20	Generally overfished in all countries. This product is for the export market
	Sea horse (threatened)	4	4	16	Thought to be overfished though Information is lacking
	Turtles	4	4	16	Consequence and likelihood ratings country dependent
	Snapper	3	4	12	Overfishing has been reported for some localized areas
	Octopus	3	4	12	Overfishing has been reported for some localized areas
	Grouper	3	4	12	Overfishing has been reported for some localized areas
	Sardine,	3	4	12	Overfishing has been reported for some localized areas
	Emperors,	3	4	12	Overfishing has been reported for some localized areas
	Crustacean,	3	4	12	Overfishing has been reported for some localized areas
	Trevally	3	4	12	Overfishing has been reported for some localized areas
By-product species	None				
Non-retained species	NA				
General Ecosystem Effects	Juvenile fish capture	4	6	24	gear specific, due to non-selective gears, small mesh size
	Coral damage	3	6	18	Site specific, archoring, walking on, coral bleaching, trammel nets, blast fishing in some cases
	Sea urchin proliferation	4	4	16	Localized but important issue (Kenyan)
	Negative trophic impacts (removal of predators)	3	5	15	Site specific, targeted for high commercial value
	Bait collection (over fishing)	1	4	4	Mussels
Human well-being: Community	Food security at risk	4	6	24	Consequence table not appropriate for artisanal fisheries, Major concern for most countries except Mauritius
	High poverty levels	4	6	24	Less of a concern in island countries
	Low technical capacity	4	6	24	Education levels are generally low, illiteracy is high
	Low influence on policy making	4	4	16	Artisanal fishing communities are consulted,
	Marginalization	4	4	16	Artisanal fishing communities are not an influential social group, they feel marginalized, they are resistant to change

	ISSUES AND RISK VALUES				
Category	**Issue**	**Conse-quence** Range 0-5	**Like-lihood** Range 1-6	**Risk Value**	**Comments**
	Risk: e.g., lost at sea, shark attacks, no safety equipments on the fishing crafts	1	1	1	
Human well-being: national	Poverty levels high	3	3	9	Impact at the national level negligible for the mainland states.
	Food security,	2	2	4	Artisanal fisheries contribution to national socio-economic well-being is not great for most countries
	Foreign exchange	2	2	4	Artisanal fisheries contribution to national socio-economic well-being is not great for most countries
Governance management	Open access to fishery resources	4	6	24	This a common issue, little limitation on who can get involved in fishing (except in Mauritius)
	Low level of compliance with fisheries regulations	4	5	20	Compliance dependent on effective enforcement
	Expectations for financial support	3	6	18	Greater concern on island states
	Information not widely available	3	6	18	Fisheries information not frequently shared with fishing communities
	Scarce human and material resources	3	6	18	Lack of access to ice, transportation, etc
	Poorly organized	2	4	8	Few organizations, difficult for policy-makers to know who to communicate with, work schedule can impede organizing
	Overly complex for policy making	2	4	8	Many actors in the sector
	Lack of management plan	2	4	8	Some areas have management plans
	Poor inter-agency coordination	2	4	8	Duplication of efforts, poor communication sometimes
	NGOs coordination with government	2	4	8	Some NGOs give away gears that are unsuitable/unsustainable, situation is improving
	Code of conduct under development	NA			National policies for artisanal fisheries
Ability to achieve environment	Habitat modification	2	4	8	Reclamation, localized
	Erosion	2	3	6	Localized
	Cyclone	1	4	4	Frequent for Mauritius
	Tsunami	4	1	4	Infrequent but devastating when it occurs
	Sedimentation	1	3	3	Localized, important for reefs
	ENSO	2	1	2	Impact more important for coral reef systems
	Poor water quality	1	2	2	Ports, localized
	Dumping	1	2	2	Localized

	ISSUES AND RISK VALUES				
Category	**Issue**	**Conse-quence** Range 0-5	**Like-lihood** Range 1-6	**Risk Value**	**Comments**
Ability to achieve - other drivers	Ghost fishing	1	1		

c) Purse seine tuna fishery [2]

Category	Issue	Conse-quence	Risk	Risk Value	Comments
Retained species	Tuna species				Too grouped for meaningful assessment.
	Bigeye stock decreasing	3	4	12	
By-product species	Shark stock depleted	3	6	18	
	Wahoo possibly under threat	2	4	8	
	Rays population impacts unknown	1	2	2	
Non-retained species	Turtles population decreasing	4	6	24	
	Dolphins stocks unknown	1	4	4	
General Ecosystem Effects	Removal of top predators	2	5	10	
	Adverse impacts on endangered species	3	4	12	
	Unknown discard effects	1	1	1	Not enough information to decide if more important
	Drifting FADs having possible effect on behaviour on migratory fish	2	5	10	Not enough information to decide if more important
	Ballast water discharge carrying alien species into ecosystems	1	3	3	
	Risk of depletion due to lack of information	4	3	12	
	Possible tuna farming opportunities/problems	1	4	4	
	Illegal/unregulated fishing depleting fish resources/ Underreporting of catches	4	6	24	
Human well-being: Community	Financial benefits to fishery/job creation/income	3	2	6	Risk evaluated on potential collapse of fishery
	Subsidiary employment	3	2	6	Risk evaluated on potential collapse of fishery
	Food source for community	0	2	0	Risk evaluated on potential collapse of fishery
Human well-being:national	Export financial benefits (forex)	4	2	8	In case of Seychelles, consequences catastrophic, Risk evaluated on potential collapse of fishery
	Employment creation	3	2	6	Risk evaluated on potential collapse of fishery
	Training opportunities/research	2	2	4	Risk evaluated on potential collapse of fishery
	Opportunity of regional collaboration	2	2	4	Risk evaluated on potential collapse of fishery
	Increase local participation in fishery	2	2	4	Risk evaluated on potential collapse of fishery

[2] This exercise was for methodological training purposes only. Within the competence of IOTC-see report text.

Category	Issue	Conse-quence	Risk	Risk Value	Comments
	Tourism opportunities	1	2	2	Risk evaluated on potential collapse of fishery
Governance - management	Monitoring/control/surveillance problems, especially with regards to cost and organization	4	4	16	
	Conflicting maritime zones	3	2	6	Isolated incidence
	Political\licensing issues (eg. Certain fishing entity vessels not recognized by IOTC)	3	2	6	
	Continued research of BRDs and TEDs	2	2	4	
	Regional agreements very important for MCS	4	4	16	
	Effectiveness of enforcement	4	4	16	
	Licensing is strength in some regions and weakness in others	1	5	5	
	Data reporting from fishery is of poor quality and requires improvement	4	6	24	
	Improved data of bycatch	4	6	24	
	Conflict with artisanal FAD, recreational/longline fisheries	3	4	12	
	Limited port control measures	4	6	24	
	Stock improvement required based on defensible stock assessments	1	4	4	
	Catch documentation schemes to be extended for all types of tuna	4	4	12	
Ability to achieve - environment	Climate change altering stock distributions	2	4	8	Stock distribution changing
Ability to achieve - other drivers	War conflict zones restrict fisheries	3	5	15	
	Political Instability: Conflict zones restricting movement of fishing vessels	3	5	15	
	Increase in fuel costs	3	4	12	

APPENDIX I

Examples of preliminary management reports

a) Fishery: SHRIMP TRAWLING

Issue: Landing of juvenile finfish as bycatch in shrimp fishery

1. Operational objective

Reduce bycatch and landings of juvenile finfish by 60 percent within 2008.

Justification:

To reduce growth over-fishing of finfish species.

2. Indicator

Proportion bycatch of juvenile finfish in the shrimp trawl fisheries.

3. Reference points (limit and/or target)

An upper limit reference point is the present bycatch proportion.

4. Data required and availables

Bycatch time series – partly available, but needs to be collected in a systematic way.

5. Evaluation

Small amounts of juvenile finfish released at present, some is landed, but major part discarded.

6. Robustness

OK

7. Management response to the issue

a) Current measures

Mesh size regulation, closed season, limited access to fishery.

b) Future measures

Reduced fishing effort, MPAs, BRDs (e.g. 90 degree codends, sorting grids and/or square mesh panels).

c) Action if performance measure is exceeded

To be decided.

8. Impacts of management measures on other issues and objectives

a. Retained species

Possible loss of shrimp.

b. Non-retained species

Increased sustainability of finfish stocks.

c. General ecosystem

Increased biodiversity and recruitment to finfish stocks.

d. Human well-being (community and/or national)

Increased resource base for (artisanal) finfish fisheries. Improved food security.

Improved economy in artisanal fishery due to higher catches and prices of larger finfish.

e. Governance

9. Comments and actions

To be completed

10. External drivers or pressures

To be completed

b) Fishery: ARTISANAL FISHERIES

Issue: Incidental catch of dugongs through various fishing gears which is threatening its survival

1. Operational objective

Need to improve and maintain a viable population size and structure of dugong at Aldabra Atoll, Lamu archipelago, South of Zanzibar Island and Pemba Island

Justification:

The population of the dugong in the mentioned sites is threatened through fishing activities and there is need to protect and conserve the populations for posterity.

2. Indicator

Improved population size and sightings

3. Reference points (limit and/or target)

The populations of dugongs are threatened with extinction in the stated areas. The dugong is also in the IUCN red list. The population has dropped below 50 percent of the original population size. We therefore target to increase the population of dugong in the specified areas by 30% by the year 2020.

4. Data required and available

1) Yearly census 2) Count the number of females with calves 3) Identify of breeding sites.

5. Evaluation

The population status is poor. The sightings have been very few. The dugong is threatened with extinction

6. Robustness

These indicators have been tested elsewhere and shown to indicate population changes in different areas.

7. Management response to the issue

a) Current measures

The current fishing regulations and guidelines do not guarantee the survival of the dugong. The MPA regulations and guidelines give priority to the conservation of the dugong, however many of the dugong are found beyond the MPA boundaries.

b) Future measures

1. Protection of their breeding sites
2. Reduce the impact of fisheries on dugong which may include; encourage the release (while alive) when caught incidentally in artisanal fishing gears, increase public education and awareness on the need to conserve the species
3. Encourage eco-tourism to increase community benefits
4. Practice ecosystem approach to fisheries management

c) Action if performance measure is exceeded

Enforce total closure of the dugong breeding sites.

8. Impacts of management measures on other issues and objectives

Human well-being (community and/or national)

The fishing communities occasionally eat dugong and an obligation to release them would have a minor reduction of protein in the diet. Successful eco-tourism will increase employment and income.

Governance

None. Covered above

9. Comments and actions

Initiate population monitoring programs, initiate education and public awareness and initiate eco- tourism activities

10. External drivers or pressures

Negative attitude of the artisanal fishermen towards conservation

Limited support from the tourism sector.

The Workshop on Bycatch, Particularly in Prawn Fisheries, and on the Implementation of an Ecosystem Approach to Fisheries Management was attended by participants from Kenya, Madagascar, Maldives, Mauritius, Mozambique, Seychelles, South Africa, Somalia and the United Republic of Tanzania. The workshop was also supported by resource persons from Italy, Nigeria and the United States of America.

The workshop received from the countries national reports and reviews concerning bycatch, sea turtle distribution, critical habitats, main sources of natural and man-induced mortality and conservation efforts. The use of turtle excluding devices (TEDs) and interactions between sea turtles and fisheries in the shrimp trawling was discussed.

It was concluded that two workshops about turtle and fisheries should be set up, the first for collecting data on turtle occurrence and mortality and the second for presenting these results to managers, fisheries associations and industry in an attempt to find the best solutions and exchange knowledge.

Information about the countries implementation of the ecosystem approach to fisheries (EAF) management effort was reported. Two different methods of identifying ecosystem approach to fisheries issues and risk analysis in order to prioritize the issues were presented and tested. Obstacles on implementing the EAF were considered by the workshop and, as a way forward, it was concluded that a risk assessment for sustainable fisheries (RASF) approach should be applied in order to implement EAF in the region. This could be done in national case studies.

ISBN 978-92-5-106169-5 ISSN 2070-6987

9 789251 061695

TR/M/I0554E/1/01.09/1000