Availability: 21 October, 2011

IOTC-2011-WPNT01-INF02

FAO Fisheries and Aquaculture Report No. 970 **RNE/FIPI/R970 (En)**

ISSN 2070-6987

REGIONAL COMMISSION FOR FISHERIES

Report of the

WORKSHOP ON FISHERY STOCK INDICATORS AND STOCK STATUS

Tehran, Islamic Republic of Iran, 26–29 July 2009

Copies of FAO publications can be requested from:
Sales and Marketing Group
Office of Knowledge Exchange, Research and Extension
Food and Agriculture Organization
of the United Nations
E-mail: publications-sales@fao.org
Fax: +39 06 57053360
Web site: www.fao.org/icatalog/inter-e.htm

FAO Fisheries and Aquaculture Report No. 970 RNE/FIPI/R970 (En)

REGIONAL COMMISSION FOR FISHERIES

Report of the

WORKSHOP ON FISHERY STOCK INDICATORS AND STOCK STATUS

Tehran, Islamic Republic of Iran, 26–29 July 2009

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2011

ISBN 978-92-5-106850-2

PREPARATION OF THIS DOCUMENT

This document contains the report of the FAO/Regional Commission for Fisheries (RECOFI) Workshop on Fishery Stock Indicators and Stock Status that was held in Tehran, the Islamic Republic of Iran, from 26 to 29 July 2009. The Workshop was convened by Piero Mannini (RECOFI Secretary), FAO Regional Office for the Near East and North Africa, and Sachiko Tsuji (Senior Fisheries Statistician), FAO Fisheries and Aquaculture Department, Statistics and Information Service. Input and assistance was provided by Yimin Ye (Senior Fisheries Officer), FAO Fisheries and Aquaculture Department, Marine and Inland Fisheries Service, and Elie Moussalli (FAO Consultant). Heba Fahmy and Ingy Youssef provided secretarial support. Sachiko Tsuji acted as Technical Secretary of the Workshop and prepared the present document.

FAO/Regional Commission for Fisheries.
Report of the FAO/RECOFI Workshop on Fishery Stock Indicators and Stock Status. Tehran, the Islamic Republic of Iran, 26–29 July 2009.
FAO Fisheries and Aquaculture Report. No. 970. Rome, FAO. 2011. 46p. Includes a CD-ROM.

ABSTRACT

This document contains the report of the FAO/RECOFI Regional Workshop on Fishery Stock Indicators and Stock Status that was held in Tehran, Islamic Republic of Iran, from 26 to 29 July 2009. At the fourth session (2007) of RECOFI held in Jeddah, Kingdom of Saudi Arabia, the Secretariat prepared for the minimum requirements of stock assessment. The Commission recognized that those requirements were too complicated and noted a shortage of expertise. The effort was resumed at the second meeting of the Working Group on Fisheries Management (WGFM) in 2008 where a shift to a pragmatic approach based on an Ecosystem Approach to Fisheries management (EAF) with adaptive procedures was recommended. The objective of the Workshop was to review the availability of data on the biology of the identified priority resources, catch and effort statistics for the relevant fisheries, other socio-economic statistics, results of stock assessments and other relevant research activities in member countries; to identify the major gaps in knowledge and information, priority areas for regional cooperation and potential joint activities; and to formulate the RECOFI work program for regional cooperation in assessment of stocks and fishery status appraisal in the short and medium term. Employing a simple matrix of Susceptibility Productivity Analysis (PSA), the participants identified three areas of particular concern. These are the ecosystem-wide impact of shrimp trawls, the exploitation of neritic demersal assemblages as well as sharks as indicators of the overall level impact of exploitation, and, thirdly, the stock status of a selected priority species, *Scomberomorus commerson*, for which historic data are available. The Workshop concluded with a set of recommendations to the WGFM that focused on improvement of data collection and monitoring capacity and members' contributions to scientific knowledge through joint activities.

CONTENTS

OPENING OF THE MEETING

1. The FAO/Regional Commission for Fisheries (RECOFI) Workshop on Fishery Stock Indicators and Stock Status was held in Tehran, the Islamic Republic of Iran, from 26 to 29 July 2009. The Session was attended by 18 representatives from seven RECOFI Members and 26 observers from the Islamic Republic of Iran. Participants are listed in Appendix 2.

2. At the opening ceremony, Mr Mehdi N. Shirazi, Deputy Director General, Public and International Relations Department, Iranian Fisheries Organization, and RECOFI National Focal Point, welcomed the participants and introduced the speakers. He pointed out the consistent commitment and support of the Islamic Republic of Iran to the RECOFI since its establishment in 1999 and regretted the absence of Iranian experts and scientists in the RECOFI activities during 2008 and part of 2009. Mr Shirazi made reference to the to the fifth session of the RECOFI recently held in Dubai, United Arab Emirates(12–14 May 2009) during which the Commission decided to hold an ad hoc meeting on the future development and consolidation of the RECOFI and informed the audience that the Islamic Republic of Iran has offered to host this important meeting in 2010.

3. Dr Alinaghi Sarpanah, Deputy Minister and Head of Iran Fisheries Organization, Ministry of Jehad-e-Agriculture, in welcoming the participants highlighted that many of the fishery resources found in the Gulf of Oman and Persian Gulf are shared among the coastal states. He recalled the commitment of coastal states to adhere to the FAO Code of Conduct for Responsible Fisheries when common and shared fisheries resources are concerned. He underscored the role and mandate of RECOFI as the relevant regional fisheries management organization for the responsible management of the regional fisheries and their sustainable development. Dr Sarpanah highlighted the key elements of the fifth Five Year Plan of the Iranian Fisheries Organization that had been elaborated as part of the National Five Year Plans due to commence in 2010. The fifth Five Year Plan of the Iranian Fisheries Organization includes the following objectives: achievement of food security; responsible and sustainable fishery resources exploitation; optimization of the use of fishery infrastructures; increased aquaculture and fisheries production, the latter coupled with reduced by-catch and discards; rehabilitation of aquatic resources; vigorous confrontation of illegal, unreported and unregulated (IUU) fishing; improved fish marketing and trade systems; increased fish consumption per person; and increased involvement and transfer of fisheries-related activities from the public to the private sector. The improvement and optimization of the fish value chain is one of the main priorities of the Iranian Fisheries Organization. The Deputy Minister emphasized the relevance to the Iranian Fisheries Organization of the protection and conservation of natural resources. Currently, some marine and freshwater species are protected and are managed in a manner to contribute to the enhancement of aquaculture for food production; pursuing of sustainable fishery yields; combating illegal fishing of sturgeon and related smuggling; stock enhancement programmes; protection of critical and essential fish habitats; monitoring, control and surveillance systems; involvement of resource users; use of scientific advice for fisheries management; responsible fishing and selective fishing techniques; and diversification of fishers' income. The social and economic relevance of fisheries in the Islamic Republic of Iran is evident as the sector provides employment opportunities to about 140 000 fishers operating a fleet of more than 12 000 fishing vessels stationed in 159 harbours and landing sites throughout the country.

4. Dr Piero Mannini, the RECOFI Secretary and Senior Fishery Officer, Regional Office for the Near East and North Africa, Food and Agriculture Organization of the United Nations, Cairo, Egypt, gave the opening speech on behalf of Dr Shaid Najam, FAO Representative in the Islamic Republic of Iran, who could not attend due to unforeseen circumstances. In his speech, Dr Najam recalled that RECOFI was established on the basis of Resolution 1/117 that was adopted by the FAO Council in 1999. He highlighted the Commission's mandate to promote the development, conservation, rational management and best utilization of living marine resources, as well as the sustainable development of aquaculture in the area covered by the Commission. To this end the Commission is entrusted to, *inter alia*, keep under review the state of exploitation of fishery resources, formulate appropriate measures

for the conservation and rational management of living marine resources, and ensure the implementation of these recommendations. The FAO Representative opening note underscored that the Islamic Republic of Iran is a key member of RECOFI as well as one of the biggest fishery producers in the Near East, landing about 400 000 tonnes in 2006. The country supports regional cooperation for fisheries research and management.

5. After welcoming the participants, Dr Mannini pointed out that capture fisheries and aquaculture supplied the world with about 110 million tonnes of food fish in 2006. After growing steadily, aquaculture is, for the first time, set to contribute half of the fish consumed by the world's human population. At the same time, most of the world's marine fish stocks are either fully exploited or overexploited. It is of concern that there are reports indicating that RECOFI capture fisheries are relying increasingly on low-value species, thereby concealing the slow decline of demersal high-value resources. The depletion of fishery stocks constitutes a net loss of natural capital from the region. Rising fishing costs, declining fish stocks and climate change challenges further reinforce the need for concerted national and international efforts to rebuild fish wealth. In this respect, the 1995 FAO Code of Conduct for Responsible Fisheries provides a comprehensive overarching framework for promoting long-term sustainable fisheries. Implementation of the Code of Conduct is encouraged vigorously at the national, regional and global levels.

6. In the RECOFI region, fisheries may appear of low relative importance in economic terms. Marine fisheries production, however, reached 700 000 tonnes in 2006. By any measure, this is a substantial amount of fish that contributes significantly to food security in the region. Furthermore, capture fisheries employ more than 100 000 fishers and generate around 400 000 jobs in secondary activities such as processing, trading and distribution. Overall, fisheries in the region ensure the livelihoods of probably more than one million people. The RECOFI region is characterized by rich marine biodiversity and productive ecosystems, supporting valuable fishery stocks. Coastal countries benefit from the goods and services that flow from these ecosystems; they share many of the fishery resources as well as the responsibility for their sound management.

7. Over the past four decades, the region has also experienced rapid development in the coastal zone, which has led to the degradation of the marine and coastal environment and a loss of its potential to sustain coastal populations. Very acute ecological problems have resulted from the loss and degradation of productive coastal habitats, caused by coastal landfills, dredging, and sedimentation.

8. Turning to the issue of governance, the RECOFI Secretary remarked that regional fisheries management organizations such as RECOFI are the cornerstones of international fisheries governance and for this reason regional cooperation should be strengthened. Many regional fisheries problems can be solved through effective consultation and the timely exchange of information as well as concerted joint action.

9. The nature of a semi-enclosed sea makes the RECOFI region a particularly suitable exemplar case to meet the provisions articulated in Part IX (Article 23) of United Nations Convention on the Law of the Sea (UNCLOS) on cooperation of coastal States in enclosed or semi-enclosed seas. Moreover, the FAO Code of Conduct for Responsible Fisheries in coherence with UNCLOS and other relevant international declarations and fisheries instruments further emphasizes the necessity, especially when shared stocks are harvested, for coastal States to cooperate for fisheries research and management.

10. The management of shared fishery resources is one of the great challenges in the pursuit of sustainable fisheries. The fact should be highlighted that non-cooperative management ultimately and invariably leads to overexploitation. It has to be also recognised that management and enforcement of laws and regulations are obviously more complex for shared fisheries than for non-shared fisheries. The Code of Conduct for Responsible Fisheries clearly and unequivocally addresses issues concerning shared stocks; emphasis is given to cooperation among States as an essential and unavoidable requirement for the responsible exploitation of such resources.

ELECTION OF THE CHAIRPERSON

11. Mr Ali Asghar Mojahedi, Director General of Fishery Management, Iran Fisheries Organization, Islamic Public of Iran, was nominated unanimously as Chairperson of the Workshop by the participants. The Chairperson expressed his gratitude to the Meeting for the confidence in electing him to the office.

ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE MEETING

12. The draft Agenda was adopted after incorporating the additional bullet point – impacts of red-tide and coastal development, with the understandings that the discussion at the meeting should focus on general aspects of the issue. The adopted Agenda is in Appendix 1.

OBJECTIVES OF THE WORKSHOP

13. Dr Mannini explained that the effort to establish the regional management plan was initiated at RECOFI's fourth session that was held in Jeddah (Kingdom of Saudi Arabia) from 7 to 9 May 2007, where the Secretariat prepared for the minimum requirements for stock assessment. The Commission recognized that those requirements were too complicated and noted a shortage of adequate expertise. Simple initial steps were sought without much progress. The effort was resumed in 2008 at the second session of the RECOFI Working Group on Fisheries Management (WGFM) held in Cairo, Egypt, from 27 to 30 October 2008. The WGFM recommended a shift to a pragmatic management based on an Ecosystem Approach to Fisheries (EAF) with adaptive management procedures and recommended to hold the workshop to discuss on data and information currently available and to identify the minimum data requirements in order to monitor status of fisheries and fishery resources. The fifth session of the Commission held in Dubai, United Arab Emirates (12–14 May 2009) approved both recommendations that are the basis of this workshop. In the prospectus of the workshop (as Appendix 3) are listed the main objectives, which are the following: to review the availability of data on biology, fishery and other social-economic aspects of fishery and fishery resources, to analyze and assess the status of fisheries and fishery resources based on available data, to formulate scientific advice on management strategies and measures when appropriate, including immediate management actions, stock assessments, and/or improved monitoring in the region as well as identifying major gaps in knowledge and information, and to formulate the RECOFI work programme in assessment of stocks and fishery status for the short and medium terms.

14. Dr Sachiko Tsuji, Technical Secretary of the workshop and Senior Fishery Statistician, FAO, Rome, Italy, introduced briefly the concept of EAF. The ultimate goal of EAF is to ensure long-term sustainability of a whole ecosystem including fishery resources, human communities and natural environments supporting them. EAF can be considered as a type of risk management with a set of pre-determined action plans that would be triggered when corresponding indictors would reach the pre-determined thresholds. Depending on how to define indicators, the implementation of EAF can be either very simple or complex and sophisticated. The majority of fisheries within the RECOFI region are multi-species, multi-gear small-scale operations, where a fishery management based on single-stock assessment is less effective. Also, many of the stocks harvested are shared among neighbouring countries at least, and throughout the region for some fish stocks. In this context, it is essential to establish common management plans and monitoring indicators in the region for conducting responsible fishery in accordance with the Code of Conduct of Responsible Fisheries. As the first step moving toward EAF, she indicated that the important role of this workshop is to agree on what is to be monitored in order to ensure long-term sustainability of the ecosystem in the region and to identify a minimum set of data to enable such monitoring.

15. Bahrain noted a difficulty in translating assessment results into actual management procedures, e.g. when results of assessment and analysis recommend a substantial reduction of fishing effort, the useful action cannot be taken without financial consequences, either through a buy-back program or provision of alternative employment for those who would lose their jobs in the fishery. EAF would

not provide the final solution. Dr Yimin Ye, Senior Fishery Resource Officer, FAO, Rome, Italy, responded that the stock assessment recommendations (such as effort reduction) and sustainable development of communities could be integrated into the management plan through coordination among different sectors. If the overcapacity was identified as the top priority to be addressed, EAF would provide a vehicle to consider how to achieve capacity reduction in a pragmatic way by cancelling out negative impacts with possible advantage.

COUNTRY REPORTS

16. Dr Mannini noted that only a few countries provided the country reports and a set of statistics prior to the workshop as agreed at the second WGFM. Non-availability of such requested information largely limited the Secretariat's capacity to prepare a draft summary of the current situation on fisheries, harvested stocks and information gaps in the region. He stressed that the fulfilment of agreed-upon tasks is the first step toward responsible fishery and real collaboration and strongly urged stronger commitments in the future.

17. Country reports and/or presentations are in Attachment A-G of the accompanying CD ROM. Brief summaries and follow up discussion were as follows:

BAHRAIN

18. Since the moratorium of finfish trawling by industrial steel-hulled vessels through the Ministerial Decree (No.7) issued in 1997, Bahrain has only small scale artisanal fisheries sector operating with gargoor (wire-traps), hook and line, gill-nets, shrimp trawls, barrier traps (haddrah) landing 6 000–9 000 tonnes of finfish and 2 000–3 000 tons of shrimp. In addition, the recently developed ladle fishery landed 300–1 800 tonnes of jellyfish. Total landing steadily increased since 1980 and coincided with the increase of shrimp catch. The fishing effort had almost doubled during the last two decades through an increase in the number of fishermen and boats as well as amount of gear deployed. Fishing effort also increased through more fishing days and through enhanced gear technologies (e.g. the use GPS units and fish finders.) As a result, the catch rate per boat declined substantially when compared that of 20 years ago. The assessment of shrimp fishery indicated that the current fleet size of 200 boats was in excess the proper level of 117 boats, which corresponds to the level required to land the estimated Maximum Sustainable Yield (MSY) of 1 800 tonnes. Improvement of land-based fisheries infrastructure had started in 2 000 with the construction of jetties for mooring, access channels, fuel stations, water supplies, shaded work areas, storage depots, fenced areas, security and toilet facilities. These improvements were accomplished using funds collected as penalties from dredging or polluting the marine environment. The Bahrain fishery sector only represent about 0.2 percent of Gross Domestic Product (GDP). Bahrain fisheries are in a critical situation due to pollution of marine habitats and overcapacity. Future plans and strategies include the improvement of natural resource production, development of mariculture and reduction of overcapacity.

19. Responding to questions, Bahrain further explained that it had conducted stock enhancement on an experimental basis since 1994 by releasing fingerlings of sea bream, groupers, catfish and other species, to the level of up to four millions fingerings per year in recent years. A substantial project of 7–10 years' duration, including the establishment of artificial reefs has been recently implemented to rehabilitate a large marine coastal area that was destroyed. However the project is still in its initial phase and thus it is not possible yet to assess its actual impact.

20. Aquaculture in Bahrain is focused only on certain finfish, such as seabream, seabass, and groupers. Jellyfish are primarily exported to South Korea and China, and Iran is the main trading partner. Other countries involved in re-export of jellyfish. The species targeted were not identified but were the ones preferred by the Chinese. It was noted that although fisheries in Bahrain are, in principle, managed through licensing system, a small part of fishing is carried out by occasional part-time fishermen that could not be fully monitored or controlled.

ISLAMIC REPUBLIC OF IRAN

21. The northern and southern parts of the country have distinct fisheries and aquaculture characteristics. Marine fishery production now comes mainly from the southern part in an increasing trend, while in the northern part; aquaculture production of sturgeon has increased substantially accounting for half of the total fishery and aquaculture production. Major species caught in the southern include tunas, demersal species, shrimp, sardines, ribbonfish, and myctophidae. Production of shrimp has remained relatively stable. The Iranian industrial fishing fleet is composed of 700 fishing boats that include 303 tuna boats and 44 trawlers. A total of 157 000 fishers are employed in the fisheries sector employing gillnets and fish traps (gargoor), for demersal species in the Oman Sea. This figure includes fishers trolling for tuna and Spanish mackerel, as well as those working on small purse seiners targeting small pelagics including sardines, and large purse seiners targeting tunas in the Oman Sea and the Indian Ocean.

22. Fishing operations are managed mainly through licensing. Additionally, area and season closures as well gear and mesh size regulations are imposed on the shrimp fishery. Standard gear and mesh size are also set for gillnets for management of cuttlefish, shrimp and silver pomfret (*Pampus argenteus)*. These measures are part of the regulations for bycatch reduction. Catches taken by bottom trawls and gillnets are not separated by species; this is considered one of the main challenges of management together with bycatch reduction in those fisheries. Pollution, red tides, and rehabilitation of natural habitats are other areas of concern. Iran has vigorously pursued implementation of national artificial reefs, enhancement of mangroves, and the artificial breeding and release of shrimp, yellowfin tunas and sea breams, together with monitoring of production indices. In order to enhance fisheries management and to evaluate the illegal catch, additional measures including vessel monitoring systems (VMS) and on-board observers are also applied.

23. Total landings are obtained by multiplying Catch per Unit of Effort (CPUE) collected by enumerators at 35 landing sites and logbooks, by the effort obtained through a census. In addition, at selected sample sites, gear specifications and species composition are monitored with a random sampling scheme. All of these data are sent to a scientific committee and a provincial sub-committee. The Committees are responsible to set regulations and determine the exploitation plans and policy measures. Ongoing research projects include the estimation of bottom area swept by demersal gear, the study of large pelagics in collaboration with the Indian Ocean Tuna Commission (IOTC). Stock assessment surveys and other activities required for the study of shrimp management including setting the opening and closing dates of the season are carried out, as well as, stock assessment surveys for mesopelagic myctophids and hairtails. Cruise surveys are regularly conducted to cover seventeen strata within the Gulf as well as the Iranian coast of the Oman Sea to obtain the standardized CPUE for the narrow barred Spanish mackerel (*Scomberomorus commerson*). Spatial distribution, biological and population parameters and information on spawning areas and seasons are well established for many of commercially important species including large pelagics, small pelagics such as sardines, and shrimp, which are integrated into fishery regulations like mesh size control.

24. Responding to the question on the effectiveness and enforcement procedure of mesh size control, Iran explained that the gear would be investigated at the time of data collection on catch at landing sites. Size distribution and species composition of catch is also examined and compared with average size distribution and species composition when using gear of standard mesh in order to ascertain whether or not the catch composition corresponds to that of the legal gear. Those arrested for the violating gear restrictions are subject to cancellation of their fishing licence for a period between three days and three months. The introduction of mesh size regulations for the purpose reducing bycatch has been a long process starting on experimental basis nine years ago and gradually expanding to artisanal vessels with proven reduction of bycatch. The effort is still continuing with new experimental projects and implementation of a monitoring, control and surveillance (MCS) system.

25. Responding to the question on precautions related to the recently developed myctophids fishery, it was explained that the current exploitation level and fleet size was still quite low compared to the optimum levels. While their biomass was estimated more than one million tonnes, only 5 700 tonnes were taken with two vessels in the last year. A plan to introduce five more vessels to this fishery over the next five years has been planned.

26. There was some discussion regarding the on-going Gulf Cooperation Council (GCC) survey project where Bahrain and Iran are conducting the survey in the same area of the Gulf. The main focus of these two surveys differs; the Bahraini survey is focused on demersal stocks, while the Iranian survey is focused for pelagic stocks. Efforts are being made to overcome some technical difficulties. The aim is to make data comparable. Nevertheless, the meeting noted the benefits of sharing data and results obtained through the surveys. Iran described the good experience of the joint project on silver pomfret from 2002 to 2005 which delivered one final report containing comprehensive and shared results. Iran undertook another successful collaboration with Iraq. Such collaboration would help to integrate many studies that were conducted independently and therefore are all incomplete due to the shared nature of the stocks. These collaborative efforts improve our understanding of the ecology and assessment of stocks; these are all regional issues. It was noted at the meeting that the information on Spanish mackerel accumulated by member countries is another area in which data sharing would be beneficial. It was noted that one of the RECOFI mandates is to promote cooperation over the shared ecosystems and stocks and that it would provide a structure to facilitate and improve cooperation among member countries.

IRAQ

27. The status of fisheries resources in Iraq nowadays suffers from decline in stock density of commercial fish species in its coastal area as a result of declining water flow in Shatt El Arab. Beside, the Iraqi territorial marine areas are very limited due to the political situation. Starting in 2003, managing fisheries through a licensing system had ceased. There are occasional fishing operations that are conducted without licenses.

28. Concerns were expressed regarding the current total lack of monitoring and control of the fishery in Iraq. Even through fishing operations are described as occasional, the total catch taken by Iraq is roughly equivalent to that taken by Qatar and Kuwait. Iraq explained its plan to re-introduce management through licensing after establishing appropriate quota. The meeting supported the plan of Iraq and encouraged the re-initiation of monitoring as quickly as possible.

KUWAIT

29. Kuwait's marine waters cover approximately 2 540 square nautical miles (8 700 km^2). However, fishing grounds are limited to about half of this area because commercial fishing is forbidden in the Kuwait Bay and within three miles from the coast. Kuwait fisheries comprise multi species where multiple gear types are used that target various pelagic and demersal fish species (345 species that fall in 94 families). The fishing fleet consists of two distinct sectors: the industrial shrimp fishery with trawl nets and the artisanal fisheries with trawl nets, fish traps (gargoor), drift gillnets and inter-tidal fixed nets, catching both demersal and pelagic species. In 2007, 881 licensed fishing boats with 28 trawling vessels, 128 wooden boat and 725 speed boats, operated in Kuwaiti waters. The 2007 catch production was 4 373 tonnes consisting of 2 833 tonnes of finfish and 1 540 tonnes of shrimp. The industrial shrimp fleet is comprised of 35 steel-hulled double-rigged trawlers of 20–32 m in length owned by two companies. The shrimp season starts in September and closes in January/February. Out of nine shrimp species found in the area, three are commercially important. Other fishing operations are allowed throughout Kuwait waters year-around except for the closed season for Zobaidy (*Pampus argenteus*). Fishery regulations other than licensing and closed areas include minimum mesh size for shrimp and fish nets and minimum size for a variety of fish species.

30. Research work conducted include stock assessments of commercially important species such as Zobaidy, shrimp and other finfish resources; assessments of environmental impacts of fish cage culture and altered discharge regime; improvement of gear operations including bycatch reduction in the shrimp fishery and restoration of Pearl Oyster resources. The major issue is negative impacts of river diversions coupled with the draining of marshes in Shatt-Al-Arab river system on biotic communities. Many commercially important species including Suboor, Zobaidy and Kuwait's second most important shrimp species *Metapenaeus affinis* heavily depend on the marshes or low salinity water either for their spawning or feeding. Other concerns include bycatch of the shrimp fishery whose ratio in Kuwait water amounts to 74:1. This bycatch is composed of juveniles of some commercially important species. In addition to utilization of Bycatch Reduction Devices (BRDs), active utilization of bycatch for fish meal is pursued. Future plans include implementation of Marine Protected Areas (MPAs), control in fishing capacity through capping of total license numbers, protection of mangroves, the sea floor and sea grass areas as well as the use of a VMS. Uncontrolled fishing in the international waters and increase in size of Dhows and industrial trawlers raise another challenge of increased fishing capacity.

31. Responding to the question on IUU fishing activities in the international waters, Kuwait responded that there were no data available but that the Kuwaiti markets attract fishers coming into its Executive Economic Zone (EEZ) especially during the closed season. Molluscs compose minor part of catch and are not separated from crustaceans in the Kuwait's statistics where shrimp dominates the catch. Regarding stock enhancement, it was explained that the there are on-going efforts to assess the impacts on relevant sites for sea ranching. Speedboats are also controlled through permits that limit their power in kilowatts. In an effort to reduce fishing capacity, it is now required to combine two licences in order to issue one licence with increased power.

OMAN

32. Oman has a coastline of 3 165 km along which many small and often isolated fishing communities are located. A wide variety of fish are consumed locally – kingfish and hamour (grouper) being very popular, while shoals of small sardines are netted for use as fertilizer and animal fodder. Shark-fins are exported and lobsters that were avoided in the past by fishermen are now caught for the lucrative hotel and restaurant trade. The quantity of the total catch landed increased rapidly during the 1980s, reached a peak in 1988, and then declined. The catch in 2007 amounted to 153 900 tonnes to which the traditional fisheries contributed 134 444 tonnes and commercial fisheries 26 549 tonnes. Fourteen percent of the traditional catch came from Dhofar, including 40 tonnes of abalone and 305 tonnes of lobster. In 2008, the catch decreased to 148 164 tonnes. This was partly due to an European Union (EU) ban on fish imports from Oman, which has now been lifted. Scientists at the Sultan Qaboos University are actively involved on nine research projects and help the Ministry to develop the quality control of fish exports required by the EU and by the international standards set by the World Trade Organization (WTO). The regulations to protect stocks and traditional fisheries include restriction of fishing for lobsters and abalone to only two winter months, regulation of the size of nets and other fishing equipments, and restriction of the areas, depths, quantities and fish species that may be caught commercially. Commercial fishing is limited to 15 percent of the total catch and foreign vessels may not fish without a license within Oman's territorial waters. In 2008, the fishing industry employed 32 940 registered fishermen operating with 13 458 small crafts. The Ministry has taken steps to modernize the fishery sector through building ports with cold-storage plants and processing facilities, providing boats, fishing equipments and other technical support,

33. Responding to the questions, the Omani delegate explained that the 2007 fishery independent acoustic survey together with trawl samples indicated the biomass of mesopelagic lantern fish to be four million tonnes. The lantern fish are distributed in water deeper than 200 m with many schools found around 300–600 m in depth.

34. The meeting noted that much information was collected by Iran, the UAE and Oman on Spanish mackerel which should be compiled to formulate management decisions. Due to high and common interest in this species in the region, it was considered to be desirable that the management of kingfish to be listed as a mandate of the RECOFI. Although the IOTC is responsible for the management of large pelagics in the Indian Ocean including Spanish mackerel, a neritic species such as kingfish generally commands mild interest and is given a low priority at the IOTC. In addition, only few countries in the region in fact participate to the IOTC. The meeting generally agreed that the Secretariat should inform the intention of the RECOFI to develop a management scheme on Spanish mackerel in the region and maintain a close communication with the IOTC.

35. Responding to the question on negative impacts of red tides and preventive measures, the meeting was informed that the occurrences of red tides have increased since first reported in 2004 and that the 2008 red tide caused the mortality of 70 tonnes of aquatic organisms. Red tides also caused decline of catch rate of sardine. Dr Mannini informed all at the meeting that the Commission at its last session (Dubai, UAE, 12–-14 May 2009) agreed to hold the Workshop on red tide impacts on aquaculture and capture fisheries with invited experts in Kuwait. The meeting noted that coastal development and expansion (i.e. artificial land reclamation) also have negative impacts on aquatic ecosystems and their sustainability, especially directly on spawning and nursery grounds of many commercially valuable fishery resources. Since the coastal development is planned and conducted under the responsibility of national authorities other than those responsible for fishery management, the meeting noted that it would be difficult for the RECOFI to influence the national development policy. Nevertheless, the meeting agreed on the importance for the RECOFI to disseminate information about the negative impacts of coastal development on fish habitats and on sustainability of fishery resources and to request the inclusion of fishery sector concerns into consideration of future planning of developments.

QATAR

36. Qatar has two types of fishing vessels, the launches and tarrads. The launch is a decked vessel of wood or fibreglass, powered with an in-board engine. A total of 444 launches are active with 2 899 fishermen operating with 3–5 days trips. The tarrad is an open dory of fibreglass with outboard motors, generally operating during one day. There are about 1 000 licences including 100 licences for recreational fishing. Major gear types used are fish traps (gargoor) targeting demersal species followed by drift gill nets, encircling gillnet, and hand lines. Total landings in 2007 and 2008 were about 15 187 and 17 688 tonnes, respectively. Catches are landed at four landing sites out of which those landed in Doha Central Market are fully enumerated by species. Effort is only available as a number of active launches but CPUE for various gear types is collected and calculated randomly at al-Khour landing site. Fish prices per category are collected at al-Doha fish market. Fishing effort is controlled by limiting landing frequency and trip period for launches, together with capping of total number of licences issued. Additional measures implemented include minimum size limit for key commercial species including orange-spotted groupers, closed areas as marine protected areas surrounding all islands and the prohibition of shark fin exports. Two national projects and one regional project are ongoing, which provide estimations on the stock status of kingfish, swimming crabs and demersal fish stocks in the Gulf and Sea of Oman. The analysis indicated the over-exploitation of the Spanish mackerel and recommended an appropriate minimum size to achieve higher spawning stock biomass ratio per recruit.

37. The question was raised about the low CPUE, which turned out that the fishing activities were limited to territorial waters of shallow depth with relatively low national interest for expansion. Qatar indicated that there is no immediate plan to establish further sampling at landing sites. All gillnet operations are conducted by other countries with minimum mesh size of 10 cm. Also there is a restriction of engine power up to 200 horsepower (hp).

UNITED ARAB EMIRATES

38. The United Arab Emirates has 80 km of marine coastline and is home to 5 million people. The total number of fishers engaged in fisheries in 2007 was 21 220, among which about 6 000 were local and the rest came from outside the country. A total of 5 571 fishing boats operated in 2007, out of which 4 745 are small vessels operating with petrol and 826 steel-hulled diesel-operated boats. Total production in 2007 was 96 453 tonnes consisting of 71 000 tonnes of pelagic species, 24 700 tonnes of demersal species, and the remaining 700 tonnes of crustaceans. They are typically distributed to local markets at landing sites. There are 68 landing sites, 15 of which are major and 53 are minor ones. Fishing gear used includes traps, hook and line and several types of nets. The possession of new boat is restricted to one per fisher. The fishing season is limited to mid August. The United Arab Emirates also conducted stock enhancement with artificial breeding and aquaculture of groupers and algae. Stock assessment and estimation of biological parameters including mortality, age-length relationship, age at first maturity and growth curves have been conducted for key commercial species. Some of the results indicated over-exploitation status of stocks. Major concerns include the recent decline of the sardine stock, adverse impact of power fishing, conflicts arising from shared stocks with neighbouring countries, and negative impact of economic coastal development on the environment and ecology of the region, as well as red tides.

39. Responding to questions, the United Arab Emirates delegate indicated that the red tide within territorial waters affected both fishing and mariculture along the coast beginning in 2008 until May 2009. There have been no efforts to monitor the effect of grouper restocking. Regarding tunas, a genetic study was conducted but no tagging in the area was carried out.

SUMMARY OF STATUS OF FISHERY RESOURCES AND AVAILABLE DATA

40. The Secretariat introduced the agenda by summarizing the information obtained through the presentations and discussion of the country reports (Agenda Item 5). The data reported to the RECOFI Secretariat indicate that the total catch of priority species (i.e. those identified at the second WGFM) remained relatively constant during the last ten years, while the total catch from the region continued to increase. Type of gears commonly used throughout the region include driftnet/gillnet, wire traps and hooks and lines that mainly harvest coastal fish, and shrimp trawls. Shrimp trawls are catching about 50 percent of shrimp and a broad range of other marine species, though some countries reported much lower proportion of shrimps in their catch. On the other hand, the majority of shrimp was taken by shrimp trawls. The catch composition of other gears was mostly finfish except wiretraps that target crab where the catch is almost exclusively made of swimming crabs. There was no clear pattern observed in occurrences of priority species among different gears. The graphs presented are in Attachment H.

41. The meeting identified several issues and concerns that are common in the region. These include the impact of shrimp trawls on shrimp stocks as well as on other fisheries resources, stock status of Spanish mackerel, and stock conditions of commercially important demersal coastal fin fishes in general. Major problems identified regarding shrimp trawl fishery 1) high-level of by-catch, 2) overcapacity and 3) decline in catch rates observed in some countries. The delegates generally agreed on the need to enhance enforcement efforts, especially for the adoption of bycatch reduction devices as well as mesh size controls. Regarding the Spanish mackerel stock, all countries experienced severe decline of landing and catch rate of this species that is regarded as a shared stock in the region. The meeting noted that quite a large amount of information was already accumulated by Members including Iran, Oman and the United Arab Emirates and considered that such information should be compiled and integrated to support formulating management decision for the region. Concerns about demersal coastal finfish stocks include the negative impacts caused by degradation of habitats and the coastal zone modifications (e.g. red-tide, pollution, land reclamation, habitat destruction, rampant urbanization and stock declines). The development of the jellyfish fisheries in

Bahrain and the myctophid fisheries in Iran together with the general increase in significance of the crab fishery were recognized as the emerging issues related to fisheries in the region.

42. The multispecies and multigear nature of the majority of fisheries in the region could constitute an apparent difficulty hampering fishery management. In general, the CPUE data available were aggregated for all species caught by individual types of gear and/or fleet sectors. The lack of species specific CPUE would make it difficult to assess the condition individual stocks and hence the impacts (i.e. fishing mortality) exerted by each gear on them.

43. The meeting noted that a significant amount of fisheries data and survey data had been collected over the years and could be made available in the region. A common format of data collection and procedure to coordinate survey efforts would need to be developed. Such common reporting procedures would allow us to compare and integrate catch and effort data, survey results and other localized knowledge available at countries and to maximize the effective use of the data collected. Furthermore, a regional work plan would be needed to secure enhanced regional cooperation on a continued basis that may lead to the unified stock assessment of those species of common interest (e.g. the agreed priority species).

HIGH PRIORITY AREAS AND MAJOR GAPS IN KNOWLEDGE

44. The meeting reviewed various issues and concerns in the area. At the end of discussion, the participants filled a set of questionnaires to provide broad overview on the current situation. The summary results of the questionnaires are attached in Attachment I.

Social and economical importance

45. The meeting considered that social and economic importance of the fisheries sector should be measured by the extent of its contribution to the local food supply and its contribution to exports both in value and quantity. However, it was noted that this measure may not really reflect the importance of a fishery if the total production volume was not taken into account. For example, in the case where fishery A producing 1 000 tonnes a year and 80 percent (800 tonnes) are consumed locally, while fishery B landings 10 000 tonnes annually but only 20 percent (2 000 tonnes) reach local markets, it was generally felt that the fishery B is of a higher importance to local food supply.

46. The other measures identified included fishery contribution to national GDP, proportion of natural catch to aquaculture, and per capita annual consumption. It was noted that some of these measures were difficult to define accurately. There was a suggestion to measure the socio-economic importance of fisheries by fishery category: e.g. artisanal, industry, demersal and pelagic.

47. It was noted that in some countries, fishers were already involved in planning and development of fisheries management measures through fishing committees and/or boards where fishing companies, unions, managers and other stakeholders would discuss the regulations.

48. At the same time, most of fisheries in the region have received benefits in the form of subsidies. These are sometimes used to reward good behavior and/or promote new technology and equipment. This includes direct subsidies to livelihood for well behaved fishers, provision of special price and/or coupons for boats, engines, fuel (diesel), traps, echo-sounders, as well as compensation in cash during closed seasons and loans with low or zero interests.

Vulnerable marine ecosystems

49. This topic focused on whether or not any vulnerable marine ecosystems were identified in the region and if so what actions had been taken already or are in progress. It was noted that mangroves would protect juvenile shrimp and fish from predation and form important nursery grounds. Lots of

mangrove areas in the region have been damaged or destroyed and need to be restored. Coral reefs were recognized as another area in need of protection.

50. It was noted that there was a general need to identify sensitive areas and habitats essential for life cycles of important fishery resources, including spawning areas and nursery areas, as the areas need to be protected. Geographic Information System (GIS) mapping was recognized as a useful tool to handle spatial dimension in fisheries and aquaculture management. The meeting noted that the FAO/RECOFI workshop on GIS in 2010 would discuss on the relevant issues.

51. Potential impacts of fishing operations to vulnerable environment (e.g. coral reefs by wire traps, anchors etc.) were also noted. Also noted were some mitigation efforts already taken including area closure for wire trap operations in coastal areas and halting or reduction of bottom trawl fishing.

Major gaps in knowledge and information

52. The meeting recognized that the lack of information exchange was a serious problem in the region. Members do not exchange fishery information and data, which makes it difficult to understand the situation of fisheries and fishery resources in neighbouring countries as well as at the regional level. This obviously hinders the collaborative effort to achieve the regional coherence in the management of common interests and concerns such as such as management of shared resources, or facing common problems such as red tide blooms, etc.

53. The meeting took special note of the need to establish a regional fishery database to maintain those data that were identified and agreed upon as minimum requirements to report, in order to support the regional monitoring strategy. Data banks covering national data collection and monitoring systems, fishing methods, catch, effort and biological data and all other related information were considered to be useful. There was general agreement to recommend to the Commission to consider the establishment of a regional fishery database as a matter of urgency in accordance with the strategy based on potential benefits and cost.

Stock enhancement

54. It was observed by the participants that stock enhancement had been getting a momentum in this region over last few years. Here, the stock enhancement in a broad sense includes bycatch mitigation, restoration of habitat with artificial reefs, release of juveniles for stock enhancement purposes, and establishment of Marine Protected Areas. However, their potential impacts on marine ecosystems and actual profitability has not been evaluated. Such evaluation should include the impacts of artificial reefs and guidance on the areas proper for artificial reefs deployment. The meeting considered it useful to develop joint studies.

Coastal zone development

55. The meeting noted that throughout the region, coastal zone development has had a great impact on coastal fishery resources and marine ecosystems. Oil extraction, land reclamation, power plants, land-derived sources of pollution, decline in freshwater discharge all lead to changes of natural coastal environments, particularly the most sensitive and important inter-tidal zone that often provides nursery and fishing areas for many of important fishery resources. Even though an environmental impact assessment is generally required before a coastal development project can proceed, the impacts on the fisheries sector and resources are often not incorporated into such assessment nor are they given a sufficiently high priority to attract proper attention of the governments. It is important for those in charge of the fisheries sector to relay information to the proper levels of government in order to mitigate the negative impacts of coastal zone development. Synergies with environmental organizations such as the Regional Organization for the Protection of the Marine Environment (ROPME) that focus on impacts of pollution can certainly help in this regard.

56. The meeting recognized that the coastal zone development is an important common issue in the region and that the RECOFI should raise member countries' awareness by providing guidelines and coordination with the government authorities of other sectors to reduce their impacts on fisheries. Also, RECOFI should improve communication with the sectors concerned including the relevant regional organizations such as ROPME.

MANAGEMENT STRATEGY AND WORK PLANS

57. The Secretariat outlined the roles of monitoring indicators in the context of the Ecosystem Approach to Fisheries (EAF) and the basic principles to select them. A key strength of monitoring indicators in the EAF and adaptive management is a direct link between monitoring indicators and management actions that could be implemented when a given monitoring indicator reaches a pre-determined reference point. A set of management actions and operational objectives should be discussed at the forthcoming sessions of WGFM. In the absence of agreed upon operational objectives, the participants tried to identify a minimum set of data that would enable monitoring biological aspects of fisheries and fishery resources, including non-target species; this was considered a priority in the region.

58. Participants agreed to avoid an excessively theoretical approach. In fact, the management issues currently at stake in some Member countries called for practical solutions that could be easily communicated and possibly accepted by fishery managers and resource users.

Priority components to be monitored

59. First, participants reviewed the status of currently operational fisheries, their attendant data collection and monitoring of catch and effort, the sector's relative importance in food security and the economy of the country, as well as a source of livelihood in community and the main issues in the context of relevant regional ecosystems. Key issues identified include:

- Overcapacity and decline of catch rates of the shrimp trawlers, and their effect on a large number of species including commercially important coastal fish species through bycatch removal of juveniles and discards.
- Difficulties of managing multi-species, multi-gear fisheries. The Narrow-barred Spanish mackerel was identified as the species whose stock status required particularly close attention, because of its commercially high value, recognition of the severe decline of its catch rates, and shared interest throughout the region. In the northern area of the region, there were also marked declines of silver pomfret (*Pampus argenteus)* and Indian shad (*Tenualosa ilisha*).
- Degradation of marine habitats, in particular, of the coastal and inter-tidal zones which are critical for many of marine organisms by providing them protection from fishing pressure. This includes destruction of mangrove and/or sea grass areas through coastal development and increased pollution discharge.
- Appraisal of stock enhancement and utilization of artificial reefs which have been in use for a substantial period of time in some parts of the region.

60. The impact of stock enhancement efforts was noted as potentially important but basic information on their positive and negative effects and the extent of monitoring and evaluation activities is inadequate. Further clarification would be needed especially in order to set up the goals and principles of management measures related to this issue. The meeting considered that it might not yet reach the stage to consider monitoring indicators. The meeting also identified another issue, i.e. the degradation of coastal marine habitat, that is, in principle, not under the jurisdiction of the fisheries sector. Participants at the meeting considered that this issue should be dealt by enhancing communication with the responsible national sectors within the region as well as with other relevant regional organizations including ROPME. Therefore, the meeting did not develop data requirement for those two issues.

Selection of monitoring indicators:

61. In the absence of agreed-upon operational objectives, it is not possible to set up a specific set of monitoring indicators. Therefore, attention at the meeting was focused on identifying key reference species and fisheries suitable to be used for monitoring to address the issues. In order to make an initial step as feasible and pragmatic as possible, consideration was only given to the type of data obtainable through the existing data collection systems. Also, the participants tried to keep the set of monitoring indicators to a minimum. These indicators can be modified and expanded in the future when more experience and data are accumulated.

62. The meeting conducted a simple Susceptibility Productivity Analysis (PSA) on major types of fishing gear used in the region and a list of the RECOFI priority species identified during the second WGFM. The objective of the exercise was to identify the components of high risk, e.g. vulnerable stocks or fisheries of high impact, within the ecosystem that could be used as reference points to monitor the health of the ecosystem. The possible impact of the different types of fishing gear on a given species, i.e. susceptibility, was defined with qualitative assessment by experts' knowledge of the participants on the selectivity characteristics, escapement survival, and by extent of immature juveniles captured in the gear concerned. The productivity of each species was assessed in the same way in terms of sexual maturity, longevity, size at maturity, reproductive strategy, and trophic level. Higher productivity in general indicates higher resilience to exploitation, while those gear types to which a target species has a high susceptibility are considered to give larger impacts on stock with the same level of efforts. The susceptibility of fishery resources to exploitation and risk of overexploitation would be the highest when the resource of low productivity is exploited by gear to which it has high susceptibility. The summary results of exercise are in Attachment J.

63. The analysis (Tables J–1 through J–5) revealed that shrimp trawlers and driftnets were the two top gear types that have the highest impact on the priority species and that sharks were the most sensitive, as a whole, to the types of gears used in the region, followed by groupers and emperors. Based on these observations, especially when combined with the issues and concerns identified during the review process, the participants decided that the initial focus should be on data collection targeting the following monitoring indicators:

- **Ecosystem wide impact of shrimp trawls**: collecting data of all components of the catch (i.e. targeted, retained, and non-retained components) and the extent of operational activities. No consideration is given on linkage with operational objectives and management actions.
- **Exploitation of finfish resources**: through CPUE of groupers and emperors as indicator of exploitation pressure on coastal fish species, together with enhanced data collection of sharks to improve understandings of the current situation.
- **Stock status of priority species**: The narrow-barred Spanish mackerel. Although this species- was not identified as one of the most sensitive species and species groups, there are strong interest and concern in the region about this species. The bulk of the catch, in fact, is taken by highly targeted operations of high selectivity gear, which makes this species more easily amenable to stock assessment. In addition, much biological and ecological information has already been accumulated. Therefore, data collection on this species specified for stock assessment is considered as high priority. However, it should be noted that even though the narrow-barred Spanish mackerel was selected as the first case study to establish stock assessment in the region, this does not mean that the importance of other species including silver pomfret and shad are any lower. The experience learnt from the narrow-barred Spanish mackerel should be expanded to cover other species in the future as appropriate.

64. The delegates further developed the protocol of the minimum data reporting required to calculate the level of the monitoring indicators identified above. The agreed protocols of minimum data reporting are as follows:

Ecosystem wide impacts of shrimp trawls

- dates of opening and closure of the season;
- species composition of discards, if available;
- total number of vessels operating shrimp trawls as well as the number of vessels by size categories (e.g. steel/speed boats/dhows);
- annual effort in terms of the average tow duration and number of tows per day, and the number of days at sea, according to vessel size categories;
- quantity of annual catch of shrimps, swimming crabs, cuttlefish, narrow-barred Spanish mackerel, emperors, groupers, sharks, rays, other fin fishes and the annual amount of discards;
- shrimp species composition within the shrimp catch, if available [optional]; and
- catch composition of discards.

Exploitation of finfish resources

- annual effort of driftnet/gillnet gear, wiretraps, and hook–and-line fisheries, respectively, and description of efforts used. Members may decide to define the type of effort used but are encouraged to include the "number of days at sea";
- annual total catch, the amount of catch of narrow-barred Spanish mackerels, emperors, groupers, sharks and rays, and amount of discards. For emperors and groupers, species should be identified to the extent possible; and
- Species composition of discards, if available.

Stock status of selected species (Narrow-barred Spanish mackerel)

- monthly catch and its fork length composition;
- for operations targeting narrow-barred Spanish mackerel (e.g. fixed nets, driftnets/gillnets and hook-and-line gear), monthly catch with length composition and effort by gear type, together with a clear description of types of effort used; and
- any results obtained through surveys and research work relevant to narrow-barred Spanish mackerel that could include fishery-dependent and fishery-independent stock indicators, biological parameters (e.g. growth rate, age-length relationship, reproductive information, natural mortality) and ecological information (e.g. distribution, feeding habitat, habitat preferences).

65. It was agreed that the data should be reported annually to the Secretariat, possibly in a standard format provided by the Secretariat. In principle, data and information that support directly regional management decision-making, should be housed at the Secretariat as a public asset of the Commission. The workshop recommended taking appropriate action to establish adequate data handling and managing capacity by the Commission with adequate support of human and financial resources.

RECOMMENDATIONS TO THE WORKING GROUP ON FISHERIES MANAGEMENT

66. This section summarizes the recommendations identified during the meeting. Some delegates voiced their concerns about discussing these general and broad topics and cautioned to be realistic in developing a list of recommendations considering the limited resources available to the RECOFI. On the other hand, it was noted that the role of this workshop was to inform the Commission on the issues related to fisheries for their decisions.

Improvement of data collection and monitoring capacity:

- establish standard data reporting formats and procedures for catch and effort data, survey results and other localized knowledge available at countries;
- Secretariat to prepare practical guideline for minimum data reporting.

Contributions to scientific activities:

- Members to report stock assessment results and estimates of biological parameters for stocks of interest to the Secretariat and the Commission;
- Member countries to provide information on survey plans and protocols prior to the survey and their results of survey on its conclusion to the Secretariat/WGFM who should distribute information to relevant institutes; and
- consider the development of joint studies on evaluation of impacts of stock enhancement including artificial reefs, and guidance regarding areas suitable for the deployment of artificial reefs.

Actions required for fisheries management:

- establish the regional fishery database to host data required for regional stocks and fisheries management as a matter of urgency with appropriate human and financial resources;
- develop a Regional Management Plan for Spanish mackerel; the Secretariat is to communicate appropriately with the IOTC on this regards; and
- the Secretariat and Member countries are to enhance communication with those sectors responsible for coastal development to raise awareness of their impacts on fish habitats, on the sustainability of fishery resources, and to take those impacts into account during future planning of coastal developments.

67. The workshop participants recommended specifically to:

- adopt the protocols and minimum data reporting identified in the draft regional resource monitoring strategy;
- hold another workshop to finalize the process, by re-defining data requirement in view of decisions taken by the WGFM, by examining the agreed protocols with actual data reported, and by developing a RECOFI guideline for the preparation of minimum indicators, prior to the Commission's sixth session in 2011; and
- take appropriate action to establish data handling and management capacity at the Commission.

RECOFI ACTION PLANS

68. Based on the discussion throughout the meeting, the draft regional resource monitoring strategy (Appendix 4) was approved unanimously.

OTHER MATTERS

69. There were no other matters.

ADOPTION OF THE REPORT

70. The Secretariat advised the participants that the Workshop report would be prepared and distributed for approval by correspondence. With that understanding, the meeting was formally closed. The Chairperson thanked representatives for their constructive inputs and hard work during the Session.

APPENDIX 1

Agenda

1. Opening of the meeting
2. Election of Chairperson and Vice-Chairperson
3. Adoption of the Agenda and arrangement for the meeting
4. Objectives of the Workshop
5. Country report - Review of national fisheries, exploitation status of fishery resources and other relevant scientific information available:
    a. Bahrain
    b. Iran (Islamic Republic of)
    c. Iraq
    d. Kuwait
    e. Oman
    f. Qatar
    g. Saudi Arabia
    h. United Arab Emirates
6. Status and trends of major fisheries, stock indicators and data availability in the region
7. Identification of high priority areas in fishery management of the Region and major gaps in knowledge – *For discussion*:
    - Social and economical importance
    - Stock conditions
    - Vulnerable Marine Ecosystems
    - Issues required urgent actions
    - Major gaps in knowledge and information
    - Stock enhancement
    - Coastal zone development
8. Development management strategy and work plans to ensure sustainable use of ecosystem in the region
9. Recommendations to the Working Group of Fisheries Management;
    - Actions to improve data collection and monitoring capacity
    - Actions in scientific activities
    - Actions required for fisheries management
    - Requirement of the next meeting
10. RECOFI action plans toward regional cooperative assessment of stock status and fishery monitoring in the short and medium term
11. Other matters
12. Adoption of the report

APPENDIX 2

List of participants

BAHRAIN

Abdulkaim Habib AL-RADHI
Head of Fisheries Assessment Section
Directorate
PO Box 20071
Manama
Tel.: 00973-17815870
Fax: 00973-17728459
E-mail: radhi58@hotmail.com

Nasser Ebrahim Nasser AL-SAFFAR
Marine Resources Specialist
PO Box 20071
Manama
Tel.: 009737815872
Fax: 0097317728459
E-mail: nasseralsaffar@hotmail.com

IRAQ

Musaddak D. Ali AL-SHAMARE
General Board for Fish Resources and Development
Baghdad
Tel.: 00964-7901616053
Mobile: 0127106645
E-mail: mmdmda@yahoo.com
Fisheries_iraq2005@yahoo.com

IRAN (ISLAMIC REPUBLIC OF)

Ali Asghar MOJAHEDI
General Director for Fisheries Management
Tehran- Fatemi Ave.No 230
Tel.: 0098 21-66941373
Fax: 009821-66941673
E-mail: a_mojahedi@hotmail.com

Farhad KAYMARAM
Head of Marine Biology and Stock Assessment Department of IFRO
No. 297 Wet Fatemy
Tehran
Tel.: 0098-21-66945145
Fax: 0098-21-66420732
E-mail: kaymaram_ifro@yahoo.com

Reza SHAHIFAR
Iranian Fisheries Organization
West Fatemi St., No 230
Tehran
Tel.: 009821-66941675
Fax: 009821-66941673
E-mail: r.shahifar@gmail.com

Mokhtar AKHONDI
Deputy Director General for Fishing Affairs
Iran Fisheries Organization
Tehran
Fatemi Ave. No 230
Tel.: 009821-66943965
Fax: 009821-66941367
E-mail: akhondi2200@yahoo.com

Ghazanfat AZADI
Deputy Diector General for Fishing Affairs
Iran Fisheries Organization
Fatemi St. No 230, Tehran
Tel.: 009821-66942576
Fax: 009821-66943852
E-mail: g_azadi@hotmail.com

Reza Abbas pour NADERI
Head of Fishery Management Group
Iran Fisheries Organization
Tehran- Fatemi Ave. No. 230
Tel.: 00982-166941373
Fax: 00982166941367
E-mail: r-naderimail@yahoo.com

KUWAIT

Haider MURAD
Deputy Ditector General for Fisheries, Public Authority for Agricultures Affairs and Fish Resources
PO Box 21422, SAFAT 13075
Tel.: (965) 22254111/ (965) 22254100
Fax: (965)22254103
E-mail: drhmuiad@yahoo.com

Marzooq Al-Hepi ALAZMI
Fish Resource Manager
State of Kuwait
PO Box 21422
Safat 13075
Tel.: 00(965)2224108 / 00(965) 99010813
Fax: 00(465) 2224103

OMAN

Abdullah Alnahdi Ibarahim SAID
PO Box 3089
P. C 111 Muscat Airport
Tel.: 00968-99830200/ 00968-24688358
E-mail: alnahdi21@gmail.com

Ibarahim Said AL-ANBOORI
112, Ruw:/251, Muscat
Tel.: 00968-95200528/00968 – 95200528
Fax: 00968-24740159
E-mail: camry2005@yahoo.com

Haitham Khamis AL-BUSAIDI
PO Box 430
P. C 130 Al Athiabah, Muscat
Tel.: 00968-99383489
Fax: 00968-24740159
E-mail: al-busaidi2000@hotmail.com

Said AL SHOJAIBE
Oman/Dhifar. Salalah Morth
Augad/P. P. B 33 & cod 217
Tel.: 0096899485055
Fax: 0096823219275
E-mail: raljanob@yahoo.com

QATAR

Jassim Saleh AL MOHAMMEDY
Assistant Director
PO Box 8703, Doha
Tel.: 00974-4463320
Fax: 00974-4131986
E-mail: jalmohamady@mmaa.gou.qa

Abdul Rahman AL BENALI
Biology Researcher
Box: 13800 (Doha-Qatar)
Complex Alzapai a Hose (c-g)
Tel.: 00974-5550620
Fax: 00974-5550620
E-mail: albenali202@hotmail.com

UNITED ARAB EMIRATES

Eisa ALYAFEE
Head of stock Assessment Section
PO Box 21
Tel.: 00971-67655881
Fax: 00971-67655581
E-mail: ealyafee@moew.gov.ae

Food and Agriculture Organization of the United Nations (FAO)

Piero MANNINI
Senior Fishery Officer
RECOFI Secretary
Regional Office for the Near East and North Africa (FAO-RNE)
Cairo, Egypt
11 AL-Eslan EL Zerai St.
Dokki-Cairo, P. O Box 2223
Tel.: +202-33316000-33316141
Fax: 202-37495981-33373419
E-mail: piero.mannini@fao.org

Sachicko TSUJI (Ms)
Senior Fishery Statistician
Viale delle, Terme di Caracalla
00153 Rome, Italy
Tel.: 0039-657055318
Fax: 0039-657052476
E-mail: sachiko.tsuji@fao.org

Yimin YE
Senior Fishery Resources Officer
Viale delle Terme di caracalla
00153 Rome-Italy
Tel.: 00 39-3488701922
Fax: 0039-0657053020
E-mail: yimin.ye@fao.org

IRAN (ISLAMIC REPUBLIC OF) (observers)

Mehdi N. SHIRAZI
Deputy Director General,
Public and International Relations Dept.
Iran Fisheries Organization
Tehran - Fatemi St.No 230
Tel.: +9821-66941674
Fax: +9821-66941673
E-mail: mnshirazi@gmail.com

Ahmad RIAHI
Director of Far Seas Fishery Management
Iran Fisheries Organization
Tehran - Fatemi St.No 230
Tel.: +9821-66944444
Fax:: +9821-66943852
E-mail: ahmadriahi@yahoo.com

Reza Nouri DAFRAZI
Expert in fisheries affairs
Iran Fisheries Organization
Fatemi ST,No 230
Tel.: +9821-66941373
Fax: +9821-66941376
E-mail: r_noorimail@yahoo.com
Nouri.ifo@gmail.com

Seyed Parviz Mohebbi NOZAR
Deputy for Fishing
Jahad-e-Agriculture
Iran Fisheries Organization
Hoimozgan Province-banddar abbas city
Tel.: +98761-3340904
Fax: +98767-3340903
E-mail: pjmohebbi@yahoo.com

Vahid TOFIGHI
Intl. Specialized Agencies Expert Public
and International Relations
Iran Fisheries Organization
Tehran - Fatemi St.No 230
Tel.: +9821-66941674
E-mail: vtofighi@gmail.com

Ebrahim MAYGOLINEJAD
Tehran - Fatemi St No 230
Tel.: +9821-66942575
Fax: +9821-66941673
E-mail: emaygoli@graail.com

Moheb Ali SISTANI
Deputy DG, Sistan and Baluchestan,
Fisheries of Chabahai
Deputy of General Director
Tel.: 05452222002
Fax: 0545-2221961
E-mail: Mohebali971@yahoo.com

Abdulhosein TANGESTANI
Deputy of Fishing and Fishing Ports
Busher SHILAT office
Taleghani Highway
SHILAT management Office
Tel.: 0771-2530024,
Fax: 0771-2527647

Hamidreza BARGAIN
Senior Expert of Aquatics Artificial
Reefs Development
Iran Fisheries Organization
Tehran - Fatemi Ave.No 230
Tel.: +9821-66943844
Fax: +982166941673
E-mail: Hr.Bargahi@gmail.com

Naser Karami RAD
Head of Breeding and Stock Enhancement of
Marine Aquatics, Iran Fisheries Organization
Fatemi ST No 230, Tehran
Tel.: +989123274631
Fax: +9821-66943913
E-mail: Naser276US@yahoo.com

Sabah KHORSHIDI
Head of Fisheries Statistics and Economy
Group
Iran Fisheries Organization
Address: Tehran - Fatemi Ave No 230
Tel.: +9821-66944444
Fax: +9821-66943852
E-mail: Sabah_khoishidi@yahoo.com

Jassem MARAMMAZI
Khoszestan, Ahwaz
Tel.: 0098-611-3921761-62
Fax: 0098-611-3921761
E-mail: marammazi@yahoo.com

Hooshang ANSARI
Ahwaz - 61645/ 866 Ghadir post
Tel.: 00986-113921763-5
Fax: 00986-113921761
E-mail: hooshng_ansari@yahoo,com

Mohammad Taghi AZHIR
Iran, sistan-o-balochabahar
Tel.: 0545-2220537-453
Fax: 0545-2220537
E-mail: azhir3@yahoo.com

Mohammad HASSANZADEH
Iran Fisheries Organization
Tel.: 0631-3333088/3333099
Fax: 0631-3333085
E-mail: KH-MS-silat@yahoo.com

Mahdi SHAKOURI
National Coordinator for RAIS
Iran Fisheries Organization
Fatemi Ave.No 230, Tehran
Tel.: +98-21-66943844
Fax: +98-21-66943913
E-mail: mehdishakouri@yahoo.com

Seyfollah KHORRAM
Head of Fishery Affairs Group
Iran Fisheries Organization
Fatemi St No 230, Tehran
Tel.: 09123997987
Fax: +9821-66943852
E-mail: kho_1384@yahoo.com

Behname DAGHOOGHI
Head of Biology and Stock Assessment Department
PO Box 1597 Persian Gulf and Oman Sea Ecological Research Institute
Ghadir Blvd Bandar Abbas Iran.
Tel.: 0098761/3333329/00989177633591
Fax: 0098761/3340017
E-mail: b.daghooghi@gmail,com

Reza DEHGHANI
Research Deputy
PGOSERI, Coastal street,
Tel.: 0098761/3333329
Fax: 0098761/3340017
E-mail: rdehghany@gmail.co

Morteza Pahlavan YALI
Costal Guard Expert
Research Expert
Tehran - Fatemi Ave.No 230
Tel.: +9821-66943873
Fax: +9821-66943863
E-mail: mpahlavanyali@gmail.com

Shahram SAFIYARY
Iran Fisheries Organization
Tehran - Fatemi ST No 230
Tel.: +989121506931
Fax: +9821-66943852
E-mail: Pars 2002@gmail.com

Bahram Kazan Zadeh ZAHEDI
Iran Fisheries Organization
Fatemi ST No 230
Tel.: +9821-66943971
Fax: +9821-66943940
E-mail: Zahedi_2052 @yahoo.com

Ali kamyab FARAHBAKHSH
Costal Guard Expert
Iran Fisheries Org.
Fatemi Ave.No 230, Tehran
Tel.: +9821-66943971
Fax: +9821-66943940
E-mail: AKF6683@Gmail.com

Tooraj Valinassab POURI
The head of Marine Biology and Stock Assessment Group
Jihad-e-Agriculture
Iranian Fisheries Research Organization
Tehran
297- Fatemi St Tehran-IRAN
Tel.: +9821-66945154
Fax: +9821-66940732
E-mail: T_Valinassab@yahoo.com

Shahiooz GHASEMI
Artificial Reefs Expert
Iran Fisheries Organization
Fatemi Ave.No 230, Tehran
Tel.: +9821-66943844
Fax: +982166941673
E-mail: shahrouzg@yahoo,com

Fariboiz Sheikh HASSANI
Head of Natural Conservation Office
Iran Fisheries Organization
Tehran - Fatemi Ave.No 230
Tel.: +9821-66943844
Fax: +982166941673
E-mail: fjfp4321@yahoo.com

OTHERS

Alireza Keyhanpour
Naser Soltanmohamadi
Abbas Afshar
Reza Khalili
Farhad Hosseinzadeh
Hamid Darbandsari
Mehdi Alamii
Dr Gholamr eza Abbasian
Maryam Movassagh (Ms)
Sara Nikbakht (Ms)

APPENDIX 3

Prospectus of the FAO/RECOFI Regional Workshop on Stock Indicators and Stock Status Reporting

BACKGROUND

Sustainable fisheries require maintaining productivity of fish stocks through controlled exploitation based on best available knowledge and information on biological and ecological characteristics of resources (e.g. growth rate, lifespan, area and season of reproduction, distribution, recruitment fluctuations, etc) and understanding of the natures and likely impacts of exploitation (e.g. effort distribution, catch composition, fishing mortality level, impacts to physical and biological environments). The aim of stock status assessment is to understand the current status of resources exploitation relative to the long-term sustainable levels. The results of stock assessments, together with environmental, economic, and sociological considerations, are then used to formulate scientific advice on effective and pragmatic fisheries management measures and resources conservation.

The stock status reporting is fundamental to the RECOFI mandate. Little progress, however, has been made. The Commission at its fourth session (Jeddah, Kingdom of Saudi Arabia, 7–9 May 2007) addressed this issue and referred to the Working Group on Fisheries Management for further analysis. The second session of the Working Group on Fishery Management (Cairo, Egypt, 27–30 October 2008) briefly reviewed the major fisheries in the RECOFI region and identified a set of species of primary concerns and agreed on the gear-boat classifications to be used for further work. The Working Group concurred on the need to promote and improve cooperation within RECOFI for the appraisal of the state of fishery resources and to formulate scientific advice for management. It also noted the importance to shift toward an ecosystem approach to fisheries together with adaptive management.

OBJECTIVES

The objectives of the FAO/RECOFI Regional Workshop on Stock Indicators and Stock Status Reporting are to:

- Review the availability of data on the biology of the identified priority resources, catch and effort statistics for the relevant fisheries, other socio-economic statistics, results of stock assessments and other relevant research activities in member countries;
- Analyze and assess the status of fisheries in the RECOFI region and the stock status of identified priority resources based on available data;
- Identify the components that require immediate management actions, stock assessment, and/or improved monitoring in the region;
- Formulate scientific advice on management strategies and measures when appropriate;
- Identify major gaps in knowledge and information, priority areas for regional cooperation and potential joint activities; and
- Formulate the RECOFI work programme for regional cooperation in assessment of stocks and fishery status appraisal in the short and medium term.

OUTPUTS AND IMPACTS

The expected outputs and outcomes of the workshop are:

- Improved understanding on the status of major fisheries and identified priority resources;
- Scientific advice on management strategies and measures;
- Identification of the regional priorities and formulation of the action plan to improve monitoring and assessment capability concerning regional fishery resources and ecosystem;
- An integrated statistics and knowledge database for the purpose of stock assessment and fishery management in the Region.

STRUCTURE OF THE WORKSHOP

The workshop consists of two parts. The first part is the presentation and discussion of country reports of RECOFI members, which overview the current status of fisheries, data availability, management measures, stock assessments and other research activities in each county. Members are kindly requested to prepare the country report following the guideline in Annex 1. The Secretariat will provide an integrated overview of regional status and trend of fisheries and catch of identified primary resources based on data provided prior to the meeting as well as overview of fishery data availability and present management regulations in the region based on country reports.

In the second part of the workshop, the meeting will further examine the materials provided to the meeting, identify the priority areas in regional fishery management and vulnerable components in the region, and formulate scientific advice on management strategies and measures. The main focus of the workshop will be formulating concrete future work plans toward long-term sustainable regional fishery management and stock assessment.

The FAO Fisheries Management and Conservation Service and Fisheries and Aquaculture Information and Statistics Service will be part of the workshop Secretariat and provide technical backstopping in coordination with the RECOFI Secretary. The elected Chairperson/Coordinator will ensure the workshop to achieve the objectives in collaboration with the RECOFI Secretary. An editorial team will be established to finalize the workshop proceedings that will be published as the FAO Fisheries and Aquaculture report series.

PREPARATION BEFORE THE WORKSHOP

Members are kindly requested to report to the RECOFI Secretary by 25 June 2009 the time series data of catch and effort by fishery as well as catch of the priority resources listed in Annex 2 (the Secretariat will send the standard data template to the designated participants). Country reports should be submitted by 5 July 2009 for distribution prior to the workshop.

FUNDING

The workshop will be hosted by the Islamic Republic of Iran. In accordance with the existing practice, the costs related to the attendance to the FAO/RECOFI Regional Workshop on Stock Indicators and Stock Status Reporting shall be borne by the RECOFI Members.

INVITATIONS AND PARTICIPATION

Invitations for the workshop will be issued by the Secretary of RECOFI trough the FAO Regional Office for the Near East and North Africa (FAO/RNE). Participants should be actively involved in fishery stock assessment and management. In consideration of the topics to be dealt with at the workshop, participants are expected to be fisheries experts currently engaged in fishery stock assessment and management.

LOCATION AND DATES

The workshop will be held from 26 to 29 July 2009 in the Islamic Republic of Iran. The workshop venue will be communicated to participants as soon as possible.

LANGUAGES

The workshop will be conducted in English.

ADMINISTRATIVE ARRANGEMENTS

Administrative arrangements will be handled by FAO/RNE in cooperation with the Iranian Fisheries Organization (SHILAT).

REPORT OF THE WORKSHOP

The report of the workshop will be published in the FAO Fisheries and Aquaculture Department report series.

WORKSHOP INFORMATION

Additional information about the workshop can be obtained from:

OFFICERS OF THE WORKSHOP

Officers of the workshop will include:

Workshop Coordinator:	Piero Mannini (piero.mannini@fao.org)
Technical Secretary:	Sachiko Tsuji (sachiko.tsuji@fao.org)
Technical Backstopping Officer:	Yimin Yi (yimin.yi@fao.org)
Workshop Secretary/Assistant:	Mona Hafez (mona.hafez.fao.org)

Annex 1

COUNTRY REPORT – National Overview of Fisheries in RECOFI Region

The purpose of this template is to ensure for the Commission to be able to examine national fisheries information in comparable way and analyse the current status of fisheries and resources in the Commission area. Report should cover the following points as much as possible with good, condensed general narratives including tables, graphs, and maps as appropriate. Quantity in parentheses is only indicative.

Summary

Provide a general overview of the status of fisheries and resources in the country and major issues (0.5 page)

Fisheries overview

For each of major fisheries, provide the followings:

- General description of operations including, gears and types of fishing vessels used, target species and main species caught, and seasonality; substantial evolution of main practices;
- Historical trend of catch; total production volume (tonnes) and value in either US$ or local currency in the recent years;
- Catch and CPUE trends of identified key species. List of key species is available in Annex 2;
- Management measures and regulations specific to fisheries; monitoring and data collection procedures;
- Main issues
  (0.5-1 page per fishery)

The regulations

Provide a list of the main existing regulations and management measures in general as well as applicable to certain fisheries (e.g. licensing, resource ownership, gear restriction, closed area, closed season, catch limit, Marine Protected Area, etc), the enforcing institutions and monitoring procedures. (0.5 page)

Contribution to society and economy

Describe the contributions of fishery sector (artisanal, small scale, commercial, industrial, foreign fleet) to national food security, social and economic development, including impact on livelihood of rural households, employment, marketing, and trades with emphasis on role in poverty alleviation. (0.5 page)

Research

Stock assessment

Describe the results of stock assessments conducted on any of the priority species listing the data used, providing a brief description of procedures, major assumptions and uncertainties. When applicable and appropriate, use guideline in Appendix A.

Fishery and biological survey and research

Provide list of fishery and biological surveys and researches and main results, including major findings relating to the priority species.

The institutional framework

Identify the institution vested with administrative control of fisheries (i.e. the lead government agency), and its specific responsibilities. Provide an organigramme showing the location of the fisheries agency under the concerned Ministry; and a breakdown of the structure of the agency. Provide information about the role of and support to the fishers associations and other relevant private sector associations, and self regulation efforts. (0.5 page)

References (Bibliography and Links)

List of key species supporting main reference fisheries in the RECOFI area

FAO name	ASFIS	Common name	Scientific name
Penaeid shrimps nei	PEZ	Shrimps	Penaeidae
Blue swimming crab	SCD	Blue swimming crab	*Portunus pelagicus*
Pharaoh cuttlefish	IAH	Cuttlefish	*Sepia pharaonis*
Stolephorus anchovies	STO	Anchovies	*Stolephorus* spp
Indian oil sardine	IOS	Indian oil sardine	*Sardinella longiceps*
Bludger	NGY	Jacks	*Carangoides gymnostethus*
Golden trevally	GLT	Golden trevally	*Gnathanodon speciosus*
Indian mackerel	RAG	Indian mackerel	*Rastrelliger kanagurta*
Snubnose emperor	LBW	Orange finned emperor	*Lethrinus borbonicus*
Pink ear emperor	LTS	Redspot emperor	*Lethrinus lentjan*
Spangled emperor	LHN	Spangled emperor	*Lethrinus nebulosus*
Coral hind	CFI	Coral grouper/Bluespotted	*Cephalopholis miniata*
Orange-spotted grouper	ENI	Orange-spotted grouper	*Epinephelus coioides*
White-spotted spinefoot	SCN	Rabbitfish	*Siganus canaliculatus*
Narrow-barred Spanish	COM	King mackerel/Narrow-	*Scomberomorus commerson*
Longtail tuna	LOT	Longtail tuna	*Thunnus tonggol*
Requiem sharks nei	RSK	Sharks	Carcharhinidae

Appendix A

Example form of reporting stock status of identified key species, where appropriate and applicable

Table 1: Indication of Fish Stock Status

Country: _____ Region: _____

Species	**Stock**	**Trans-boundary/ Straddling/ EEZ>**	**Catch (t)**	**Abundance Estimate**		**Current biomass (t)**	**Unfished biomass (T)**	**Stock Status**	**$F_{current}$**	**F_{MSY}**	**Annual management plan prepared?**
				Absolute	**Relative**						

Notes relating to completion of Table 1

Background

The purpose of this table is to enable the Commission to examine and report on the current status of fisheries resources in the Commission area using information from as many sources as possible obtained from member countries as well as collaboration with relevant competent regional organisations and regional NGOs. This will allow an assessment and report to the Commission on the status of stocks of relevance to the Commission and the likely effects of further fishing and of different fishing patterns and intensities".

The term "stocks of relevance to the Commission" is broad and includes transboundary/straddling stocks, as well as stocks of species that are found in more than one country.

Table fields

The following notes provide guidance for completing Table 1.

Species: Provide the scientific name – genus and trivial name, e.g. *Penaeus semisulcatus*.

Stock: If there are more than one stocks of the species for which assessments are done, provide the name of the stock unit.

Transboundary and/or straddling stock: Indicate with a "T" if the stock extends to the waters of an adjacent country; indicate with an "S" if the range of the stock extends beyond the EEZ to the high seas; use EEZ if the stock is entirely within national territory or jurisdiction.

Abundance: If an absolute estimate of stock abundance exists, i.e. *x* tonnes, indicate with a "✓"; if not use an "×". If a relative index of abundance exists, e.g. a catch-per-unit-effort measure, or trend, likewise use a "✓"; or "×" otherwise.

Current biomass: If there is a current estimate of stock biomass (i.e. estimated within the last 12 months) provide the biomass value in tonnes. It will be useful to indicate how the biomass was estimated.

Unfished biomass: The 'unfished' biomass is the biomass of the stock before fishing started. If this is known, indicate. Again, be able to provide supporting comments if appropriate.

Stock status

U: Underexploited, undeveloped or a new fishery. Believed to have a significant potential for expansion.

M: Moderately exploited, exploited with a low level of fishing effort. Believed to have some limited potential for expansion in total production.

F: Fully exploited. The fishery is operating at, or close to, an optimum yield, with no expected room for expansion.

O: Overexploited. The fishery is being exploited at above a level that is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse.

D: Depleted. Catches are well below historical levels, irrespective of the amount of fishing effort exerted.

R: Recovering. Catches are again increasing from after having been depleted or collapsing from a previous high.

Fishing mortality: If the current fishing mortality is estimated, please indicate, otherwise mark with a "×". Likewise for fishing the estimated mortality at "MSY".

Detailed stock assessment information

Table 2 provides an opportunity to provide more detailed information.

Table 2: Detailed Stock Assessment Indicator

Fishery Management Unit: .....

		Estimate	Comment
Biomass	Unfished stock biomass (B_0)		Exists? How estimated?
	Current stock biomass (B_{SB})		Note how estimated, e.g. trawl, acoustic survey? Stock structure models – VPAs and derivatives
	Spawning stock biomass (B_{SSB})		Biomass of mature individuals
	Biomass giving MSY (B_{MSY})		
	Biomass at minimum SSB		Minimum SSB is a limit reference point at which lower stock biomasses levels are considered highly undesirable.
	Target biomass		The level/size of biomass constituting a target reference point.
Mortality	Natural mortality (M)		
	Fishing mortality (F) at MSY (F_{MSY})		
	$F_{0.1}$		Or some other fishing effort reference unit
	Current F		
Fishing effort	Fishing Effort		Indicate units of fishing effort; provide time series
	Technological creep		Analysis of changes in fishing power over time
	Fishing effort at MSY (F_{MSY})		
	Fishing effort at reference level of fishing mortality (F_{Ref})		
	Recruitment measure/index		Implies some means of determining recruitment
Yield	Maximum sustainable yield (MSY)		Indicate model(s) used to obtain the estimate
	Optimum Yield		May involve economic (and/or social) considerations
	Total allowable catch (TAC) or effort (TCE)		This should be the most recent value available
	Year when current MSY was determined		
	Year when current TAC/TCE was determined		

APPENDIX 4

RECOFI regional resource monitoring strategy (draft)

The fifth Session of the Regional Commission for Fisheries (RECOFI) held in Dubai, United Arab Emirates (12–14 May 2009) agreed the shift toward an ecosystem approach to fisheries (EAF) with adaptive management procedures. The Workshop on Stock Indicators and Stock Status Reporting held in Tehran, Islamic Republic of Iran, during 26–29 July, 2009, discussed and developed this draft regional resource monitoring strategy based on current situation of fishing practices and data collection capacities and common interests and concerns in the region.

While monitoring indicators within an EAF context need to cover a wide spectrum of aspects in the fisheries sector, this strategy focuses only on monitoring biological aspects of fisheries and fishery resources, including non-target species. The key strength of monitoring indicators in the context of EAF as well as in adaptive management procedures is the direct link between monitoring indicators and management actions which would be implemented when a given monitoring indicator reaches pre-determined reference point. This strategy tries to define a minimum set of data which can serve to produce a range of potential monitoring indicators directly linked with operational objectives which should be discussed at the forthcoming session of RECOFI Working Group on Fisheries Management (WGFM). In the absence of agreed-upon operational objectives the delegates did not attempt to produce a final and detailed set of indicators.

Key issues identified:

First, the meeting reviewed the status of current fisheries, data collection and monitoring of catch and effort, their relative importance in food security and the economy of each member country as well as their importance in providing livelihood in the community and the main issues of relevance in the context of a regional ecosystem. Key issues identified include:

- Shrimp trawls as related to decline of catch rate, and over-capacity and their impact on a large number of species including commercially important coastal fish species through catch removal before their maturity.
- Difficulty in managing multi-species, multi-gear fisheries. Narrow-barred Spanish mackerel (*Scomberomorus commerson*) was identified as the species that required the highest attention for its stock status due to its high commercial value, the recognition of severe decline in its catch rate, and its shared importance throughout the region. Similarly, in the northern area of the region, there was marked decline of silver pomfret (*Pampus argentus*) and Indian shad (*Tenualosa ilisha*).
- Degradation of marine habitats, particularly the coastal and inter-tidal zones which are critical refugia for many of the marine organisms where they are protected from fishing pressure. Degradation includes frequent harmful algal blooms and destruction of mangrove and/or sea grass areas through insufficiently planned coastal development and increased discharge of pollutants.
- Appraisal of stock enhancement and of artificial reefs which have been used for a substantial period in parts of the region.

The impact of stock enhancement efforts was noted as potentially important but basic information on their positive and negative effects and extent of activities associated with them is inadequate. Further clarification will be needed especially on goals and principles on how and what to manage. Now is not in the stage to consider a monitoring indicator for such efforts. The degradation of marine habitats is, in principle, not under the control of the fisheries authorities; this should be dealt with by enhancing communication with the responsible national players within the region as well as with other relevant regional organizations such as Regional Organization for Protection of Marine Environment (ROPME). Thus, the first two issues identified are a priority of common concern in the context of this strategy.

The delegates recognized the need to improve communication and coordination within the fishery sector in the region as well as with the other sectors concerned.

Selection of monitoring indicators:

In the process of developing monitoring indicators to address the two issues identified above, the meeting focused to minimize the set of indicators. These indicators can be modified and expanded in the future when more experience and data are accumulated. It is important to initiate a whole process of EAF, i.e. setting operational objectives and corresponding monitoring indicators and management strategy, with implementation and follow-up evaluation. In the absence of agreed-upon operational objectives, it is not possible to come up with a specific set of monitoring indicators. Therefore, attention was focused on identifying key reference species and fisheries to address this issue.

In order to make the initial step as feasible and pragmatic as possible, consideration was given only to the kinds of information obtainable through existing data collection systems. Conclusions from several analyses conducted at the meeting, including a rough Productivity-Susceptibility Analysis (PSA) to identify the species most sensitive to fishing practices in the region, and the types of gear most efficient in harvesting include the following:

- Most of the shrimp catch was harvested by shrimp trawlers which also caught a broad range of marine species as by-catch.
- Shrimp trawls and driftnets are the two top gear types that have the highest impact on the priority species.
- Sharks are the most sensitive, as a whole, to the types of gear used in the region, followed by groupers and emperors.
- Type of gears commonly used throughout the region are driftnet/gillnet, wire traps and hook and line that primarily target coastal fish in addition to shrimp trawls. Although "driftnet" and "gillnet" could be consolidated into one gear type for the purpose of identification of monitoring indicators, member countries may apply their own national gear classifications currently in use. The harmonization of terminology for this purpose should be one of the priority tasks in the near future. Based on these observations, together with the issues and concerns identified during a review process, the participants decided that the initial focus of this strategy of data collection should target the following monitoring indicators:
  - Ecosystem-wide impacts of shrimp trawls: no specific monitoring indicators to address this issue were considered other than collecting data about all components of the catch of shrimp trawlers (i.e. targeted, retained, and non-retained parts of the catch) and the extent of operational activities;
  - Exploitation of finfish resources: through trends in the CPUE of groupers and emperors as indicators of exploitation pressure on the coastal fish species, together with enhanced data collection of sharks mainly for a better understanding;
  - Stock status of priority species – Narrow-barred Spanish mackerel: Although the narrow-barred Spanish mackerel was not identified as one of most sensitive species and species groups, there is a strong interest and much concern about stocks of this fish in the region. The bulk of the catch was, in fact, taken by highly targeted fishing operations with high selectivity gear. This fact has produced information useful for stock assessment (much biological and ecological information has already been collected over the years). Therefore, data collection specified for stock assessment is considered as high priority[1].

[1] The selection of the narrow-barred Spanish mackerel does not mean the importance of other species, including silver pomfret and shad is any less.

While this strategy targeting data requirement for the above indicators, some additional indicators may be derived from the set of minimum required data, e.g., occurrence of reference species which are susceptible to fishing gear used but that are of lower commercial value, once reference species are identified that correspond to operational objectives.

Protocols of minimum data reporting:

A set of **mandatory** data required to monitor those three targeted components is as follows:

Ecosystem wide impacts of shrimp trawls:

- dates of opening and closure of the season;
- species composition of by-catch and discards, if available;
- total number of shrimp trawlers as well as their size categories (e.g. steel-hulled/speed boats/dhows);
- annual effort in terms of average tow duration and number of tows per day, and number of days at sea, for each vessel type and size categories;
- quantity of annual catch of shrimp, swimming crab, cuttlefish, narrow-barred Spanish mackerel, emperors, groupers, sharks, rays, and other finfishes, and annual amount of discards;
- shrimp species composition within the shrimp catch , if available [optional]; and
- catch composition of discards, if available [optional].

Here, vessel size categories indicate those used in relevant country. In case of no multiple size categories, data should be presented as one size category.

If any of by-catch reduction devices (BRD) are used or other mitigation measure are taken, the catch and effort data obtained from those vessels with mitigation measures should be separated from those vessels operating normally. In this case, a clear description of BRD/mitigation measures should be provided together with the data.

Data on species composition of shrimp, as well as catch composition of discards, are optional. If those data are obtained from surveys and research efforts other than regular monitoring, supplementary information on samples taken should be provided.

Exploitation of finfish resources;

- Annual efforts of “driftnet/gillnet”, wire-traps, and hooks-and-line fisheries, respectively, and description of efforts used. Members may decide to define kinds of efforts used but are encouraged to include “number of days at sea” to be included.
- Annual total catch, amount of catch of narrow-barred Spanish mackerels, emperors, groupers, sharks and rays, and amount of discards. For emperors and groupers, species should be identified to the extent possible.
- Species composition of discards, if available.

The above is the minimum standard of data to be reported with no prohibition on going beyond it. All Members are strongly encouraged to provided further detailed information, especially further breakdown of the total catch into species groups, species identification within the catch of the species group, as well as a breakdown of gear categories by boat-size or gear-size. If member countries decided to report effort in further disaggregated categories within each gear (e.g. small and large wire-traps), catch data must be reported in the same categories.

Once the database is established, a workshop may be required to review indications of a range of “effort” terms and agree on standard “effort” definition for those three gear types, in order to assure a certain level of comparability among catch rates of different countries.

Stock status of selected species – narrow-barred Spanish mackerel;

- Monthly catch amount and its fork length composition.
- For operations targeting narrow-barred Spanish mackerel (e.g. kingfish fixed net, driftnet/gillnet, and hooks and line), monthly catch with length composition and effort by gear type, together with clear description of kinds of effort used.
- Any results obtained through surveys and research work relevant to narrow-barred Spanish mackerel, including fishery-dependent and fishery-independent stock indicators, biological parameters (e.g. growth rate, age-length relationship, reproductive information, natural mortality) and ecological information (e.g. distribution, feeding habitat, habitat preferences).

Data requirement in this component was established based on data requirement for stock assessment rather than information on data currently collected. Members should make their best effort to develop a system and capacity to accommodate this requirement at the earliest possible opportunity. Data should be reported to the Secretariat once a year possibly in the standard format provided by the Secretariat.

In principle, data and information that directly support regional management decision-making should be housed in the Secretariat as a public asset of the Commission. The meeting recommends taking an appropriate action to establish adequate data handling and managing capacity at the Commission's Secretariat with adequate support of human and financial resources.

On the possible establishment of the regional database, Members should provide any of their historical data together with their most updated data sets, and then should continue reporting all required data annually. The Secretariat should incorporate them into the central database in the region which will be accessible to all relevant institutes in the region promptly.

Additional information sharing:

In addition to those requirements above, member countries should provide information on survey plans and protocols prior to their undertaking, as well as results of such surveys upon their conclusion, to the Secretariat/WGFM who, in turn, should distribute this information to relevant institutes. This allows for all relevant institutes to note the on-going as well as planned activities and to modify survey procedures to make them comparable, when appropriate and possible.

Data reporting of catch by species by RECOFI Subdivisions to FAO/RECOFI should be continued, together with the number of vessels and gear types, if possible.

A common regional work plan needs to be developed on the appraisal of the ecology and population dynamics of those species of common interest and/or listed as RECOFI priority species. This would permit researchers to compare and integrate results and include local knowledge and to maximize the use and effectiveness of the data collected.

Attachments A to G are included in the accompanying CD ROM

Attachment H

Summary of catch and fisheries in the region

Figure H-1 Capture production in the region reported to the RECOFI Secretariat. Details species (groups) correspond to the priority species (groups) identified at the 2nd WGFM.

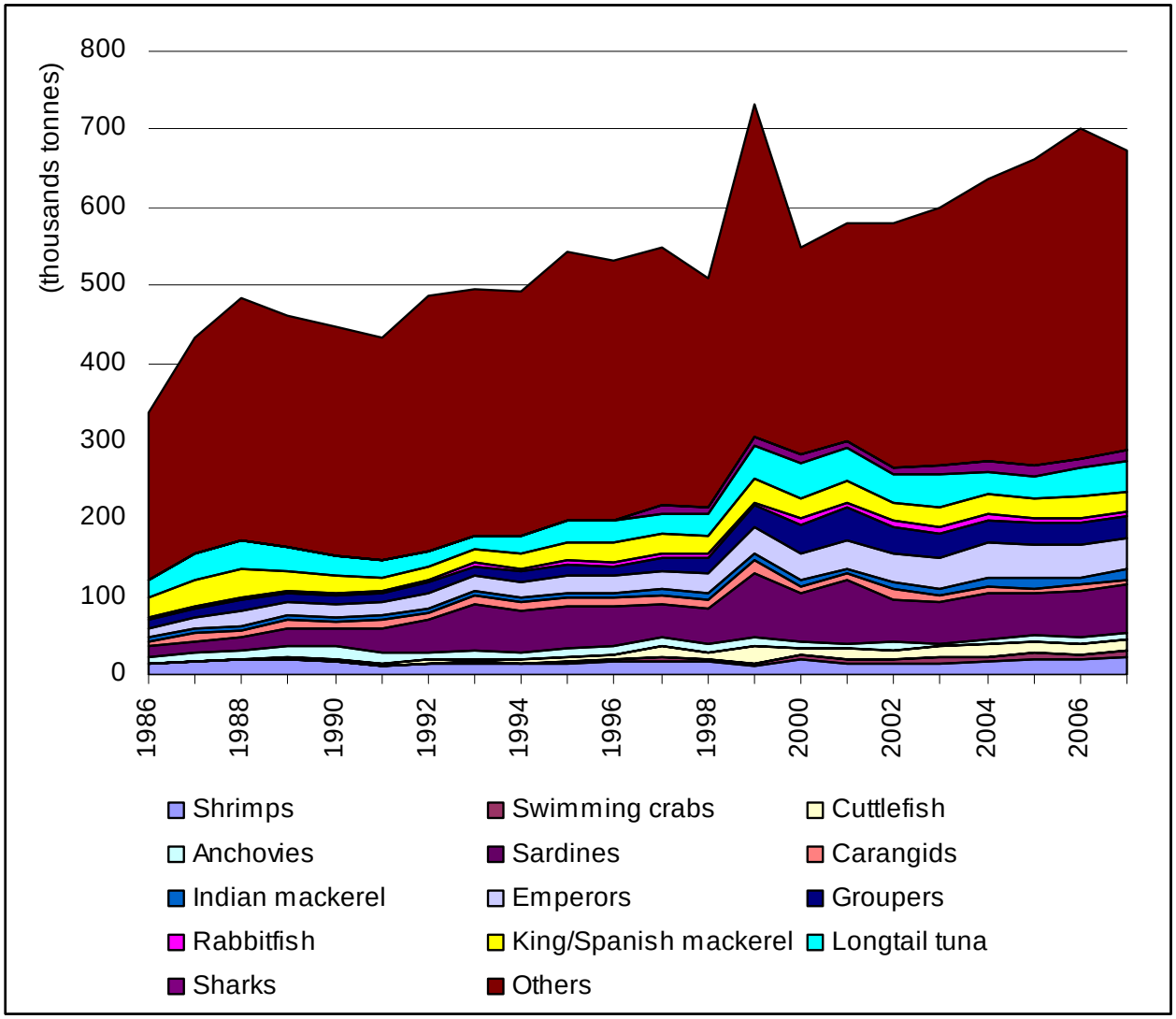


Figure H-2-1. Catch composition in species groups by gear type.

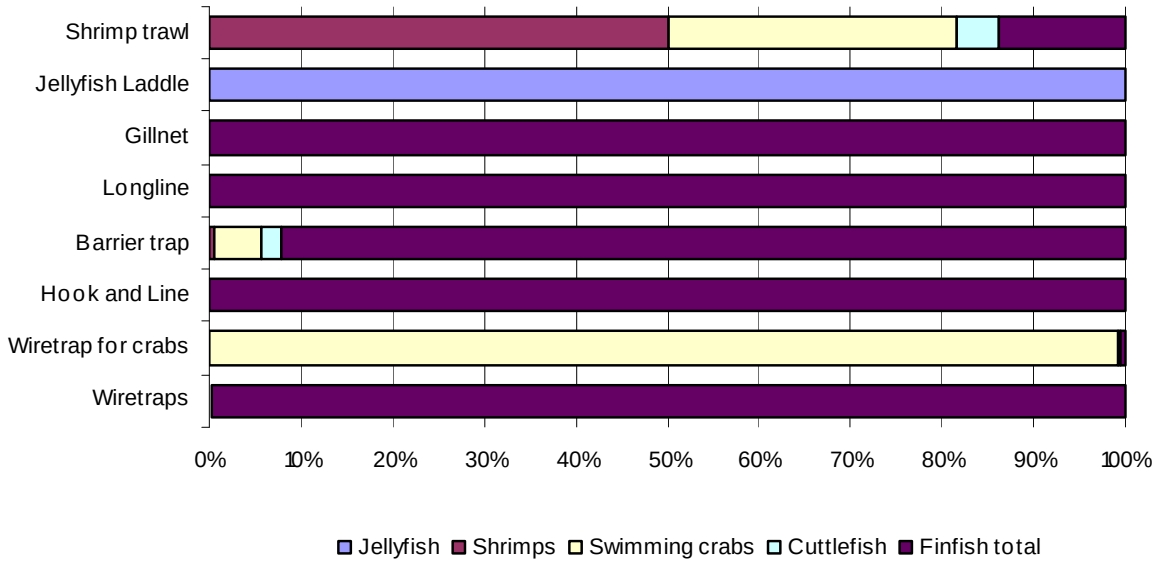


Figure H-2-2. Catch composition of finfish (by priority species groups) by gear types.

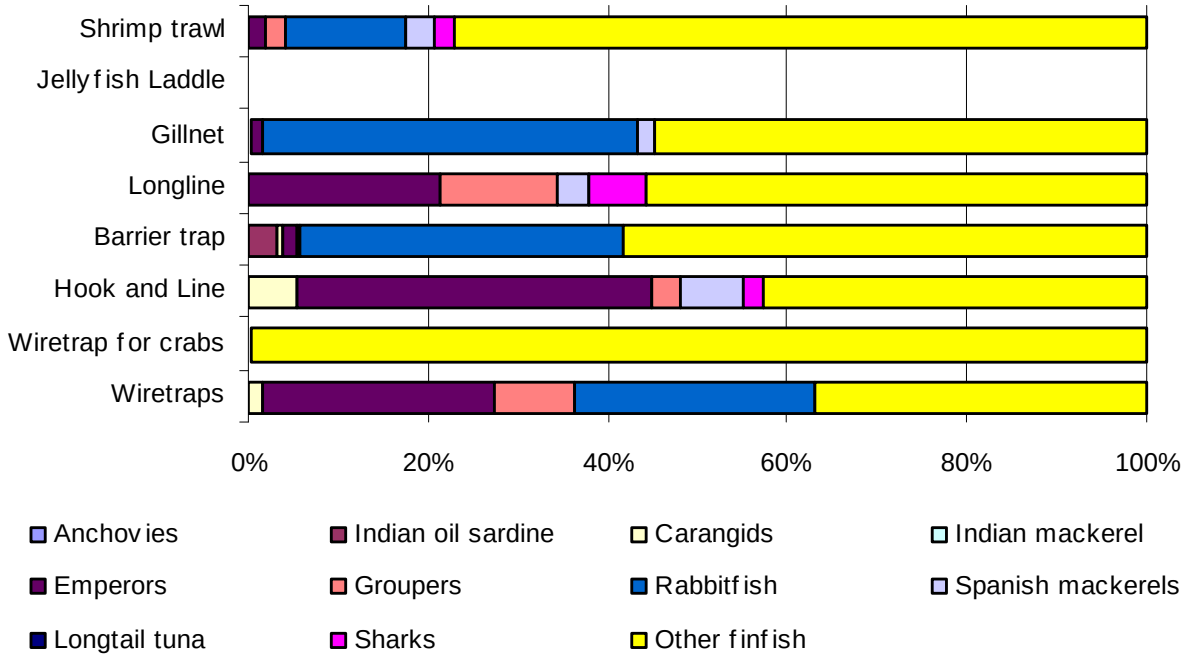
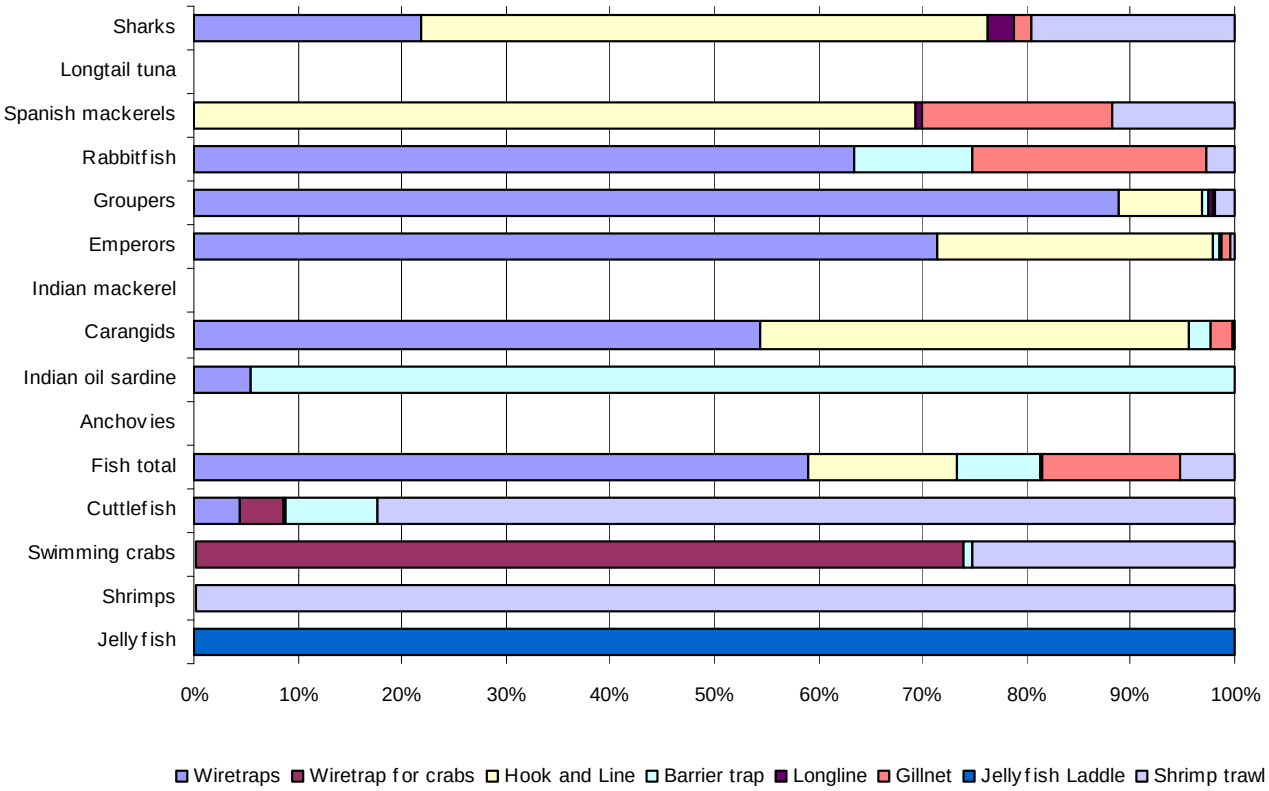


Figure H-2-3. Catch composition in gear targeting individual priority species groups.



Results of preliminary survey on fisheries characteristics with questionnaires

Table I-1 The importance of fisheries from a social/economic perspective. Figures in the table indicate average score based on qualitative assessment by participants on with three categories defined as High (score 3), Medium (score 2) and Low (score 1).

	Shrimp trawl	**Finfish trawl**	**Beach seine**	**Gillnets**	**Drift nets**	**Fixed net**	**Spanish mackerel fixed net**	**Wire traps**	**Crab traps**	**Barriers**	**Hook and Line**	**Long-line**	**Average score**	**Rank**
Sample size (No. Responses)	3	0	2	4	5	3	2	6	2	2	6	5		
Direct employment	2.7	-	1.5	2.5	2.4	1.3	2.5	2.3	2.5	2.5	2.0	2.0	**2.20**	**3**
Indirect employment	2.7	-	1.0	1.8	1.8	1.0	2.0	2.0	2.0	2.0	1.7	1.6	**1.77**	**6**
Local food supply	2.7	-	2.0	3.0	2.6	2.0	3.0	2.5	2.0	3.0	2.0	1.6	**2.40**	**2**
Contribution to national food supply	2.7	-	2.0	3.0	3.0	2.7	3.0	2.3	2.0	3.0	2.0	2.0	**2.52**	**1**
Contribution to export	2.7	-	2.5	2.0	1.8	1.3	2.5	2.0	1.5	2.0	1.5	2.0	**1.98**	**4**
Supply to local industry	2.7	-	1.0	1.3	1.6	1.0	1.0	1.2	2.0	1.5	1.0	1.0	**1.38**	**8**
Contribution to national GDP	1.3	-	1.5	1.3	1.6	1.7	2.0	1.5	1.0	1.5	1.5	1.6	**1.50**	**7**
Illegal operations	2.0		1.5	1.3	1.4	1.3	1.5	1.3	1.0	1.0	1.0	1.0	**1.30**	**9**
Oil consumption	2.3	-	2.0	1.5	2.0	1.0	2.0	1.8	2.0	2.0	1.5	1.8	**1.82**	**5**
Average Score:	**2.41**	**-**	**1.67**	**1.94**	**2.02**	**1.48**	**2.17**	**1.89**	**1.78**	**2.06**	**1.57**	**1.62**		
Rank:	**1**	**-**	**8**	**5**	**4**	**11**	**2**	**6**	**7**	**3**	**10**	**9**		

Table I-2 The importance of fishery in terms of ecological and environmental impacts. Figures in the table indicate average score based on qualitative assessment by participants on with three categories defined as High (score 3), Medium (score 2) and Low (score 1).

	Shrimp trawl	**Finfish trawl**	**Beach seine**	**Gillnets**	**Drift nets**	**Fixed net**	**Spanish mackerel fixed net**	**Wire traps**	**Crab traps**	**Barriers**	**Hook and Line**	**Long-line**	**Average score**	**Rank**
Sample size (No. Responses)	3	1	2	4	5	3	2	6	2	2	6	5		
Impacts of red tide	1.0	1.0	3.0	1.5	2.2	2.3	2.0	1.8	1.0	3.0	1.3	1.5	**1.81**	**4**
Negative impacts of coastal development	2.5	3.0	2.5	2.0	2.2	2.0	2.5	1.8	2.0	2.0	2.0	2.0	**2.21**	**1**
Positive impacts of coastal development	1.5	1.0	1.5	1.3	1.4	2.0	1.5	1.3	1.0	2.0	1.5	1.5	**1.46**	**7**
Impact to mangrove	1.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	**1.04**	**9**
Impact to coral reef	1.8	1.0	2.0	1.8	2.0	2.0	2.0	2.3	1.0	1.5	1.5	1.8	**1.72**	**5**
Impact to other natural environment	2.3	3.0	2.5	1.5	2.2	2.3	2.0	2.2	1.5	1.5	1.2	1.3	**1.95**	**3**
Discards	3.0	3.0	2.5	1.8	1.8	2.0	2.5	1.8	2.0	2.0	1.0	1.0	**2.03**	**2**
Bird bycatch	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.3	**1.03**	**10**
Turtle bycatch	2.0	1.0	1.5	1.3	1.2	1.3	1.0	1.0	1.0	1.0	1.0	1.0	**1.19**	**8**
Bycatch of other sensitive species	2.3	2.0	1.0	1.5	1.4	1.0	2.0	1.3	2.0	2.0	1.3	1.0	**1.58**	**6**
Average Score:	**1.88**	**1.70**	**1.85**	**1.45**	**1.64**	**1.70**	**1.75**	**1.57**	**1.35**	**1.70**	**1.30**	**1.33**		
Rank:	**1**	**4**	**2**	**9**	**7**	**4**	**3**	**8**	**10**	**4**	**12**	**11**		

Table I-3 Administrative and management tools and measures currently utilized for individual fisheries. Figures in the table indicate the percentage of countries that utilize relevant tools/measures for individual fisheries.

	Shrimp trawl	**Finfish trawl**	**Beach seine**	**Gillnets**	**Drift nets**	**Fixed net**	**Spanish mackerel fixed net**	**Wire traps**	**Crab traps**	**Barriers**	**Hook and Line**	**Long-line**
Sample size (No. Responses)	3	0	2	4	5	3	2	6	2	2	6	5
Subsidies	67%	-	0%	50%	20%	33%	50%	50%	50%	50%	17%	20%
Buy-back program	67%	-	0%	25%	20%	33%	100%	33%	50%	50%	17%	20%
On-board observer	33%	-	100%	25%	40%	67%	50%	50%	50%	50%	33%	60%
Gear inspection	100%	-	50%	75%	80%	67%	50%	83%	100%	100%	67%	60%
Port inspection	100%	-	100%	75%	60%	33%	100%	50%	0%	50%	33%	60%
Sample survey at landings	100%	-	100%	75%	80%	67%	100%	83%	50%	100%	67%	60%
Log book	0%	-	0%	25%	20%	0%	0%	17%	50%	0%	33%	40%
License for operation	100%	-	0%	75%	80%	33%	50%	67%	100%	100%	33%	80%
License for boats	100%	-	100%	100%	100%	100%	100%	100%	100%	100%	83%	100%
Gear restriction	100%	-	50%	50%	60%	67%	50%	67%	50%	100%	67%	60%
Closed season	100%	-	0%	25%	40%	0%	0%	17%	0%	0%	17%	20%
Closed area	100%	-	50%	50%	40%	67%	50%	50%	50%	100%	17%	40%

Results of preliminary Productivity Susceptibility Analysis

Table J-1 Risk score based on species group productivity. In addition to the RECOFI priority species, corresponding to top 11 rows, productivity risk of other commercially important species were also examined. “H”, “M”, and “L” indicate high, medium, and low risks to exploitation (scored as 3, 2, and 1), respectively, based on their productivities.

	Maturity	**Max age**	**Fecundity**	**Size maturity**	**Reproduction**	**Trophic level**	**Total score**	**Rank**
High risk:	>4yrs	>25yrs	<100 eggs	>150cm	Live birth	top predator		
Low risk:	<2yrs	<10yrs	>20000 eggs	<60cm	broadcast release	plankton feeder/herbivore		
Shrimp	L	L	L	L	L	L	1.00	8
Crab	L	L	L	L	M	L	1.17	7
Cuttlefish	L	L	M	L	M	M	1.50	4
Sardine, anchovies	L	L	L	L	L	L	1.00	8
Jacks, trevally	M	L	L	L	L	M	1.33	6
Indian mackerel	L	L	L	L	L	L	1.00	8
Emperors, groupers	H	M	L	L	L	M	1.67	2
Rabbitfish	L	L	L	L	L	L	1.00	8
Shark	H	M	H	M	L	H	2.33	1
King mackerel	M	M	L	L	L	M	1.50	4
Longtail tunas	M	L	L/M	M	L	M	1.58	3
Silver/black pomphret	L	L	L	L	L	L	1.00	
Tiger tooth croacker	L	L	L	L	L	M	1.17	
Grunter	L/M	M	L	L	L	M	1.42	
Snappers	M	M	L	L	L	M	1.50	
Yellowfin tuna	M	L	L	M	L	M	1.50	
Skipjack tuna	M	L	L	M	L	M	1.50	
Seabreams	M	L	M	L	L	M	1.50	
Pearl oysters	L	M	L	L	L	L	1.17	

Table J-2 Assessment of selectivity of priority species groups to various fishing gears. Figures in the table indicate average score based on qualitative assessment by participants on effectiveness of gears to catch a given species group in three categories. The three categories were defined as High (score 3): well attribute to capture them, Medium (score 2): effective but some escapements and Low (score 1): no good to capture them Selectivity

	Produc-tivity	Shrimp trawl	Finfish trawl	Beach seine	Gillnets	Drift nets	Fixnet	Spanish mackerel fixnet	Wire traps	Crab traps	Barriers	Hook and Line	Long-line	Average score	Rank
Sample size (No. Responses)		3	1	2	4	5	2	2	5	3	2	6	5		
Shrimp	***1.00***	3.0	1.0	1.0	1.3	1.0	1.0	1.0	1.0	1.0	3.0	1.0	1.0	**1.35**	**13**
Crab	***1.17***	3.0	2.0	2.0	1.8	1.2	2.0	1.0	1.6	3.0	3.0	1.0	1.0	**1.88**	**10**
Cuttlefish	***1.50***	2.0	3.0	2.0	1.8	1.2	2.0	1.0	2.2	3.0	3.0	1.0	1.0	**1.93**	**8**
Finfish, nei	***1.50***	3.0	2.0	2.0	2.8	2.2	2.5	1.5	2.8	2.0	3.0	2.0	2.2	**2.33**	**2**
Sardine, anchovies	***1.00***	2.0	1.0	3.0	2.3	1.4	1.5	1.0	1.0	1.0	1.5	1.0	1.0	**1.47**	**12**
Jacks, trevally	***1.33***	2.7	3.0	1.5	2.8	2.4	2.5	2.5	2.6	2.0	2.0	1.0	1.4	**2.19**	**5**
Indian mackerel	***1.00***	1.0	2.0	2.5	2.3	2.2	2.0	2.0	2.2	1.0	2.5	2.0	1.4	**1.92**	**9**
Emperors	***1.67***	3.0	3.0	1.0	2.8	1.8	2.5	1.5	3.0	3.0	2.5	2.0	2.2	**2.35**	**1**
Groupers	***1.67***	3.0	3.0	1.0	1.8	1.4	2.5	1.5	3.0	3.0	2.5	2.0	2.2	**2.24**	**4**
Rabbitfish	***1.00***	3.0	2.0	1.0	2.8	1.4	2.5	1.5	3.0	3.0	3.0	2.0	1.8	**2.25**	**3**
Shark	***2.33***	1.7	3.0	1.5	2.8	2.2	2.0	2.0	1.6	1.0	2.0	1.0	3.0	**1.98**	**6**
King mackerel	***1.50***	1.3	2.0	2.0	2.0	3.0	2.3	3.0	1.2	1.0	1.0	3.0	1.4	**1.94**	**7**
Longtail tunas	***1.58***	1.3	1.0	2.0	1.8	2.6	2.3	3.0	1.2	1.0	1.0	1.0	1.4	**1.63**	**11**
	Average Score:	**2.3**	**2.2**	**1.7**	**2.2**	**1.8**	**2.1**	**1.7**	**2.0**	**1.9**	**2.3**	**1.5**	**1.6**		
	Rank:	**1**	**4**	**9**	**3**	**8**	**5**	**9**	**6**	**7**	**1**	**12**	**11**		

Table J-3 Assessment of vulnerability risk of priority species groups to various fishing gears based on gear selectivity. Figures in the table are obtained by multiplying the score obtained in Table 2 with average risk based on productivity of a given species group obtained in Table 1. The higher score means higher vulnerability. The score over 5 is underlined.

	Produc-tivity	Shrimp trawl	Finfish trawl	Beach seine	Gillnets	Drift nets	Fixnet	Spanish mackerel fixnet	Wire traps	Crab traps	Barriers	Hook and Line	Long-line	Average score	Rank
Sample size (No. Responses)		3	1	2	4	5	2	2	5	3	2	6	5		
Shrimp	***1.00***	3.0	1.0	1.0	1.3	1.0	1.0	1.0	1.0	1.0	3.0	1.0	1.0	**1.35**	**13**
Crab	***1.17***	3.5	2.3	2.3	2.0	1.4	2.3	1.2	1.9	3.5	3.5	1.2	1.2	**2.19**	**10**
Cuttlefish	***1.50***	3.0	4.5	3.0	2.6	1.8	3.0	1.5	3.3	4.5	4.5	1.5	1.5	**2.89**	**7**
Finfish, nei	***1.50***	4.5	3.0	3.0	4.1	3.3	3.8	2.3	4.2	3.0	4.5	3.0	3.3	**3.49**	**4**
Sardine, anchovies	***1.00***	2.0	1.0	3.0	2.3	1.4	1.5	1.0	1.0	1.0	1.5	1.0	1.0	**1.47**	**12**
Jacks, trevally	***1.33***	3.6	4.0	2.0	3.7	3.2	3.3	3.3	3.5	2.7	2.7	1.3	1.9	**2.92**	**5**
Indian mackerel	***1.00***	1.0	2.0	2.5	2.3	2.2	2.0	2.0	2.2	1.0	2.5	2.0	1.4	**1.92**	**11**
Emperors	***1.67***	5.0	5.0	1.7	4.6	3.0	4.2	2.5	5.0	5.0	4.2	3.3	3.7	**3.92**	**2**
Groupers	***1.67***	5.0	5.0	1.7	2.9	2.3	4.2	2.5	5.0	5.0	4.2	3.3	3.7	**3.73**	**3**
Rabbitfish	***1.00***	3.0	2.0	1.0	2.8	1.4	2.5	1.5	3.0	3.0	3.0	2.0	1.8	**2.25**	**9**
Shark	***2.33***	3.9	7.0	3.5	6.4	5.1	4.7	4.7	3.7	2.3	4.7	2.3	7.0	**4.61**	**1**
King mackerel	***1.50***	2.0	3.0	3.0	3.0	4.5	3.5	4.5	1.8	1.5	1.5	4.5	2.1	**2.91**	**6**
Longtail tunas	***1.58***	2.1	1.6	3.2	2.8	4.1	3.7	4.8	1.9	1.6	1.6	1.6	2.2	**2.59**	**8**
	Average Score:	**3.2**	**3.0**	**2.3**	**3.2**	**2.8**	**3.0**	**2.5**	**3.0**	**2.7**	**3.1**	**2.4**	**2.6**		
	Rank:	**2**	**5**	**12**	**1**	**7**	**6**	**10**	**4**	**8**	**3**	**11**	**9**		

Table J-4 Assessment of the extent of before maturity catch of priority species groups to various fishing gears. Figures in the table indicate average score based on qualitative assessment by participants on the occurrence of juveniles of a given species group within the catch taken with various gears in three categories. The three categories were defined as High (score 3): regular occurrence of juvenile, Medium (score 2) : occasional small proportion of juvenile in catch and Low (score 1): no occurrence of juvenile in catch.

	Produc-tivity	Shrimp trawl	Finfish trawl	Beach seine	Gillnets	Drift nets	Fixnet	Spanish mackerel fixnet	Wire traps	Crab traps	Barriers	Hook and Line	Long-line	Average score	Rank
Sample size (No. Responses)		3	1	2	4	5	2	2	5	3	2	6	5		
Shrimp	***1.00***	1.0	1.0	1.0	1.3	1.0	1.3	1.0	1.0	1.0	2.0	1.0	1.0	**1.13**	**13**
Crab	***1.17***	1.0	2.0	1.5	1.8	1.4	1.3	1.0	1.8	2.3	3.0	1.2	1.0	**1.61**	**10**
Cuttlefish	***1.50***	2.5	2.0	1.5	1.5	1.4	1.0	1.5	2.2	1.7	2.0	1.5	1.0	**1.65**	**9**
Finfish, nei	***1.50***	3.0	2.0	2.5	2.0	2.0	1.7	2.0	2.2	2.0	3.0	2.3	2.0	**2.23**	**1**
Sardine, anchovies	***1.00***	1.0	2.0	2.5	1.5	1.4	1.0	1.5	1.0	1.7	2.0	1.2	1.0	**1.48**	**12**
Jacks, trevally	***1.33***	2.0	2.0	1.5	1.5	2.2	1.7	1.0	2.4	2.0	2.0	2.2	1.5	**1.83**	**6**
Indian mackerel	***1.00***	1.0	2.0	2.5	2.0	2.0	1.7	1.0	1.6	1.7	3.0	1.7	1.7	**1.81**	**7**
Emperors	***1.67***	2.0	2.0	1.0	2.3	1.4	1.3	1.0	2.6	2.0	3.0	2.2	2.0	**1.90**	**4**
Groupers	***1.67***	2.0	2.0	1.0	2.0	1.4	1.3	1.0	2.6	2.0	3.0	2.2	2.0	**1.88**	**5**
Rabbitfish	***1.00***	2.0	2.0	1.0	2.3	1.6	1.3	1.0	2.6	2.0	3.0	2.0	2.0	**1.90**	**3**
Shark	***2.33***	1.5	3.0	2.0	2.3	2.2	1.7	1.0	1.6	1.7	2.0	2.7	2.8	**2.03**	**2**
King mackerel	***1.50***	2.5	3.0	1.5	2.3	2.4	1.7	1.0	1.2	1.0	1.0	2.2	1.5	**1.77**	**8**
Longtail tunas	***1.58***	2.0	1.0	1.5	1.8	2.4	1.7	1.0	1.2	1.0	1.0	2.0	1.3	**1.48**	**11**
	Average Score:	**1.9**	**1.9**	**1.6**	**2.0**	**2.0**	**1.5**	**1.2**	**2.1**	**1.8**	**2.3**	**2.2**	**1.8**		
	Rank:	**7**	**6**	**10**	**4**	**5**	**11**	**12**	**3**	**9**	**1**	**2**	**8**		

Table J-5 Assessment of vulnerability risk of priority species groups to various fishing gears based on risk of premature catch. Figures in the table are obtained by multiplying the score obtained in Table 4 with average risk based on productivity of a given species group obtained in Table 1. The higher score means higher vulnerability.

	Produc-tivity	Shrimp trawl	Finfish trawl	Beach seine	Gillnets	Drift nets	Fixnet	Spanish mackerel fixnet	Wire traps	Crab traps	Barriers	Hook and Line	Long line	Average score	Rank
Sample size (No. Responses)		3	1	2	4	5	2	2	5	3	2	6	5		
Shrimp	***1.00***	1.0	1.0	1.0	1.3	1.0	1.3	1.0	1.0	1.0	2.0	1.0	1.0	**1.13**	**13**
Crab	***1.17***	1.2	2.3	1.8	2.0	1.6	1.6	1.2	2.1	2.7	3.5	1.4	1.2	**1.87**	**10**
Cuttlefish	***1.50***	3.8	3.0	2.3	2.3	2.1	1.5	2.3	3.3	2.5	3.0	2.3	1.5	**2.47**	**6**
Finfish, nei	***1.50***	4.5	3.0	3.8	3.0	3.0	2.5	3.0	3.3	3.0	4.5	3.5	3.0	**3.34**	**2**
Sardine, anchovies	***1.00***	1.0	2.0	2.5	1.5	1.4	1.0	1.5	1.0	1.7	2.0	1.2	1.0	**1.48**	**12**
Jacks, trevally	***1.33***	2.7	2.7	2.0	2.0	2.9	2.2	1.3	3.2	2.7	2.7	2.9	2.0	**2.44**	**7**
Indian mackerel	***1.00***	1.0	2.0	2.5	2.0	2.0	1.7	1.0	1.6	1.7	3.0	1.7	1.7	**1.81**	**11**
Emperors	***1.67***	3.3	3.3	1.7	3.8	2.3	2.2	1.7	4.3	3.3	5.0	3.6	3.3	**3.16**	**3**
Groupers	***1.67***	3.3	3.3	1.7	3.3	2.3	2.2	1.7	4.3	3.3	5.0	3.6	3.3	**3.13**	**4**
Rabbitfish	***1.00***	2.0	2.0	1.0	2.3	1.6	1.3	1.0	2.6	2.0	3.0	2.0	2.0	**1.90**	**9**
Sharks	***2.33***	3.5	7.0	4.7	5.3	5.1	3.9	2.3	3.7	3.9	4.7	6.2	6.4	**4.73**	**1**
King mackerel	***1.50***	3.8	4.5	2.3	3.4	3.6	2.5	1.5	1.8	1.5	1.5	3.3	2.3	**2.65**	**5**
Longtail tunas	***1.58***	3.2	1.6	2.4	2.8	3.8	2.6	1.6	1.9	1.6	1.6	3.2	2.0	**2.34**	**8**
	Average Score:	**2.7**	**2.8**	**2.2**	**2.8**	**2.7**	**2.0**	**1.6**	**2.8**	**2.4**	**3.1**	**3.0**	**2.5**		
	Rank:	**7**	**5**	**10**	**4**	**6**	**11**	**12**	**3**	**9**	**1**	**2**	**8**		

This document contains the report of the FAO/RECOFI Regional Workshop on Fishery Stock Indicators and Stock Status that was held in Tehran, Islamic Republic of Iran, from 26 to 29 July 2009. At the fourth session (2007) of RECOFI held in Jeddah, Kingdom of Saudi Arabia, the Secretariat prepared for the minimum requirements of stock assessment. The Commission recognized that those requirements were too complicated and noted a shortage of expertise. The effort was resumed at the second meeting of the Working Group on Fisheries Management (WGFM) in 2008 where a shift to a pragmatic approach based on an Ecosystem Approach to Fisheries management (EAF) with adaptive procedures was recommended. The objective of the Workshop was to review the availability of data on the biology of the identified priority resources, catch and effort statistics for the relevant fisheries, other socio-economic statistics, results of stock assessments and other relevant research activities in member countries; to identify the major gaps in knowledge and information, priority areas for regional cooperation and potential joint activities; and to formulate the RECOFI work program for regional cooperation in assessment of stocks and fishery status appraisal in the short and medium term. Employing a simple matrix of Susceptibility Productivity Analysis (PSA), the participants identified three areas of particular concern. These are the ecosystem-wide impact of shrimp trawls, the exploitation of neritic demersal assemblages as well as sharks as indicators of the overall level impact of exploitation, and, thirdly, the stock status of a selected priority species, *Scomberomorus commerson*, for which historic data are available. The Workshop concluded with a set of recommendations to the WGFM that focused on improvement of data collection and monitoring capacity and members' contributions to scientific knowledge through joint activities.

ISBN 978-92-5-106850-2 ISSN 2070-6987

9 789251 068502

I2170E/1/04.11