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Report of the

EXPERT CONSULTATION ON INTERACTIONS BETWEEN SEA TURTLES AND FISHERIES WITHIN AN ECOSYSTEM CONTEXT

Rome, Italy, 9-12 March 2004

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PREPARATION OF THE DOCUMENT

The present text is the final version of the Report of the Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context, held in Rome, Italy, from 9 to 12 March 2004.

Distribution:

Participants
Directors of Fisheries
FAO Fisheries Department
FAO Regional and Subregional Fisheries Officers

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ABSTRACT

An Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context was convened by FAO and held in Rome, Italy, from 9 to 12 March 2004. The meeting was attended by 11 experts from seven countries, covering expertise related to sea turtle biology and conservation, fishing gear technology, fisheries management and socio-economics. The Expert Consultation was organized to provide technical input to the Technical Consultation to take place in Bangkok, Thailand, later in 2004, as agreed at the Twenty-fifth Session of the Committee on Fisheries (COFI), held in Rome, Italy, from 24 to 28 February 2003. This information paper provides a summary of the Consultation's outcomes and outputs, including overviews of sea turtle status, fisheries impacts, possible managerial solutions, socio-economic aspects and recommendations for future work and actions.

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APPENDIXES

BACKGROUND AND PURPOSE OF THE EXPERT CONSULTATION

At the Twenty-fifth Session of the Committee on Fisheries (COFI) the question of sea turtles conservation and interactions with fishing operations was raised. The Committee agreed that "while taking into consideration existing work on sea turtle interactions and conservation, a Technical Consultation should be held in Bangkok, Thailand, in 2004". The FAO Fisheries Department was asked to organize the Technical Consultation with the following scope:

- review the available information on the current status of sea turtle conservation including both incidental and direct catches, their impacts on the populations and other factors affecting the mortality of sea turtles;
- review the new development of fishing gears and techniques to reduce sea turtle mortality by incidental catches and other techniques to improve sea turtle conservation;
- produce, if appropriate, guidelines to reduce sea turtle mortality in fishing operations; and
- consider desirable assistance to Members of developing countries for the conservation of sea turtles.

The Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context was organized to provide technical input to the Technical Consultation. This information paper provides a summary of the Consultation's outcomes and outputs, including overviews of sea turtle status, fisheries impacts, possible managerial solutions, socio-economic aspects and recommendations for future work and actions.

THE EXPERT CONSULTATION

The Expert Consultation was held in Rome (Italy) from 9 to 12 March 2004, hosted by FAO, with funding from the Government of Japan.

Preparation for the meeting was overseen by an Organizing Committee of FAO staff comprising: Gabriella Bianchi and Kevern Cochrane (FIRM), Cassandra de Young (FIPP) and Wilfried Thiele (FIIT). The meeting was attended by 11 experts from seven countries, covering expertise related to sea turtle biology and conservation, fishing gear technology, fisheries management and socio-economics. The Agenda for the meeting, as shown in Appendix A, was adopted by the Expert Consultation. The list of experts and other participants in the meeting is shown in Appendix B. Prior to the meeting; each expert was asked to prepare a document on key issues relevant to the Expert Consultation (Appendix C) and published as a supplement to this meeting Report.

The meeting was called to order by Mr Ichiro Nomura, Assistant Director-General, Fisheries Department. The text of his statement is reproduced in Appendix D.

OUTCOME OF THE MEETING

The Expert Consultation was convened in the context of several other expert-based fora, including the Second International Fisheries Forum (2002), the US National Marine Fisheries Service International Technical Expert Workshop on Marine Turtle Bycatch in Longline Fisheries (2003), and the Bellagio Conference on Sea turtle Conservation in the Pacific

(2003), that addressed a range of sea turtle issues, including fisheries interactions. The Bellagio meeting most recently developed a set of recommendations that provided a basis for discussion at this Expert Consultation.

The main objective of this Expert Consultation was to summarize present knowledge on sea turtle conservation status, population trends, major sources of mortality and their relative importance, the role of fisheries in sea turtle conservation where sea turtles and fisheries coincide, advise on possible management measures, legal and socio-economic aspects of managing sea turtle mortality due to fisheries.

Synthesis of available knowledge on conservation status of sea turtle stocks (Atlantic, Pacific and Indian Oceans and Mediterranean Sea)

Four major reports were prepared prior to the Expert Consultation on the status of sea turtle stocks and the exposure of these stocks to various fisheries. These reports focused on the following geographic regions:

- Mediterranean
- Indian Ocean
- Pacific Ocean
- Atlantic Ocean

The findings of these reports were reviewed and revised by the Expert Consultation. Based on these reports, the following major hazards or threats to sea turtles were identified as follows:

Non-fisheries related hazards

- Egg harvest
- Egg predation by feral animals such as pigs or foxes
- Beach habitat destruction including beach construction and development
- Foraging habitat destruction
- Direct take or hunting, or boat strikes

Coastal fisheries related hazards

- Gillnet
- Trawl
- Pelagic longline
- Demersal longline
- Set-net
- Traps (e.g. lobster or crab)

Offshore fisheries related hazards

- Pelagic longline
- Purse seine

Relative risk rating was assigned for the various regional stock groupings exposed to the 13 hazards listed above. The following rating scale was then used by the working group:

- H = High: specific level of take or mortality that significantly effects the stock grouping
- M = Medium: specific level of take or mortality that adversely effects one or more, but not more than 50 percent of the stock grouping
- L = Low: specific level of take or mortality has no, or relatively little effect on the population/stock grouping
- ? = no information available, or some level of mortality is suspected
- NA = not applicable

Reliable estimation of sea turtle abundance that would be suitable for stock assessment and conservation management planning, and for completion of Appendix E, depends on sampling the entire demographic structure of a population resident in the foraging grounds. Yet such foraging ground abundance estimates are only known for three sea turtle stocks — the southern Great Barrier Reef green turtle metapopulation (Chaloupka and Limpus 2001, Chaloupka 2002), the Australian loggerhead metapopulation (Chaloupka and Limpus 2001) and the Hawaiian green turtle metapopulation (Balazs and Chaloupka 2004).

All previous regional assessments of sea turtle abundance have been based mainly on anecdotal or qualitative information (Spotila *et al.* 1996, Meylan and Donnelly 1999, Seminoff 2002). The working group reviewed the abundance trends for the seven species of sea turtle (greens, loggerheads, leatherbacks, hawksbills, olive ridleys, flatbacks and Kemp's ridley) for the major ocean basins using best available quantitative information. However, most data are based on nesting beach monitoring and must be viewed with extreme caution. Nonetheless, useful nesting trend series do exist for some sea turtles stocks such as the Kemp's ridley and loggerhead nesting populations in the western north Atlantic (TEWG 2000) and especially for the Tortuguero greens (Bjorndal *et al.* 1999), the southern Great Barrier Reef greens (Chaloupka and Limpus 2001) and the Hawaiian greens (Balazs and Chaloupka 2004).

Given these considerations, the status and trend of each stock and the risk rating for each stock were then summarized in the table presented in Appendix E. It should be noted that this information was based on published available data and on the collective knowledge of the working group. However, the working group did not comprise any participants with expertise in some major geographic areas such as West Africa. Hence this Report should be considered as a draft working document that provides a good starting point to focus attention on the significant information gaps and uncertainties that were identified during this Expert Consultation.

The working group assessed the current stock status (over the last five years) and trend of each stock grouping based on best available scientific information and on the qualitative judgement of the working group where such data were not available. Stock trends were assigned a qualitative score as follows:

- Increasing
- Stable
- Declining
- ? = insufficient data

Stock status was included to provide an historic context for the trend assessment summarized in Appendix E. For example, the Kemp's ridley stock trend is increasing in recent years but from a very low base since the stock was seriously depleted prior to protection measures initiated in the 1960s.

The following conclusions can be drawn from the table in Appendix E:

- not all major threats to sea turtles are fisheries-related;
- major threats to sea turtles include non-fisheries related causes such as nesting habitat destruction and egg harvesting;
- coastal fisheries also pose a significant threat to sea turtles but are poorly documented in many cases;
- Pacific loggerheads have declined significantly and are at risk in various fisheries;
- Pacific leatherbacks have declined significantly and are at risk in various fisheries;
- olive ridleys along the east India coast are at risk in various fisheries;
- Atlantic hawksbills are at risk in various fisheries;
- Mediterranean loggerheads are at risk in pelagic longline fisheries.

More detailed descriptions of the risk and potential risk mitigation measures for the following stocks can be found in the section "Case studies" below:

- North Pacific loggerheads
- Western Pacific leatherbacks
- Eastern Pacific leatherbacks
- Caribbean hawksbills
- Indian Ocean olive ridleys
- Mediterranean loggerhead

Management measures and approaches

Management measures that may be appropriate for reducing sea turtle mortality due to fisheries are largely an extension of those already applied or experimented with for fisheries management and include: technical measures, input and output controls and incentive-aligning strategies. For populations that have declined to critical levels (e.g. Pacific leatherbacks and loggerheads), a broad suite of management measures will be required to recover populations. In these cases, reduction or even elimination of fishery-related mortality will only be effective if coupled with protection of nesting population. A piecemeal approach, concentrating on a single component, such as nesting site protection or fisheries bycatch reduction, simply is not enough. Furthermore, many fisheries do not individually have much impact, but collectively with all other impacts contribute to a significant overall challenge to recovery.

Technical measures

Gear modifications

These are used to selectively catch target species, while minimizing other, unwanted effects on non-target species and habitat. Most of the work directed to reduce sea turtle bycatches have been conducted in trawl fisheries. Recently, this effort has also been directed to pelagic longline fisheries. Thus, for these two fishing methods promising results exist that should be

tested in different regions and fisheries where bycatch problems exist. Some attempts to avoid incidental catch by set-net through gear modifications have also started. Regarding purse seine fishery, sea turtles are infrequently caught, and most turtles caught are found to be alive when the gear is retrieved. In this case therefore, releasing sea turtles alive has been recommended.

(a) Trawl gear modifications: Turtle Excluder Devices (TEDs)

Selective fishing gear was originally designed to separate juvenile fish in bottom trawling targeting fish or shrimp. These developments started in European countries in the 1960s. In the shrimp trawling fishery in the Gulf of Mexico, sea turtles were recognized as bycatch species in the 1970s, in addition to jellyfish and fish species. The US National Marine Fisheries Service (NMFS), in collaboration with others, developed a trawl modification called Turtle Excluder Device (TED). The TED was developed based on the idea of the Nordmøre grid, as a rigid grid or "separator" of large mesh net with an escape opening for sea turtles and/or large fishes. Shrimps enter the cod end through the grid or the mesh of the separator, while sea turtles and large fishes are led to the escape opening by the grid/separator.

In order to implement TEDs effectively, there is a need to show that they can minimize the loss of target species while also providing benefits to fishermen. In addition to excluding sea turtles, TEDs can achieve a minimal loss of shrimp with proper construction, installation and adjustment to fishing conditions. In testing and use in regular fishing operations, TEDs can achieve a 97 percent catch retention rate, or even higher in some cases, compared to trawl nets without TEDs. Due to selectivity TEDs can reduce the need for sorting catch, and increase its quality (and therefore value) by selecting large bycatch and debris. Experiments in combining use of TEDs and other bycatch reduction devices (BRDs) were conducted and are demonstrated to be very successful.

TEDs have been adopted and in use in the Americas for many years, and through widespread use the original TED designs have been modified over time to increase efficiency and performance for both turtle exclusion and target species retention.

Attempts to introduce both TEDs (AusTED) and BRDs into Australian trawl fishery have been extensive and overall very successful. The AusTED was a unique design with the grid being constructed from steel wire rope encased in plastic, and flexible thus avoiding claims by fishermen that TEDs were a safety hazard to crew when hauled onboard. TEDs were further spread to Southeast Asian countries including Thailand, Malaysia, the Philippines, Indonesia and Brunei, mainly by the initiatives of the South East Asian Fisheries Development Center (SEAFDEC).

In the 1990s India initiated experiments for assessing the effectiveness of TEDs in Orissa. These activities were extended to develop and encourage the use of TEDs. A new TED design was developed by the Central Institute of Fisheries Technology (CIFT) and hundreds of TEDs were distributed free for use on the east coast of India. The TEDs tested in Iran and Kuwait originated in Australia and they successfully excluded large animals from the trawl with little shrimp loss.

In addition, activities to encourage the use of TEDs were initiated in Kenya, Nigeria and other African countries. There may be many other countries which are experimenting with or

actually using TEDs, however, comprehensive data and information on the actual use, diffusion and types of TEDs are not available.

(b) Longlining

Practical field experiments to test how technical modifications affect sea turtle incidental catches have mainly been carried out in the swordfish longline fishery in the NW Atlantic. These experiments have shown that hook and bait types are the two most important gear parameters affecting catch rates of turtles giving catch reductions of 90 percent for loggerhead turtle and 75 percent for leatherback turtle (Watson *et al.* 2003; Bolten *et al.* 2001). Setting depth has been shown to be the most important fishing operation modification affecting sea turtle bycatch with an order of magnitude, higher takes by shallow-set gear compared to deep-set gear (based on observer data collected in the Pacific Ocean). The Department of Marine Bioscience (Tokyo University of Marine Science and Technology) has developed longline gear modifications that consist of attaching mid-water floats to the main line, so that all hooks are placed at the same depth and below the layer where sea turtles usually occur. Technical modifications that have been shown to affect sea turtle incidental catches are summarized in Table 1. Because there are significant gaps in knowledge on how these modifications perform in other regions and fisheries, the most promising modifications should be tested in other regions, such as the pelagic longline fisheries in the Pacific and in the Mediterranean. It is also important to take into account how such modifications may affect catch rates of the targeted species.

Table 1
Fishing gear and fishing practice modifications that have been shown to affect incidental catch of sea turtles in pelagic longline fisheries

Fishing gear modifications	Fishing practice modifications
Hook type (e.g. circle versus J-hook) Hook size Bait type (e.g. mackerel versus squid) Blue-dyed bait*	Setting depth Water temperature Daylight soak time

* Results from behaviour studies that have not been confirmed in fishing experiments

(c) Set-net

Incidental catch of sea turtles is known to occur in set-nets near the nesting beaches in many countries. Some bag nets of set-nets are opened at the surface, but others are set underwater. In the latter case, sea turtles can not breathe and drown. Research on gear modification was conducted in Japan, consisting of attaching escape gate to the bag net in a similar fashion as the TEDs of trawls, and was shown to be successful. Because there are so many kinds of set-nets being used worldwide, further studies to develop escape devices in each set-net will be necessary.

(d) Gillnet

Though no clear gear modifications have been shown to be effective to reduce sea turtle interactions, other than mesh size variation, other management measures should be considered to reduce interactions with this type of gear, such as spatial and temporal measures.

Spatial and temporal control on fishing

Sea turtle mortality due to fishing can be reduced by restricting the fishing activity to certain times or seasons, or by restricting fishing in particular areas, according to known distribution/behavioural patterns of sea turtles. It is important to include an evaluation of the overall effect of a closure, considering whether the measure only displaces fishing effort, thus increasing mortality of other species elsewhere. The question of enforcement/compliance is also important. The advent of Vessel Monitoring Systems (VMS) makes time/area management more enforceable.

Fishing operation measures to reduce mortality

If turtles are caught in fishing gear, and if they are encountered alive by the vessel crew upon retrieval of the gear, there are several procedures that can be adopted to reduce the potential for mortality for the animal due to the interaction. Such procedures include a basic requirement to release turtles alive from the fishing gear, requirements for appropriate handling and treatment, including specific procedures for releasing turtles based on gear type and aid and resuscitation guidelines, and retention and use of necessary equipment for the appropriate release of bycatch sea turtles, including de-hooking and line cutting tools, as well as training in the use of such methods.

Input (effort) and output (catch) control

Capacity and effort limitations are a common fishery management tool used to reduce the fishing activity and the related fishing mortality. Reductions in fishing activity have positive effects both on target species and on bycatch species (FAO 2003).

Output (catch) controls are usually aimed at target species; however, they can also include bycatch species. Controls of sea turtles caught as bycatch in various fisheries would be a necessary tool to complement the implementation of mitigation measures directed to reducing sea turtle fisheries interactions. Such controls would contribute to maintaining sea turtle bycatch below established desirable levels.

Incentive aligning strategies

Examples of useful initiatives aimed at improving the enabling environment at the institutional and market levels include:

(a) improving the institutional framework by ensuring policy coordination across agencies/authorities;
(b) developing collective values (education, information and training);
(c) considering the effectiveness of establishing market-based incentives (e.g. eco-labeling) or non-market economic incentives;

(d) exploring mechanisms to direct financial and technical support to developing countries, possibly through the establishment of international cooperative frameworks or voluntary support fund or similar vehicle in Regional Fishery Bodies (RFBs), and to explore ways to develop cooperative programmes for research and conservation activities, including for coastal, oceanic and key habitat areas.

Socio-economic aspects

The Expert Consultation considered the background paper outlining principles for including socio-economic considerations in implementing measures to mitigate sea turtle fisheries interactions. Sea turtle conservation and management programmes should recognize the important contributions of fisheries to employment, income and food security and should be effectively integrated into fisheries management programmes. The development, design and implementation of turtle conservation and management measures should take into account the socio-economic aspects of fishers and fishing communities. These are dependent on marine fishery resources for their life and livelihood and balance should be sought between conservation and management of turtles on the one hand, and sustainable livelihood and poverty alleviation, on the other.

The following list provides guidance for taking such aspects into account:

- Sea turtle conservation programmes should recognize the rights and responsibilities of fishers under international, national and local legal instruments, especially under the 1982 UN Convention on the Law of the Sea, the 1995 UN Fish Stocks Agreement, and the 1995 FAO Code of Conduct for Responsible Fisheries.

- Sea turtle conservation and management programmes should encourage active participation of fishers, fishing communities and other stakeholders in sea turtle conservation programmes, including nesting beach protection and fisheries programmes, and should also build upon the traditional ecological knowledge of local communities.

- Efforts should be made to promote sustainable fishing gear and practices, compatible with turtle conservation and management objectives, and to minimize dislocation of fishing communities and disruption of their fishing activities.

- There should be training and awareness-building programmes for fishers to better tackle the problems of sea turtle mortality arising from fishing activities, especially through better training in effective use of fishing gear that reduces marine turtle mortality.

- There should be consideration of mechanisms to compensate fishers for lost fishing opportunities as a result of turtle conservation and management measures. These could include free training for fishers to effectively move to, and participate in fisheries that have minimal interaction with turtles, and to provide for alternative employment if fishers would like to leave fishing for other occupations as a result of turtle conservation measures.

Some concrete considerations and examples of related indicators reflecting the above principles would be as follows:

- The extent to which fishing communities have participated in decision-making processes for turtle conservation and management (number of meetings that are organized; number of meetings that fishers have attended, involvement of women and children, etc).

- The extent to which the traditional knowledge of fishers and fishing communities about turtles and turtle-fisheries interactions is documented and used for developing turtle conservation programmes (number of attempts to document traditional knowledge; how far such knowledge is known to be used, etc).

- The existence of *in situ* studies to understand the interactions between various types of fishing gear and turtles on both temporal and spatial scale (whether there is availability of such studies with increasing frequency or not).

- The extent of cooperation and coordination between different institutions involved in the implementation and enforcement of various legal provisions for turtle conservation and fisheries management, and the extent to which management agencies have been sensitized to socio-economic issues linked to turtle conservation (inventory of such meetings shows an increasing trend, proof of joint decision-making and implementation, for example).

- The extent to which public awareness, information and communication programmes in local languages have been developed to highlight the importance of turtles in the marine ecosystems (availability of information in local languages and in multimedia format, for example).

- The extent to which fishing communities have been provided adequate training in hauling, handling and return of turtles to minimize incidental mortality of turtles (development of training manuals, inventory of such meetings held, documented changes in fishing practices).

- The extent to which programmes have been designed to minimize the socio-economic impact of turtle conservation measures on livelihoods, such as through the provision of subsidies to adopt turtle-friendly fishing gear and practices (number of subsidy schemes for turtle-friendly fishing gear and practices).

- The extent to which compensation mechanisms and alternative employment opportunities have been developed for communities affected by turtle conservation and management measures (number of such schemes in operation).

Legal aspects

There are several legal aspects on the issue of sea turtle interactions with the key fisheries identified by the Expert Consultation as having a major impact on sea turtles. One aspect is the inventory of the global instruments and legal frameworks that provide the context for addressing sea turtle interactions in fisheries. A second aspect includes the regional agreements and legal arrangements which have the responsibility or capacity for managing fisheries that have interactions with sea turtles, or which are specifically responsible for sea

turtle conservation and have fisheries components. A third aspect is the consideration of how sea turtle conservation and bycatch reduction measures can be most effective within the various systems of national, provincial and local laws, regulations and policies.

Global instruments

There are several global instruments and agreements that provide the legal framework for governments to approach the sustainable conservation and management of living marine resources, both individually and collectively on a regional basis, and which might be helpful for countries to consider as the background or context for more focused actions to address sea turtle interactions with fisheries:

- The United Nations Convention on the Law of the Sea (UNCLOS), considered a "Constitution for the Oceans", which was adopted in 1982 and entered into force in 1994. Though not all countries are party to UNCLOS, many non-parties consider it to be customary international law. In addition to establishing areas of jurisdiction in the oceans (EEZs, etc.), UNCLOS also establishes general rules for fishery conservation and management.

- The 1993 FAO High Seas Fishing Vessel Compliance Agreement (Compliance Agreement), sets "flag State" responsibilities for high seas areas, including requirements for authorization of specific fishing activities and control of high seas vessels. The Compliance Agreement calls on flag States to prevent their vessels from undermining agreed fishery conservation and management measures.

- The 1995 United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement or UNFSA) applies to management of and fisheries for straddling stocks and highly migratory stocks in EEZs and High Seas. UNFSA strengthens UNCLOS rules on fisheries, incorporating the precautionary approach and the concepts of compatibility of measures, and providing additional responsibilities to States for enforcement of conservation and management measures.

- The 1995 FAO Code of Conduct for Responsible Fisheries, a voluntary instrument which applies globally, is based on international law including UNCLOS, and provides principles and standards that, among other things, call for sustainable use of aquatic ecosystems and requires that fisheries be conducted with due regard for the environment. The Code of Conduct specifically addresses biodiversity issues and conservation of endangered species, calling for the bycatch of non-target species and the impacts of fisheries on biodiversity to be minimized.

- One of the international plans of action (IPOA) adopted within the FAO Committee on Fisheries (COFI) to elaborate specific aspects of the Code of Conduct is the IPOA to deter, prevent and eliminate illegal, unreported and unregulated (IUU) fishing, adopted in 2001. The IPOA on IUU Fishing was designed as a "toolkit" in which States can draw upon to stop IUU activity, including coastal, port, and flag state measures.

- In addition to the fisheries-oriented agreements cited above, there are several other global agreements that also provide context for actions to conserve sea turtles, including the Convention on the International Trade of Endangered Species (CITES), the Convention on Biological Diversity (CBD), and the Convention on Migratory Species (CMS).

Regional Fishery Bodies (RFBs)

RFBs are tailored to address the specific needs of the organization members and the fish stocks covered under the jurisdiction of the organization. However, where they exist, the RFBs are the primary management authorities or scientific and informational exchange mechanisms for many high seas, and in some cases coastal fisheries. These existing international instruments already possess or can develop capacity to directly address sea turtle bycatch in fisheries, and should serve as the primary implementing bodies for measures to address sea turtle bycatch through an ecosystems approach.

The major RFBs with management responsibilities for fisheries that interact with sea turtles include the General Fisheries Commission for the Mediterranean (GFCM), the Indian Ocean Tuna Commission (IOTC), the International Commission for the Conservation of Atlantic Tunas (ICCAT), the Inter-American Tropical Tuna Commission (IATTC), and the Western and Central Pacific Fisheries Commission (WCPFC). Some of these Organizations have begun examining sea turtle bycatch, or have even adopted measures to address bycatch as part of their overall fisheries management schemes.

Other RFBs serve as advisory mechanisms to conduct cooperative scientific research and provide advice to members. These types of organizations include the Western Central Atlantic Fishery Commission (WECAFC) and the Fishery Committee for the Eastern Central Atlantic (CECAF).

Sea turtle agreements

Currently there are three multilateral agreements with the primary responsibility of regional sea turtle conservation. These agreements are the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA MOU) and the Memorandum of Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa (West Africa MOU), that address the range of sea turtle conservation and protection issues, and incorporate provisions to address interactions with fisheries. Though these agreements do not have fisheries management authority, they do carry obligations for member States to take bycatch-related actions for areas under their jurisdiction.

National legal aspects/considerations

There are multiple legal and institutional considerations for governments in looking at the range of measures to be adopted for the conservation of sea turtles in fisheries. Many of these considerations present significant challenges for policy development and implementation for governments. Many governments are organized with diversified management structures that include separate fisheries and environmental management authorities, and responsibility for sea turtle conservation is often similarly diversified. In

many countries there are also multiple fisheries or environmental management authorities due to a division of authority or jurisdiction between national, provincial or local governments. These institutional factors often present obstacles to effective implementation of conservation measures.

One of the important considerations for governments in examining how to ensure the measures they adopt are the most effective is the need for consistency in management and conservation policies between and among multiple government agencies. This is particularly important where the various sea turtle habitats and the human activities that impact sea turtle populations fall under the jurisdiction of various government agencies (for example, the fisheries agency is responsible for the water while the environment ministry is responsible for the beach). In some cases, the responsibility for compliance with the regulatory regimes is also vested in multiple agencies (where, for example, management policy is the responsibility of the fisheries agency, enforcement is the responsibility of the navy or coast guard, and adjudication of compliance cases is the responsibility of the civil or criminal solicitor/prosecutor).

Many countries with fisheries or other activities that impact sea turtles already have existing laws or regulations that govern the direct take of sea turtles or require measures to reduce the incidental take of sea turtles in fisheries. However, it is clear that many countries can not or do not effectively enforce such regulations. One of the first steps countries should take is an assessment of the effectiveness of the regulations they already have in place, and how those regulations might be made more effective through improved monitoring, control and surveillance.

If the regular activities to promote compliance are not effective, possibly due to lack of funding or other resources to support such efforts, governments should look at alternate approaches to enforcement, including the involvement of industries and/or communities in enforcement activities through such approaches as user-pays schemes to support enforcement programmes or community policing.

The issue of enforcement is also a key consideration in the development of new sea turtle conservation measures. Fisheries enforcement is a labour- and cost-intensive exercise. Governments often seek to adopt the most straightforward and enforceable measures. This makes sense for enforcement agencies with limited resources, but in many cases across-the-board measures that governments may adopt often impact different constituencies in different ways. Measures to reduce sea turtle bycatch in fisheries could affect both commercial and artisanal fishers, two user groups with differing operating patterns and economic interests. Measures focusing on specific areas may affect certain communities or user groups more than others. Ensuring good compliance with conservation and management measures can be complicated due to such variable constituencies. This underscores the importance of engaging communities and industries in the development of conservation measures, and in particular measures for fisheries.

Such engagement should incorporate education related to the nature of the conservation issue and the benefits of the preferred regulatory approach, as well as consultation and two-way communication to incorporate feedback from users/communities in the regimes to be adopted.

Case studies

The Expert Consultation considered that the complex of conservation, management, socio-economic and legal issues relating to efforts to improve the status of sea turtles was best illustrated in selected case studies. These case studies are not considered to represent an exhaustive set of all priority situations, but are intended to provide real-world, contemporary examples of interactions between sea turtle conservation, fisheries, and the related issues for many of the key regions and sea turtle stocks.

Case study in direct take: the Caribbean hawksbill

Problem

The situation of the hawksbill turtle in the Caribbean is very variable. While there is very low abundance in some areas, in other areas, such as in Mexico, Cuba, Dominican Republic, Puerto Rico and some other islands, there are important breeding colonies or extensive feeding grounds. In spite of regulations in many countries, the subsistence and commercial capture of sea turtles and the use of their eggs still occurs in the region. In the case of the hawksbill, products made from the shell, or "carey", are very common in tourist markets. Direct capture is mainly accomplished with turtle nets, harpoons and diving. There are three primary target species: green, loggerhead and hawksbills, as well as the eggs of any of the species. Also it is common to capture turtles in the beach during the nesting.

Bycatch is highest in gillnets and shrimp trawlers, though longlines used for shark and tuna also catch turtles, principally green and loggerhead. Excessive direct catch has been one of the most important causes for the deterioration of the populations. At the present time, the incidental capture has decisive effects in the survival of these organisms because it is impacting decimated populations and existing laws are not effectively enforced. Finally, free commercial exchange between islands makes it difficult to track the origin of the products.

Existing legal framework

Regulations and laws to protect sea turtles are available in all countries of the region, in addition to the international legal instruments described in section 'Global instruments' above.

Potential mitigation measures

- Provide more support to existing sea turtle protection and research programmes.
- Effectively enforce all local, national and international regulations.

Continue the CITES Wider Caribbean Hawksbill Turtle Dialogue meetings, where significant advances have been reached, including such topics as:

- the legal harvest levels of marine turtles in directed or opportunistic fisheries, as well as any information on the collection of eggs from beaches and on the size and use of bycatch;
- subsistence use levels and domestic markets;
- harvesting seasons and regions, as well as the destination, use and value of marine turtle products;

- the sources of raw materials for turtle products and the types of fisheries in which they originate;
- the scale of the industry and trade and the destination of the products.

Even though much of this information might not be available or applicable to hawksbills, it would be beneficial if national systems could be developed to integrate all marine turtle species harvest, use and trade data.

The continuation of this kind of work in the region will help in the regulation of the fishery and the conservation of the species.

Socio-economic aspects

- Subsistence exploitation has been occurring for many years in the great majority of countries in the region and, in many cases, it is the only source of income for local communities, so it is necessary to assist them in finding alternative sources of income.
- The enforcement of the existing regulations is not effective because governments lack resources or, in some cases, experience corruption of the officers.
- There are some research and conservation programmes in some countries like Mexico, Cuba and Puerto Rico with certain continuity, but in many other countries the continuation of this kind of programmes is difficult, because of inconsistent or inadequate support.

Case study in direct take: the Western Pacific leatherback

Problem

The leatherback turtle has large cultural significance to local customary groups in Kei Islands, Maluku, Indonesia. It has served as a sacred component of the diet for those villages for many generations. Local communities assume that, because of the traditional role in their culture, leatherback has always resided in their surrounding waters and that they will never go extinct. Over 100 adult males and females are hunted in the foraging grounds in a season (November-February). Considering the critically endangered status of Pacific leatherbacks due to various hazards including the perceived incidental catch by fishing gears, the threat such as traditional/ subsistence hunting should be alleviated. This measure, together with reduction of bycatch and egg harvests, will contribute to the recovery effort.

Existing legal framework

Ministerial Decree (Agriculture) No. 327, 1978; Protection of several types of wild animals (Whales, Dolphins, Crocodiles, Leatherback Turtle)

Potential Mitigation Measures

- Awareness and Education: update the local understanding on the status of the turtle population and link this to their own customary laws, explaining what the dire status of the turtle population means for continuation of local customs and beliefs.

- Adoption of sustainable harvest regulations: a reduction/elimination of hunting (e.g. closed hunting seasons/quota setting) should be incorporated into the framework of existing customary laws and should be an indicator of the conservation objective.

Socio-economic aspects

Costs

- funds are needed for intensive consultations and economic-related activities (to gain trust and accelerate the empowering processes);
- change of traditional lifestyle;
- provide protein source alternatives.

Benefits

- education;
- recognition/adoption of customary regulations and reinforcing self-determination;
- livelihood supports and capacity building (e.g. skills to increase economic production; and explore ways to resolve limited market access).

Case study in sea turtle bycatch in pelagic longline fisheries: North Pacific loggerhead stock

Problem

The Pacific loggerheads comprise two stocks or management units (Bowen *et al.* 1994). The North Pacific loggerhead stock comprises major rookeries along the southern Japanese coastline and Ryukyu Archipelago (Kamezaki *et al.* 2003). This stock is in decline (Kamezaki *et al.* 2003) due to exposure to major hazards such as turtle harvesting (Gardner and Nichols 2001), nesting habitat loss and incidental capture in coastal (Cheng and Chen 1997, Julian and Beeson 1998) and pelagic fisheries (Wetherall *et al.* 1993, Polovina *et al.* 2000).

Existing legal framework

The Inter-American Tropical Tuna Commission (IATTC) has taken some responsibility for reducing sea turtle bycatch in tuna fisheries in the Eastern Tropical Pacific Ocean.

Potential mitigation measures

- gear modification in the coastal longline and set-net fisheries;
- education and public awareness (resuscitation and live-release);
- time/area closure near nesting beaches;
- propeller guards near nesting beaches;
- beach habitat restoration and construction modification.

Socio-economic aspects

Costs

- closed fishery in the worst case, lost jobs;
- extra crew on board, increase tuna price;

- extra money for fishermen (circle hook, de-hooker, gear modification).

Benefits

- eco-tourism (tourism, diving);
- education;
- increased economic demands for fishing gear industry (new gear development, replacement of existing gear);
- construction industry (turtle friendly beach modifications, installation of low intensity lights along beach).

Case study in sea turtle bycatch in pelagic longline fisheries: the Mediterranean loggerhead

Problem

The loggerhead is one of the two marine turtle species with nesting beaches in the Mediterranean Sea. The main nesting areas are located in eastern Mediterranean countries. Large pelagic fisheries are the main threat to marine turtles in the Mediterranean (Margaritoulis *et al.* 2003). Fleets from most of the Mediterranean countries and from countries outside the Mediterranean basin fish for large pelagic species, including swordfish, bluefin tuna and albacore. Longline vessels from non-Mediterranean countries, IUU fleets, and tuna farming fleet components are also fishing for large pelagic species.

Mediterranean fisheries have an important impact on the local turtle stock: more than 60 000 turtles are incidentally caught annually as a result of the fishing practices, with mortality rates ranging from 10 to 50 percent of the turtles caught (Tudela 2000). Experimental studies on mortality rates of individuals injured by surface longline showed that 20-30 percent of the turtles caught by longline gear may die (Aguilar, Mas and Pastor 1993). Recently it was found that 80 percent of the hooked turtles in this fishery is released alive but with the hook still inside the mouth, pharynx or oesophagus (Laurent *et al.* 2001). Delayed mortality is unknown.

Existing legal framework

National legislation to protect sea turtles in the countries with nesting beaches is rather common. International agreements such as the Bonn and Bern Conventions and CITES include loggerheads in several annexes listing protected species. Most of the Mediterranean countries are signatories to these agreements. Fisheries activities may be subject to GFCM and/or ICCAT conservation and management measures.

Potential mitigation measures

Fishermen agree on the important economic loss due to turtle interactions with fishing gear. Loss of hooks, bait, branch lines and other components of the gear are an economic problem to solve. The capture of sea turtles also produces a decrease in the fishing effort and yields, as a consequence, of the reduction in the number of hooks and the necessary time to repair or replace the gear. Potential mitigation measures to reduce the turtles take have an economic cost to be considered. Such measures include, among others:

- technical solutions directed at gear modification leading to higher selectivity;

- raising the awareness of fishermen to the method of handling and dehooking the turtles.

However, these measures are difficult to implement since fishermen do not usually bring turtles onboard and for evident reasons, including loss of time, effort, etc., and such a programme may result in lower fishing operation efficiency.

- reduce the use of chemical light sticks that may attract the turtles;
- effort reduction by closing areas and/or closing seasons.

Socio-economic aspects

Mediterranean longline fleets fish in national and international waters in competition with other distant-water tuna surface longline fleets, international purse seiners, and others as mentioned before. An exclusive effort reduction such as a time/area closure for the Mediterranean fleets could present conflicts with the other distant-water fleets fishing in the same region. Similar problems could arise if, for example, a new license to fish with alternate gear during the closed season is offered to the longliners in order to compensate for the longline time/area closure. Conflicts with the fisheries administrations could arise because the exclusive application of the conservative management measures to these fleets could have also an important socio-economic cost. Reduction of the longline impacts at Mediterranean level requires both more information and implementation of management tools, including:

- evaluate the total annual loggerhead capture by the longline fleets;
- total capture of all turtles by all the Mediterranean and distant-water fleets fishing with surface longline gear;
- investigate the origin of the Mediterranean and Atlantic stocks affected by the Mediterranean fisheries;
- evaluate the cost of the implementation of gear modifications;
- evaluate the cost of education of fishermen to generate issue awareness;
- evaluate the cost of implementation of closed areas/closed seasons;
- evaluate the research requirements and cost to organize and maintain an information system on the fisheries impacts, including a programme of onboard observers;
- organize an experts network to work together on objectives, methodologies and results;
- implement, at the joint GFCM-ICCAT working group, the necessary and periodic assessments and produce scientific advice on the effects of the fisheries on the marine turtles;
- incorporate conservation and management measures for Mediterranean marine turtles in fisheries management regulations and legislation at the national and international levels, as appropriate;
- implement the ecosystem approach to fisheries in the management of the surface longline fisheries and in the conservation and management of sea turtles.

Case Study in incidental bycatch: Orissa Olive Ridleys

Problem

Olive ridley turtles (*Lepidochelys olivacea*) exhibit the phenomenon of synchronous mass nesting, known as arribadas. In India, mass nesting beaches are located in Orissa on the east coast of India at Gahirmatha, Rushikulya and the Devi River mouth (Pandav, Choudhury and Shanker 1998). The population on the east coast of India comprises a distinct genetic stock (Shanker *et al.* in press). The recent failure of arribadas and a sharp decrease in the size of adults suggest a potential or imminent decline, consistent with fishery-related mortality of at least 90 000 turtles since 1994, and 10 000-15 000 turtles per year since 1999 (Shanker, Pandav and Choudhury 2004). Other major threats include plantations near the coast resulting in habitat loss at the Devi River mouth and artificial illumination from towns and highways in Rushikulya. New ports and other development initiatives near mass nesting beaches are potentially a major threat to this population. The major management problems are related to lack of implementation of existing laws and regulations due to:

- lack of capacity in enforcement agencies;
- lack of clarity for stakeholders about regulations;
- lack of dialogue between stakeholders – inadequate coordination between enforcement agencies (Fisheries and Forestry Department, Coast Guard) and insufficient communication with fishing communities and sectors (artisanal, gillnetters with outboard motors, mechanized trawlers);
- no stakeholder participation in design of management measures;
- lack of appropriate monitoring and evaluation protocols.

Existing legal framework

- the olive ridley turtle is listed in Schedule 1 of Indian Wildlife (Protection) Act, 1972 – maximum protection;
- Orissa Marine Fishing Regulation Act (1982) and Rules (1983) prohibits all mechanized fishing within 5 km of coast;
- Gahirmatha Marine Sanctuary (1997) prohibits all mechanized fishing within 20 km of Gahirmatha coast (35 km);
- OMFRA (1997) prohibits mechanized fishing within 20 km of coast in Devi River mouth and Rushikulya from January to May;
- Central Empowered Committee (of Supreme Court) (2003) recommends banning of gillnet boats within 5 km of the three mass nesting beaches for three months.

Potential mitigation measures

- review of management measures (time/area closures) in consultation with various stakeholders;
- no-fishing zones to be determined by monitoring reproductive patches of turtles;
- VMS and GPS for monitoring gillnetters and trawlers;
- awareness programmes for fishing communities to comply with no-fishing zones;
- establishment of monitoring and evaluation by independent research agencies in collaboration with local Forestry and Fisheries Departments and NGOs;
- control of development near the mass nesting beaches;

- introduction of turtle-friendly beach front illumination.

Case Study in retained bycatch: the southeast Pacific leatherback

Problem

There are scarce data on the extent of sea turtle bycatch in coastal fisheries. However, a systematic study of artisanal fisheries in Peru since 2000 indicates extensive take of sea turtles in small-scale gillnet and longline fisheries (Alfaro-Shigueto *et al.* in press (a). The artisanal gillnet fisheries in Peru have significant impacts on this leatherback stock given the high level of leatherback take, and the critical declines of this stock (Appendix E). Approximately 60 percent of the leatherback catch is retained for human consumption, and mortality levels of the discarded leatherback catch is unknown (Alfaro-Shigueto *et al.* in press (b). Although harvest of leatherbacks has been prohibited in Peru since 1976, implementation of this ban and other conservation measures have not been effective due to lack of financial resources. Furthermore, poverty in coastal communities has led to a continued dependence on marine wildlife, including leatherbacks, as a source of food. Socio-economic and cultural issues therefore are significant factors preventing implementation of conservation measures for sea turtles in this case.

Existing legal framework

National Legislation protecting sea turtles in Peruvian waters.

Potential mitigation measures

- education and public awareness (e.g. training in safe turtle handling and release);
- time/area closure of area where leatherbacks occur;
- develop new funding sources for Government Agencies and NGOs involved in sea turtle issues in Peru (to implement management and conservation measures), e.g. through financial contributions from rich fishing nations (Bellagio Blueprint, in press);
- develop livelihood alternatives designed to improve the socio-economic conditions of communities;
- development of sustainable food-source alternatives;
- develop participatory process to develop and implement community-based natural resource management measures.

Socio-economic aspects

- loss of social-cultural habits;
- displacement of fishers;
- change of attitudes to use of wildlife as food source;
- improvement of economic conditions of communities;
- empowerment of communities through co-management.

Recommendations

Some sea turtle stocks are seriously impacted by fishing and require urgent attention. Because of the critical status of these stocks a broad suite of measures is recommended that includes reduction of fishery-related mortality through technology standards in addition to beach conservation measures.

1. Priority stocks

1.1 It is recommended that the following sea turtle stocks be given urgent attention:

(i) Pacific loggerheads
(ii) Pacific leatherbacks
(iii) Eastern Indian coast olive ridleys

1.2 In order to significantly reduce the impact of fisheries on the most threatened sea turtle stocks it is recommended that fisheries management attention be focused on the following regional fisheries:

(i) coastal trawl fisheries in southeast Asia;
(ii) coastal gillnet fisheries in southeast Asian waters;
(iii) coastal gillnet fisheries in south Asian waters;
(iv) coastal trawl fisheries in south Asian waters;
(v) coastal gillnet fisheries in southeast Pacific waters;
(vi) coastal gillnet fisheries in Baja California;
(vii) pelagic longline fisheries in Eastern Pacific waters.

In addition to the above fisheries, the interactions between pelagic longline fisheries and loggerhead turtles in the Mediterranean are also considered to require special attention.

2. Data deficiencies

The Expert Consultation recognizes the serious data deficiencies in sea turtle fisheries interactions and recommends the following priority actions to redress this deficiency.

2.1 In order to further evaluate fisheries impacts, it is recommended that information on sea turtles and on interactions between sea turtles and fisheries and related mortality is urgently collected for the following fisheries:

(i) coastal trawl and gillnet fisheries in the Western Indian Ocean;
(ii) coastal fisheries in the Eastern Mediterranean;
(iii) coastal and offshore fisheries off West Africa.

2.2 In order to support science-based decision-making, it is recommended that a number of improvements in data collection be made to enable quantitative risk assessments to be carried out, including:

(i) Implement reliable data collection on fisheries/sea turtle interactions and other sources of mortality.
(ii) Where data collection exists, improve its quality and reliability.

(iii) Better information on sea turtle demography, and status and trends in population abundance.

3. Management measures

A number of measures have been proposed to reduce sea turtle bycatch and mortality. It is recommended their use be developed and adopted as appropriate.

3.1 The Group identified the following gear modifications as having clearly demonstrated advantages justifying their implementation:

(i) the use of Turtle Excluder Device (TED) in trawl gear;
(ii) the use of circle hooks in pelagic longlining.

3.2 The Group also identified the following fisheries management measures as potentially useful:

(i) spatial and temporal controls on fishing;
(ii) input (effort) and output (catch) control;
(iii) capacity/effort limitations;
(iv) post-capture measures to reduce mortality;

4. Incentive aligning strategies

The Group recognized that the lack of incentive aligning strategies is a major obstacle to implementing effective sea turtle conservation strategies and recommended the development and application of the following actions:

4.1 Improve the institutional framework and ensure policy coordination across agencies/ authorities.

4.2 Develop collective values (education, information and training).

4.3 Consider the effectiveness of establishing market-based incentives (e.g. eco-labelling) or non-market economic incentives.

5. Assistance to developing countries

Taking note of Article 5 of the Code of Conduct for Responsible Fisheries, the Group recommends to:

5.1 Develop mechanisms to direct financial and technical support to developing countries, possibly through the establishment of international cooperative frameworks or voluntary support fund or similar vehicle in RFBs.

5.2 Explore ways to develop cooperative programmes for research and conservation activities, including for coastal, oceanic and key habitat areas.

6. Promote a broad set of sea turtle conservation initiatives to mitigate all sources of fisheries-related turtle mortality:

(i) nesting beach protection;
(ii) reduction of at-sea mortality;
(iii) develop framework and sources of funding to mitigation of sea turtle mortality from industry and developed nations (e.g. logging, high seas fisheries), and other mechanisms, e.g. by creating a Global Trust Fund (Bellagio).

7. Socio-economic aspects

7.1 It is recommended that the sea turtle conservation and management programmes should recognize the important contributions of fisheries to employment, income and food security and should be effectively integrated into fisheries management programmes.

7.2 Sea turtle conservation and management programmes should encourage active participation of fishers, fishing communities and other stakeholders in sea turtle conservation programmes including beach protection and fisheries programmes, and should also build upon the existing traditional ecological knowledge systems.

7.3 In recognition of the importance of socio-economic factors to the success of the implementation of any conservation and management measures, it is further recommended to collect reliable socio-economic baseline and trends data on fisheries and fishing communities to monitor the socio-economic impact of turtle conservation and management measures.

7.4 Recommend development of biological and socio-economic indicators.

8. Further research

It is recommended that further studies/research related to reducing sea turtle mortality due to fisheries be conducted, and specifically on:

8.1 Identification of sea turtles spatial and temporal habitat use and fishing areas and practices/strategies).

8.2 Research on gear modifications that may affect gillnet selectivity (e.g. twine diameter and material, hanging ratio, mesh size).

8.3 Further research on effects of longline setting depth on sea turtle bycatch and target species catch rate.

8.4 Research on circle hook and alternative bait types in the Pacific and Mediterranean pelagic longline fisheries.

8.5 Conduct field experiments based on promising behaviour studies on hook size and dyed bait.

8.6 Feasibility study of adoption of modified longline gear by various countries and regions.

8.7 Conduct research on using circle hooks in small-scale coastal longline fisheries.

8.8 Modification of TEDs for regional trawl fisheries.

9. Guidelines

9.1 Develop and consolidate existing handling and release guidelines (high priority).

9.2 FAO to explore the possibility of producing a set of guidelines based on the best current information and methods.

OUTPUTS OF THE MEETING

The meeting generated the present meeting report. In addition, the background papers prepared for the Expert Consultation will be published as a supplement to the present meeting report.

FUTURE RELATED ACTIVITIES

The main activity related to the Expert Consultation is the Technical Consultation scheduled to take place in Bangkok (Thailand) in the period 29 November to 3 December 2004.

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APPENDIX A

Agenda

1. Opening of the Expert Consultation
2. Welcome by Ichiro Nomura, Assistant Director-General, Fisheries Department
3. Nomination of Chairperson and Vice-Chairperson of the meeting and plenary sessions
4. Review of the FAO draft proposal for the report of the Consultation. Discussion and decision on the structure of the report to be produced by the Consultation
5. Constitution of the Working Groups, attribution of duties and designation of chairperson/moderator and rapporteur for each Working Group
6. Split into Working Groups. Drafting of report in Working Groups
7. Plenary: Working Groups present progress reports and discussion
8. Secretariat consolidates draft report
9. Plenary discussion on draft report
10. Plenary discussion/adoption of draft report

APPENDIX B

List of participants

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APPENDIX C

List of documents

Document	Title
1	Sea turtles population dynamics, with special emphasis on sources of mortality and relative importance of fisheries impacts – Atlantic Ocean (René Marquez)
2	Sea turtles of the Mediterranean Sea: population dynamics, sources of mortality and relative importance of fisheries impacts (Juan Camiñas)
3	Marine turtle status and conservation in the Indian Ocean (K. Shanker)
4	Status of sea turtle stocks in the Pacific (M. Chaloupka, P. Dutton and H. Nakano)
5a	A review of existing and potential longline gear modifications to reduce sea turtle mortality (Svein Loekkeborg)
5b	A review of development, modification, and implementation of TED (Turtle Excluder Device) to reduce sea turtle bycatch in trawl fisheries (Daisuke Shiode and Tadashi Tokai)
5c	Reducing turtle mortality in shrimp-trawl fisheries in Australia, Kuwait and Iran.(Steve Eayrs)
6	Management experiences in implementing sea turtle avoidance and mitigation measures in commercial fisheries (David F. Hogan)
7	Aligning and integrating incentive strategics – Creating win-win solutions for turtle protection (Creusa Hitipeuw and Lida Pet Soede)
8	Socio-economic aspects of management measures aimed at controlling sea turtle mortality: a case study of Orissa, India (Sebastian Mathew)
9	What can be done to restore Pacific turtle populations? The Bellagio Blueprint for Action on Pacific Sea Turtles (6 January 2004)

APPENDIX D

Welcome speech by Mr Ichiro Nomura
Assistant Director-General, FAO Fisheries Department

Distinguished experts,

It is my pleasure to welcome you to this Expert Consultation on "Interactions between Sea Turtles and Fisheries within an Ecosystem Context".

It is only recently that the issue of sea turtles conservation and interaction with fishing operations was brought to FAO's attention and raised at the twenty-fourth Session of the FAO Committee on Fisheries in 2001 and more so at its twenty-fith session last year. Previous activities related to sea turtles were mainly related to producing catalogues on taxonomy, biology and geographic distribution as part of the FAO Species Identification Programme. In connection with the twenty-fifth session of the Committee on Fisheries however, it was agreed "that while taking into consideration existing work on sea turtle interactions and conservation, a Technical Consultation should be held in Bangkok, Thailand in 2004". The scope of the Technical Consultation is largely related to identifying those fisheries where sea turtle mortality should urgently be addressed and, if relevant, it may recommend appropriate management actions. This Expert Consultation is meant to provide technical input and recommendations to the FAO Secretariat that will bring it forward to the Technical Consultation, tentatively scheduled to take place in November this year.

Inclusion of conservation considerations in fisheries management is not a new development. Although sea turtles are not specifically addressed, clear conservation elements can already be found in the 1982 Law of the Sea Convention. The FAO Code of Conduct for Responsible Fisheries, adopted in 1995, calls for a sustainable use of aquatic ecosystems and requires that fishing be conducted "with due regard" for the environment. It also addresses specifically biodiversity issues and conservation of endangered species and in so doing, calls for the catch of non-target species, both fish and non-fish species, to be minimized. It promotes maintenance, safeguarding and conservation of biodiversity by minimizing fisheries impacts on biodiversity. These concepts were reiterated and reinforced in the Reykjavik Declaration on Responsible Fisheries in the Ecosystem in 2001.

Because of these developments, the FAO Fisheries Department has initiated a number of global instruments aimed at facilitating compliance with the Code of Conduct for Responsible Fisheries. These include the International Plan of Action for the Conservation and Management of Sharks, the International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries and the International Plan of Action for the Management of Fishing Capacity. All of these international instruments have a strong conservation component.

This Expert Consultation will be an important further step for FAO into the field of sea turtle management and conservation. FAO is therefore looking to you to provide a good synthesis of available knowledge on the issue of interactions between sea turtle and fisheries and to make recommendations as regards the way forward. We expect that these recommendations will be discussed at the Technical Consultation later this year and will provide important information for that group as they deliberate on future national, regional and global action in relation to fisheries and sea turtles. It is essential, for the benefit of sea turtles but also for

fisheries and fishing communities around the world, that the information provided is of the highest possible quality in terms of being representative and factual and that the suggested way forward should be pragmatic, effective and applicable.

I wish you a very productive week and trust you will be able to achieve these very ambitious goals.

APPENDIX E

Overview of sea turtle stocks, their conservation status and major threats

					Hazards													
					egg	habitats			Coastal							Offshore		
Ocean	Species	Stock	Pop trend	Status	harvest	predation	beach	foraging	take	gill	trawl	long	demer	set	traps	long	seine	Source
Pacific	loggerheads	north	declining	Severely depleted	L	L	H	L	H	H	H	H	?	H	NA	M (H)	L	Kamezaki *et al.* 2003
		south	declining	Severely depleted	L	L	L	L	L	H	H	H	?	H	NA	H	L	Chaloupka (2003), Limpus & Limpus (2003)
	leatherback	EP	declining	critical	M (H)	L	L	L	L	H	L	H	L	L	NA	H	L	Spotila *et al.* (1996)
		Malaysia	near extinction	critical	H	H	M	L	M	H	L	H?	L	H	NA	M	L	Chan, Liew & Mazlan (1988), Chan & Liew (1996)
		WP	declining	threatened	H	H	M	L	M	H	L	H?	L	H	NA	M	L	Hitipeuw & Maturbongs (2002)
	hawksbills	Malaysia	stable	Threatened	M	L	?	M	M	L	L	L	L	L	NA	L	L	Pilcher & Ali (1999), Basintal (2002)
		Australia	declining	Conservation concern	L	L	L	L	H	L	L	L	L	L	NA	L	L	Loop, Miller & Limpus (1995)
		Solomons	?	Threatened	H	L	L	L	H	L	L	L	L	L	NA	L	L	
		Hawaii	stable	Conservation concern	L	L	L	L	L	L	L	L	L	L	NA	L	L	Mangel *et al.* (2000),
		EP	?	Threatened	M	L	L	M	H	L	L	L	NA	L	NA	NA	NA	Seminoff *et al.* (2003)
	greens	SE Asia	stable	Threatened	H	L	L	L	H	?	?	?	?	L	NA	L	?	Seminoff (2002)
		SW P	stable	Conservation concern	M	L	L	L	H	L	L	L	L	L	NA	L	L	Chaloupka & Limpus (2001)
		CP	increasing	Conservation concern	L	L	L	L	L	L	NA	L	?	NA	NA	L	NA	Balazs & Chaloupka (2004)
		EP	?	Threatened	M	L	L	L	H	L	M	M	L	NA	NA	M	L	Seminoff *et al.* (2003)
	olive ridleys	EP	increasing	Low Risk	L	L	L	L	L	L	L	L	L	NA	NA	L	L	Penaflores *et al.* (2000)
		WP	?	Threatened	L	L	L	L	L	?	H	L	NA	?	NA	L	L	Poiner & Harris (1996)
	flatbacks	NA	stable	Conservation concern	H	H	L	L	H	L	H	L	NA	L	NA	NA	NA	Limpus *et al.* (2002)
		EA	stable	Conservation concern	L	L	L	L	L	L	H	L	NA	L	NA	NA	NA	Limpus *et al.* (2002)
Indian	loggerheads	Oman	stable	Low Risk	L	L	L	L	L	M?	M?	L	L	L	NA	L	L	
		Sri Lanka	stable	Conservation concern	L	L	L	L	L	M?	M?	L	L	L	NA	L	L	Kapurasinghe (in press)
		KZ-Natal	increasing	Low Risk	L	L	L	L	L	M?	M?	L	L	L	NA	L	L	

					Hazards													
					egg	habitats			Coastal							Offshore		
Ocean	Species	Stock	Pop trend	Status	harvest	predation	beach	foraging	take	gill	trawl	long	demer	set	traps	long	seine	Source
	leatherback	Sri Lanka	stable	Conservation concern	L	M	L	L	L	L	L	L	L	L	NA	L	L	Kapurasinghe (in press)
		Nicobar/Andaman	stable	Conservation concern	L	M	M	L	L	L	L	L	L	L	NA	L	L	Andrews, *Krishnan & Biswas* (2001)
		KZ-Natal	increasing	Low risk	L	L	L	L	L	L	L	L	L	L	NA	L	L	Hughes (1996)
	hawksbills	Seychelles & IO Islands	decreasing	severely depleted	L	M	H	M	M	H	L	M	L	H	NA	L	L	Mortimer (1998), Mortimer & Collie (1998)
		NWIO	?	unknown	M	L	L	M	L	H	H	L	L	L	NA	L	L	
		Sri Lanka/ Maldives/Laksh	?	severely depleted	L	L	L	M	L	L	L	L	L	L	NA	L	L	Kapurasinghe (in press), Tripathy, *Choudhury & Shanker* (2002)
		Nicobar/Andaman	stable	Conservation concern	L	L	L	M	L	L	L	L	L	L	NA	L	L	Andrews, *Krishnan & Biswas* (2001)
		NW Australia	?	unknown	L	?	L	M	L	L	L	L	L	L	NA	L	L	
	greens	Seychelles & IO Islands	stable	severely depleted	L	L	L	L	M	H	H	L	L	H	NA	L	L	Mortimer (1998), Mortimer & Collie (1998)
		NWIO	declining	depleted	L	H	L	L	M	H	M	L	L	L	NA	L	L	Asrar (1999), Sunderraj, *Joshua & Serebiah* (2001)
		Sri Lanka/ Maldives/Laksh	?	severely depleted	L	L	L	L	L	L	L	L	L	L	NA	L	L	Kapurasinghe (in press), Tripathy, *Choudhury & Shanker* (2002)
		Nicobar/Andaman	stable	Conservation concern	L	M	M	L	L	M	L	L	L	L	NA	L	L	Andrews, *Krishnan & Biswas* (2001)
		NW Australia	?	unknown	?	L	L	L	H	L	L	L	L	L	NA	L	L	
	olive ridleys	WI	?	depleted	L	M	L	L	L	H	H	L	?	L	NA	L	?	Asrar (1999), Sunderraj, *Joshua & Serebiah* (2001)
		ECI/SL	declining	threatened	L	M	L	L	L	H	H	L	L	?	NA	L	L	Bhupathy & Saravanan (2002), Tripathy, *Shanker & Choudhury* (2003), Shanker, Pandav & Choudhury (2004)
		Nicobar/Andaman	stable	Conservation concern	L	M	M	L	L	M	L	L	L	L	NA	L	L	Andrews, *Krishnan & Biswas* (2001)
Atlantic	loggerheads	GoM	stable	depleted	L	L	L	L	L	M	L	L	L	L	NA	L	L	TEWG (2000), Marquez (in press)
		Caribbean	?	threatened	L	L	M	L	L	M	M	L	L	L	NA	L	L	
		WA	increasing	threatened	L	L	L	L	L	M	L	L	L	L	NA	L	L	TEWG (2000)
		EA	?	unknown	L	L	L	L	L	?	?	?	?	?	NA	?	?	Fretey (2001)

					Hazards													
					egg		habitats			Coastal							Offshore	
Ocean	Species	Stock	Pop trend	Status	harvest	predation	beach	foraging	take	gill	trawl	long	demer	set	traps	long	seine	Source
	leatherback	Caribbean	increasing	severely depleted	L	L	M	L	L	M	M?	L	L	L	L	M?	L	
		WA	increasing	severely depleted	H	L	M	L	L	M	M?	L?	L	L	L?	M?	M?	
		EA	?	unknown	M?	L	L	L	L	M?	L?	L?	L	L	L?	L?	L	Fretey (2001)
	hawksbills	GoM	increasing	severely depleted	M	L	L	M	L	M?	L	L	L	L	NA	L	L	Marquez (in press)
		Caribbean	increasing	threatened	H	L	M	M	M	M?	M?	L	L	L	NA	L	L	
		WA	?	severely depleted	H	L	L	M	L	M?	L	L	L	L	NA	L	L	
		EA	?	unknown	H	L	L	M	L	M?	L	L	L	L	NA	L	L	Fretey (2001)
	greens	GoM	increasing	severely depleted	M	L	L	L	L	M?	L	L	L	L	NA	L	L	Marquez (in press)
		Caribbean	increasing	severely depleted	H	L	M	L	H	M?	L	L	L	L	NA	L	L	
		WA	?	severely depleted	H	L	L	L	L	M?	L	L	L	L	NA	L	L	
		EA	?	unknown	H	L	L	L	L	M?	M?	L	L	L	NA	L	L	Fretey (2001)
	Kemp's ridleys	GoM	increasing	severely depleted	L	L	L	L	L	M	L	L	L	L	NA	L	L	TEWG (2000), Marquez (in press)
		NWA	increasing	severely depleted	NA	NA	NA	L	L	M	L	L	NA	L	L	NA	NA	TEWG (2000), Marquez (in press)
	Olive ridleys	WA	?	severely depleted	M	M	M	L	M	M	M	?	L	?	NA	L	?	Hilterman & Goverse (2004)
		EA	?	unknown	M	?	?	?	?	?	?	?	?	?	?	?	?	Fretey (2001)
Medi	loggerheads	Mediterranean	stable	threatened	L	M	H	M	L	M	M	NA	L	L	L	H	L	Margaritoulis (1988), Margaritoulis *et al.* (2003), Laurent *et al.* (2001), Tudela *et al.* (2003)
	greens	Mediterranean	stable	critical	L	M	H	M	L	NA	H	NA	M	L	L	H	L	Kasparek, Godley & Broderick (2001), Godley (1998)
	leatherback	WA	increasing	threatened	NA	NA	NA	NA	NA	M	L	NA	L	L	L	L	L	Camiñas (1998)

An Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context was convened by FAO and held in Rome, Italy, from 9 to 12 March 2004. The meeting was attended by 11 experts from seven countries, covering expertise related to sea turtle biology and conservation, fishing gear technology, fisheries management and socio-economics. The Expert Consultation was organized to provide technical input to the Technical Consultation to take place in Bangkok, Thailand, later in 2004, as agreed at the Twenty-fifth Session of the Committee on Fisheries, held in Rome, Italy, from 24 to 28 February 2003. This information paper provides a summary of the Consultation's outcomes and outputs, including overviews of sea turtle status, fisheries impacts, possible managerial solutions, socio-economic aspects and recommendations for future work and actions.

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