

IUCN Eastern Africa Programme

**Report of the Western Indian Ocean
Turtle Excluder Device (TED)
Training Workshop**

**Bandari College, Mombasa, Kenya
27 - 31 January 1997**



April 1998

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Kenya
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All photographs of the workshop were taken by Mike Pugh, World Society for the Protection of Animals.

CONTENTS

Commitments for Follow-Up	iv
Introduction	
The Status and Conservation of Sea Turtles in Kenya	2
<i>J. W Kariuki, Ag. Assistant Director Fisheries (Marine and Coastal)</i>	
Developing a Regional Approach to Sea Turtle Conservation: IUCN Opening Address	4
<i>Dr. Rodney V Salm, Coordinator Marine and Coastal Conservation Activities</i> <i>IUCN--The World Conservation Union, Eastern Africa Regional Office</i>	
Speech by Mr Peter L.N. Kiilu, Provincial Commissioner Coast Province	6
Overview of the Training	8
Country Reports	
Shrimp Fishery in Eritrea: Exploitation and Legislation	12
<i>Teclegiorgis Gebremariam, Abu Amer, Semere Gebremariam and Mussie Astaw</i>	
Bycatch in Shrimp Trawls in Kenya with Specific Reference to Sea Turtles	14
<i>George M. Wamukoya, Jane R. Mbendo and J. Eriya</i>	
TED Experience in Madagascar	16
<i>Heritiana Randriamiarana, Berthin Rakotonifina and Jean Maharavo</i>	
Summary of Turtles and Fisheries Resources Information for Mozambique	18
<i>Samiro Magane, Lizette Sousa and Hermes Pacule</i>	
Some Information on the Sea Turtles of Tanzania	21
<i>Winfred V Haule, G. Kalikela and /I. Mahundu</i>	
Workshop Evaluation	23
Appendix: Workshop Participants	28

COMMITMENTS FOR FOLLOW-UP

COMMITMENTS BY COUNTRY REPRESENTATIVES FOR THE NEXT 12 MONTHS



ERITREA

- Organise a TED awareness workshop to be attended by trawler operators, crew and government officials.
- Conduct several trials with the sample TED with observers onboard to evaluate its performance in the field.
- Based on the outcome of TED trials, encourage establishment of a TED production unit to make appropriate TEDs. This will be preceded by a training workshop on TED manufacture. Based on the outcomes above, enforce the TED
- regulations in the statute books that currently are not being implemented.

KENYA

- Collect data on the turtle mortality associated with shrimp fishery.
- Conduct trials with the sample TEDs and document and evaluate their performance. This will involve putting observers on board for the first six months of 1997.
- After trials, hold an Evaluation Workshop to discuss TED performance, turtle mortality and mechanisms of enforcement.
- Establish, either through the Fisheries Department or the Kenya Marine and Fisheries Research Institute (KMFRI), a Production Unit to provide TEDs for the industry and encourage individual trawler operators to establish TED production units. Support for TED manufacture materials will be sought.
- After 12 months (February 1998) gazette the TED regulations to mandate the use of TEDs.
- The multi-disciplinary Coastal Fisheries Management Committee will do surveillance and monitoring with lead agencies being Kenya Wildlife Service, Fisheries Department, Kenya Navy and KMFRI.



MADAGASCAR

- Conduct a survey to determine turtle mortality in shrimp fishery (one year).
- Involve the Fisheries Research Institute in trials using the two TED samples made during the workshop.
- Organise a TED Training Workshop for trawler operators, policy makers and others, and sensitise them on the importance of TEDs.
- Develop appropriate TED legislation and enforcement.
- Implement a six-month grace period for TED technology adoption by the trawler operators.



MOZAMBIQUE

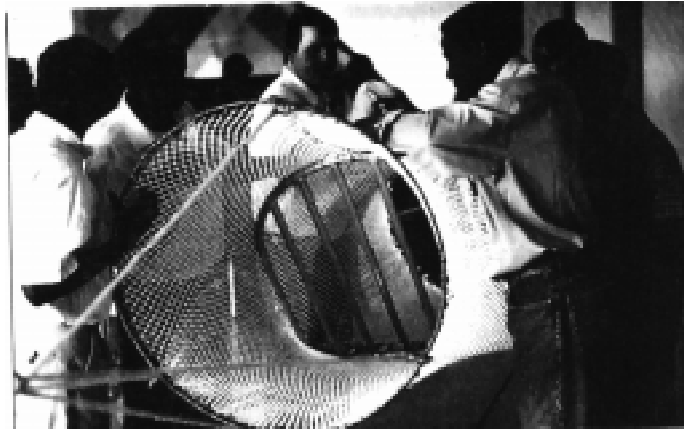
- Determine the turtle mortality in shrimp fishery (at least 12 months). Since Mozambique has routine inspectors on board, they could be used to collect these data.
- Identify the trawler operators currently exporting shrimp to USA. Since USA has regulations on shrimp imports, this could be used as an entry point for TED trials and adoption in Mozambique.
- Integrate artisanal fishermen in the turtle conservation initiatives.
- Sensitise other trawler operators currently exporting shrimp to the European Union on the efficacy of TEDs.

TANZANIA

- Sensitise the policy makers and the Directorate of Fisheries about TED Technology.
- Arrange for Tanzania Fisheries Research Institute (TAFIRI) to carry out TED trials to determine the efficacy.
- Organise a TED training workshop for trawler operators, policy makers and others.
- Solicit support for TED manufacture materials, for capacity building and for setting up a workshop.
- The Director of Fisheries will develop TED regulations and gazette them to facilitate compliance and enforcement.
- Implement a six-month grace period before the adoption of TEDs.



INTRODUCTION



The Status and Conservation of Sea Turtles in Kenya,

J. W. Kariuki, Ag. Assistant Director Fisheries (Marine and Coastal)

Sea turtles occur in tropical and warm temperate waters all over the world. They inhabit shallow waters along coasts and around islands, but some species are highly migratory and are commonly found in the open sea. During the nesting season, all species naturally return at regular intervals to the beaches on which they were born, where females lay their eggs in a nest dug in the sand. The hatchlings go into the sea to spend the rest of their lives there. After about 30 years, depending on species, females come back to nest. Traditionally, sea turtles have been held in high esteem as food for people and have been exploited for many years. Both artisanal and commercial fishermen hunt them for their meat, eggs and oil. In Kenya, the main threats to the turtle populations are the artisanal fishermen who hunt them for meat, eggs, shells, leather and oils, and the commercial shrimp fishermen who catch them accidentally (bycatch) in their trawl nets. Though the coastal people used these animals sustainably in the past, today's exploiters are far more numerous, technologies much more sophisticated, and the cultural inhibitions that prevented many people from over-exploiting them have largely died off. Thus the threat to sea turtles is greater than ever.

Conservation of Sea Turtles

The above threats and survival factors have caused the decline of turtle populations, and prompted sea turtle conservation programmes throughout the world as well as in Kenya. Under the Fisheries Act (Cap. 378) and its subsidiary legislation, marine mammals and turtles are protected, and no person is allowed to kill, chase, harass or take any marine mammal or turtle alive or dead, including any such animal stranded on land. Similarly, sea turtles are also listed as protected animals under the Wildlife Act (Cap. 376).

Recent-surveys on sea turtle nesting behaviour, identification of nesting beaches along our coastline and interviews with local people have assisted greatly in our turtle conservation endeavours. However, the natural populations of sea turtles are still threatened and declining, especially in their nesting areas. Various organisations in liaison with the Fisheries Department are increasing their efforts in research and conservation activities on sea turtles. However, a good understanding of the biology of sea turtles is essential for their effective management and protection.

Conservation Activities in Kenya

Various sea turtle research and conservation activities have been on going since 1984 when the Fisheries Department started work on the revision of the repealed Fisheries Legislation. In the new Fisheries Act (Cap. 378) of 1989 and its subsidiary Legislation of 1991, sea turtles are protected animals.

As early as 1991, research work on the nesting and hatching behaviour of sea turtles was initiated. This work helped managers identify specific areas to be addressed to enhance the conservation of sea turtles.

In 1994, the Kenya Sea Turtle Conservation Committee (KESCOM) was formed which comprises a team of marine and fisheries scientists, managers, hoteliers, NGOs and private individuals.

Several activities have been completed, including management, research, monitoring, control and community education and mobilisation. Aerial surveys have also been conducted, and beach patrol exercises undertaken and strengthened. Nesting beaches and nests have been identified and protected and hatchlings assisted to the sea.

Community education and mobilisation activities focused on the formation of local sub-committees on turtle conservation at various fish landing beaches to work in liaison with KESCOM. KESCOM has also established a scheme that rewards those who sight, report and guard turtle nests until they hatch. Fishermen have their nets replaced if these are destroyed while they release turtles accidentally caught in them.

Several education and awareness activities have been undertaken to enhance an understanding of both ecological and conservation needs of sea turtles. School competitions in art, poems, brochures, posters, models, songs, and dances have been conducted and winners rewarded. KESCOM has also organised turtle walks, mass media communications, video -shows and a teaching kit for schools.

To enhance capacity building for improved management and conservation of turtles, training workshops, symposiums, seminars and information exchange among the stakeholders and resource beneficiaries have been conducted. The TED workshop is a part of this capacity building and technology transfer.

Future Conservation Plans

A Sea Turtle Recovery Action Plan has been developed for Kenya. Mitigation measures for threats to sea turtles are being put into place, including the use of TEDs. Efforts to increase the number of protected nests along the coast and improve hatching success rate are being enhanced with the establishment of community beach patrol groups. There is also a plan to ensure long term protection of important nesting beaches and foraging habitats. Since turtles are migratory, efforts are being made to study turtle population dynamics, and establish an inter-regional monitoring and surveillance centre at Kipini to be replicated throughout the entire Western Indian Ocean region.

Recommendations

There is still a great deal of work to be done on turtle conservation. One of the major constraints, as always, is financial support. Looking at the list of things to be done, it is clear that a substantial amount of funds is needed to undertake the needed research, training, enforcement and public education and awareness activities.

My appeal is to all of you to do all that is within your means and make this work a success.

***"My appeal is to all of you
to do all that is within your means
and make this work a success."***

Developing a Regional Approach to Sea Turtle Conservation: IUCN Opening Address

Dr Rodney V. Salm, Coordinator Marine and Coastal Conservation Activities
IUCN - The World Conservation Union, Eastern Africa Regional Office

Mr Deputy Provincial Commissioner, friends and colleagues:

I won't keep you too long as we came here to learn about TEDs and their design, benefits and deployment, not to hear endless introductory speeches. However, I would like to say a few words about the process leading up to this workshop, and to comment on integrated approaches to coastal management.

The process started a little over three years ago when the Kenya Wildlife Service (KWS) invited IUCN to provide some very basic training in sea turtle biology and conservation. KWS quickly applied this training along the Kenya coast. However, KWS were not going to let us at IUCN off the hook. KWS realised that whatever it did to conserve turtles in Kenya would not amount to much if these efforts were not matched in neighbouring countries that shared those same turtles. For example, it is known from tagging studies of turtles in South Africa, that turtles nesting on protected beaches there move to unprotected feeding grounds in Mozambique, Madagascar, Tanzania, Kenya and even Somalia-a distance of 3,300 km away.

No matter how well these turtles are protected on their South African nesting beaches, they will disappear from the region if they are routinely caught in Tanzania, for example. KWS recognised this and called on IUCN to help develop a collaborative regional programme for turtle conservation in which the efforts of one country to safeguard turtles would be recognised by its neighbours and supported by their complementary efforts.

We at IUCN were hooked, and were fortunate enough to raise sufficient money to convene a regional meeting at Sodwana Bay in South Africa. The site was chosen because it had been carefully studied, monitored and managed for 33 years, demonstrating one of the longest

ongoing programmes of its kind in the world.

The workshop had two main objectives. One was to provide training to the turtle scientists and managers of the region. For this, we had three of the top turtle scientists/managers in the world: Dr Jeanne Mortimer from the USA, Dr Colin Limpus from Australia and Dr George Hughes from the Natal Parks Board in South Africa, who was also our host and the person who initiated the turtle work in the area. Three participants of the workshop are here: Teclegiorgis Gebremariam from Eritrea, Samiro Magane from Mozambique and, last but not least, our guide through the next few days, George Wamukoya from Kenya.

The second main objective was to jointly formulate a conservation strategy for the turtles of the Western Indian Ocean (WIO). The conservation strategy and proceedings of the workshop were the two printed outputs of the workshop. A Steering Committee to oversee implementation of the strategy was established during the Sodwana workshop. Both George Wamukoya and I were elected members. As a contribution to our responsibilities on the committee, we have jointly catalysed this TED workshop which, thanks to the generous financial support of the US National Marine Fisheries Service, WWF International, and our hosts, KWS, we are able to attend over the next five days. Another output of the Sodwana workshop is grants to enable nationals of the region to attend the Symposium on Sea Turtle Biology and Conservation that is held annually in the USA. We had first arranged for George Wamukoya to go there. He came back so energised and so much more committed to turtle conservation in Kenya that we have since sent two more people to participate, one of whom, Jane Mbendo from the Fisheries Department in Kenya, will be with us throughout this workshop.

This year, we have arranged grants through WWF International to support two more people to go, both of whom are with us: Samiro Magane from Mozambique and Pierre Berthin Flakotonirina from Madagascar. The Symposium is valuable because it exposes participants to upper end technology as used in the USA and to the approaches used in several South and Central American and Caribbean countries that face many of the same problems we do in this region. It is a wonderful opportunity to share experiences and discuss different approaches with equally challenged and determined colleagues.

Through forums such as the Sodwana meeting and this workshop, we are establishing a solid core of turtle expertise in this region. Hopefully, in the coming years, there will be no need to go to the symposium in the USA. We will get the same benefits by networking in this region, sharing our experience here and visiting each other's project sites.

The WIO sea turtle conservation strategy I referred to earlier lists 12 priority actions for implementation that were identified by the participants at the Sodwana meeting. One of these is: *Reduce fisheries bycatch mortality, including promotion of Turtle Excluder Device (TED) implementation*. This workshop is a big step in that direction. Another priority action was to declare 1998 the *"Year of the Turtle for the Indian Ocean"*. This is where you come in. We call on all of you to help make 1998 a special success by planning now for a concerted programme of tagging and public awareness, and to push through TED regulations and implementation in your countries.

Finally, I would like to refer back to comments made by Dr Mwandotto of the Coast Development Authority on

integrated coastal management (ICM), a point that was picked up and emphasised by Mr Kariuki, Assistant Director of Fisheries.

ICM is an essential approach to planning for the sustainable development of coastal areas. It helps to reconcile the needs of the different sectors and to safeguard the interests of coastal people. But there are other forms of integration that are very important too. Regional integration is absolutely crucial to safeguard such highly migratory species as turtles and to ensure collaboration among all the states that share the resource, along with the responsibility for its management.

But we should not lose sight of temporal integration—the integration of activities over time. I raise this because, although we may think there are many remote areas where turtles are safe, the World Bank has predicted that there will be continuous strip development along the eastern seaboard of Africa by the year 2025. This means one long city from Cape Town to Kismayo and beyond a frightening prospect. If turtles are in trouble now, how will they fare then, unless we plan carefully to avoid destroying any more nesting beaches? How will they fare unless we take measures now to safeguard them on their feeding grounds, such as through the installation of TEDs?

Not well, I'm afraid, unless we maintain our commitment, pool our skills, and use all of our influence to prepare for the future while we meet the challenges of the present. This is the challenge facing all of us here.

Thank you, and I wish you all a good workshop. We are in good hands.

"We call on all of you to help make 1998 a special success by planning now for a concerted programme of tagging and public awareness,, and to push through TED regulations and implementation in your countries. "

Speech by Mr Peter L. N. Kiilu Provincial Commissioner Coast Province

Assistant Directors, Kenya Wildlife Service and Fisheries, US National Marine Fisheries Service (NMFS), IUCN Eastern Africa Regional Office, IUCN Marine Turtle Specialist Group, World Wide Fund for Nature (WWF International), The Organising Committee of the Workshop, Workshop Participants, Distinguished Guests and Conservationists, Ladies and Gentlemen: I must say at the outset that I am most grateful for the opportunity accorded to me to participate in this opening session of the Regional Workshop on Turtle Excluder Devices (TEDs)-a workshop geared towards forging partnerships among the Eastern Africa countries, i.e. Eritrea, Kenya, Tanzania, Mozambique and Madagascar, to adopt fishing practices in their respective coastal waters that exclude non-target species. It is an opportunity I intend to use to explain the government point of view on the long-standing conflict between small-scale fishermen and trawler operators. I also hope that my presence here in person will not be in vain but will give the workshop the prominence and boost it so much deserves and provide a new impetus in addressing the problem of incidental capture of sea turtles and other unwanted organisms in trawl nets.

It is common knowledge that the countries of the region are endowed with extensive coastal waters that support important fisheries. The most relevant to this workshop is the shrimp fishery. Kenya has a narrow continental shelf thus limiting the fishing grounds. The key fishing grounds in Kenya are Ungwana Bay and Malindi. This also limits the number of trawlers fishing inshore. Currently only four trawlers have been licensed. Unfortunately, areas where shrimp fishermen deploy their trawl nets are feeding habitats for sea turtles. As a result, it is common to observe sea turtles caught incidentally in the trawl nets. It is estimated that at least 100-500 sea turtles are caught each year in trawl nets. This figure appears on the low side, especially when it is considered

that sea turtles seem abundant in shrimp trawling grounds, making them more vulnerable to incidental capture.

A lot of efforts have been made to educate the small scale fishermen on the incidental capture of sea turtles in set nets. However, this workshop focuses on the mechanised commercial fishermen (trawlers).

Kenya, like many other countries, will for many years continue to depend on its commercial marine fisheries as a future mainstay of its economy. This, however, must be done in a manner that will not compromise the existence of other non-target species.

It is against the above background that Kenya considers itself privileged to host this important workshop as a part of the implementation of the Western Indian Ocean Marine Turtle Conservation Strategy. The TED that has been developed by the NMFS will go a long way in renewing our commitments and partnerships for concerted sea turtle conservation. The partnerships must cut across the entire spectrum of society including the government, the private sector, the people and our regional and international partners.

Government will give conservation of biological diversity, particularly endangered species such as sea turtles, the priority they deserve in line with the United Nations charter for sustainable development, Agenda 21 and the Convention on Biological Diversity to which we are signatories. The private sector must be more sensitive to the environmental impact of its development activities and investments. We need investments and development, but not at the expense of the environment that is expected to sustain future generations.

It is encouraging to learn that the use of TEDs does not cause lowered shrimp catches and that, if anything, it improves the quality as it reduces the bycatch which in most cases is discarded or sometimes used for local

market, fetching very little money. Conservation of sea turtles cuts across national boundaries, as these animals are highly migratory, moving long distances from their nesting beaches to feeding grounds (even up to 3,000 km!). Kenya joins the growing family of the Eastern Africa countries who have pledged their support to conserve endangered species such as sea turtles. We will cooperate with all countries and institutions that share our concern for conservation and are willing to work with us for its sustenance.

Mr Chairman, (would like to take this opportunity to highlight some of the efforts taken by the government in preparation for this workshop and implementation of its recommendations.

1. The relevant government departments (Kenya Wildlife Service, Fisheries, Kenya Marine and Fisheries Research Institute, Coast Development Authority, Kenya Navy and Provincial Administration) have had a dialogue with the trawler operators and have established a standing committee to address all matters relating to coastal fisheries management.
2. The Fisheries Department, which is the government licensing body for trawlers, has developed procedures that have categorised the trawler operators into inshore and offshore trawlers, thus regulating their activities.
3. A draft legislation on the shrimp trawling in Kenya has been developed, discussed by the Interested and Affected Parties and has received a nod. This will make it easy to implement and monitor compliance of the TED requirements.

4. The Fisheries Department has accepted the local community-based Kipini Community Conservation Group to establish a sea turtle research centre at Kipini. This will enhance the monitoring of the TED workshop implementations.

Finally, the workshop has the benefit of an impressive list of highly qualified Gear Technology trainers from the United States and other resource persons. I have every reason to look

forward so that they can be implemented. I commend the IUCN/SSC Marine Turtle Specialist Group and IUCN Eastern Africa Regional Office and the Western Indian Ocean Sea Turtle Conservation Strategy Steering Committee for selecting Kenya to host this important workshop-the only one of its kind on the continent. I commend the workshop organisers and their parent institutions and the trawler operators for their support and willingness to participate.

I thank WWF International and the US National Marine Fisheries Service for funding this important workshop. It is this form of committed partnership from government, local and international NGOs, private sector and donors that promotes environmentally friendly and sustainable development. We pledge our commitment to nurture such a partnership.

With those few remarks, I wish to declare the workshop officially opened and hope that the international participants will also find time to sample and visit our conservation areas, besides enjoying the hospitality of Kenya's local people.

Thank you.

“Kenya joins the growing family of the Eastern Africa countries who have pledged their support to conserve endangered species such as sea turtles. We will cooperate with all countries and institutions that share our concern for conservation and are willing to work with us for its sustenance.”

Overview of the Training

The training workshop covered a variety of topics, including:

- the relationship between sea turtles and shrimp fisheries,
- the history of TED development,
- TED designs and modification (including construction, installation and deployment),
- global efforts to enhance use of TEDs (such as through restrictions on shrimp trade and shrimp imports),
- US TED legislation and enforcement mechanisms.

The training consisted of verbal presentations, video shows, group discussions, demonstrations, hands-on practical sessions, and TED trials on the Malindi Bay fishing grounds. The principal trainers were Charles (Chuck) Oravetz, James Barbour and Kendall Falana of the US National Marine Fisheries Service (NMFS).

Sea Turtles and Shrimp Fishing

Shrimp fishermen often deploy their trawl nets in the same waters used by sea turtles. When a turtle finds itself in the path of a trawl, it generally tries to escape by swimming faster than the trawl is moving, instead of swimming out of its path. As the turtle tires, it is overtaken and finally caught in the trawl. Then, if the trawl is not pulled out of the water in good time, the turtle usually drowns. A turtle that is exhausted by one capture may not survive a later capture if it occurs soon after the first.

In 1983, NMFS estimated that more than 48,000 sea turtles were "incidentally captured" each year in the southeastern shrimp fishery. Of these, about 34,000 were caught in the South Atlantic and 14,000 in the Gulf of Mexico.

The History of TED Development

Between 1978 and 1984, NMFS spent \$3.4 million of endangered species funds on a research programme to develop fishing gear that would significantly reduce the incidental capture and drowning of sea turtles while maintaining the shrimp catch. This programme involved shrimp fishermen who assisted with the development of the soft and hard TED designs.

TED Designs and Construction Materials

Although both soft and hard TEDs were certified for use in the shrimp fishery, soft TEDs have shown serious operational problems. Consequently, hard TEDs are the preferred option and their use is encouraged.

There are a variety of hard TED designs available to the fisherman, including:

- Georgia jumper
- Hooped TED
- Fixed Angle
- Super Shooter
- Anthony Weedless, and
- Flounder TED.

TED regulations specify that hard TEDs be constructed of:

- solid steel rod,
- fibreglass rod,
- aluminium rod,
- heavy gauge steel, or
- aluminium tubing

to be successful, TEDs must meet specific design criteria on such aspects as:

- grid size,
- bar spacing,
- bottom exit hole (as opposed to top exit),
- angle of elevation (with help of standard carpenter's protractor),
- floatation (float placement and method of attachment),
- webbing flap,
- chafing webbing, and
- lazyline.



Operation and Efficiency of TEDs

The TED is a device that is placed in front of the bag, or cod end, of a shrimp trawl. When large objects, such as turtles, large fish, rays, rocks or tree trunks enter the TED, they encounter bars slanted at a 45-50° angle that deflect them through an opening and out of the shrimp net.

A funnel of webbing in front of the slanting bars accelerates the water flow past the bars and carries shrimp and fish into the cod end of the trawl.

TEDs can be modified to facilitate installation in the smaller nets that are often used inshore.

There are many advantages to using TEDs:

- TEDs provide a technological solution to the problem of incidental capture and drowning of sea turtles in the shrimp fishery.
- TEDs have been shown to maintain normal levels of shrimp catch while reducing the incidental capture of sea turtles by 97% and eliminating sea turtle drowning.
- By reducing the incidental capture of other unwanted marine life such as sharks, rays, large fish and trash, TEDs can reduce the total trawl take by 44%.
- A reduction in bycatch also decreases the weight and drag of the nets, thereby increasing the fuel efficiency of a shrimp trawler.
- By reducing the bycatch, TEDs also reduce the time spent by fishermen separating the

- By reducing bycatch that can damage the shrimp, TEDs can increase the quality and therefore value, of the shrimp catch.
- TEDs also reduce bycatch that can damage the trawl net.
- Also, use of TEDs helps shrimp fishermen comply with Fisheries and Wildlife regulations, where they exist, that prohibit the capture of sea turtles.

Shrimp Trade and TED Regulations

Despite the involvement of shrimp fishermen in TED development and NMFS's efforts over several years to promote the TED, very few U.S. shrimpers voluntarily adopted its use. As a consequence, in January 1986, the Center for Environmental Education (CEE), other conservation organisations and the US Fish and Wildlife Service requested NMFS and the Gulf of Mexico Fishery Management Council to require seasonal mandatory use of TEDs by Spring 1987.

At the end of 1992, NMFS issued regulations requiring that all shrimp trawlers in offshore areas and large inshore trawlers use TEDs all year. On May 1st 1996, a law was implemented in the United States that required all countries exporting shrimp to the United States to adopt mandatory use of TEDs or face embargoes on their shrimp products.

As a response to this embargo and sea turtle conservation needs, NMFS has worked closely with numerous countries to facilitate the transfer of TED technology. The countries involved include Australia, Honduras, Hong Kong, India, Indonesia, Malaysia, Mexico, Nigeria, Panama, Thailand and Venezuela, among

others. Some of these countries, such as Indonesia and Mexico, are in compliance with the US shrimp export requirements.

Hands-on Practical Sessions and TED Field Trials

All participants had the opportunity to contribute at different stages, to the construction of the different TEDs. The assistance of the gear technologists from the trawler companies, together with the enthusiasm exhibited by the participants, greatly facilitated this exercise. Consequently, more TEDs were constructed than anticipated by the trainers, providing one for use in the trawler trial and others for participants to take to their home institutions.

Each country represented at the workshop was given one or more TEDs to take home as a sample and for field trials in their coastal waters. Overall distribution of TEDs is indicated below:

Eritrea	1 (large)
Kenya	4 (3 medium and 1 small)
Madagascar	2 (medium and small)
Mozambique	2 (medium)
Tanzania	1 (small)

A trawler for the TED trials was provided by M/S ALSECO. Under the supervision of Kendall Falana of NMFS, a TED was fitted in one of the two trawl nets and both nets deployed on one of the main fishing grounds off Malindi Bay. The second net was left without a TED to act as a control.

Both nets were towed for 30 minutes at a depth of 107 fathoms (185m), a record depth for the floats attached to maintain the orientation of the TED. The nets were retrieved and the contents of each poured on the deck. It was evident that the net fitted with the TED had a clean catch, with insignificant bycatch as compared to the second net that had a ray, assorted fish and trash, along with an equivalent amount of shrimp.

Although the tow time was limited, it was encouraging to hear the boat crew themselves acknowledge that the TED improved the quality of their shrimp catch but had no effect on the quantity, as evidenced by the amount caught in each net. However, more trials are needed to substantiate the catch differences.

"It was encouraging to hear the boat crew themselves acknowledge that the TED improved the quality of their shrimp catch but had no effect on the quantity."



COUNTRY REPORTS



Shrimp Fishery in Eritrea: Exploitation and Legislation

Teclegiorgis Gebremariam, Abu Amer, Semere Gebremariam and Mussie Asfaw

Fisheries are important to Eritrea, providing extra protein to the people, generating hard currency and creating employment opportunities. Fisheries can be compatible with the conservation of sea turtles if adequate controls are placed on trawling activities, especially the compulsory use of Turtle Excluder Devices (TEDs) at demarcated places and during certain seasons of the year.

Existing Legal Framework for the Control of Bycatch in Shrimp and Fish Trawls

At present there is no commercial shrimp trawling in Eritrea. It has been estimated that the Maximum Sustainable Yield (MSY) for Eritrean shrimp resources would be only 500 tons/year (Guidicelli, 1984). Trial fishing trips were made to assess the feasibility of commercial shrimp exploitation in Eritrean waters in early 1995 by the Saudi Fishing Company and in December 1996 by IFREMER. Around 80-90% of the harvests was bycatch. If further surveys do not identify additional shrimping grounds, the development of a shrimp fishery is unlikely.

Regulations for commercial fishing trawlers provide the legal framework for the control of bycatch in fish trawls. The regulations prohibit use of small mesh nets (the stretched mesh size must be 11-14 cm and should comply with all national and international regulations and standards) and require the use of TEDs. Despite this, TEDs are not used because there is no experience for their manufacture, correct installation, deployment and

maintenance in the country or with the concerned foreign fishing companies. As the result, TEDs are still not in use and large numbers of turtles are being caught and killed in fish trawl nets.

The deployment of TEDs must include both shrimp and fish trawls because in one incident 300 turtles were caught by one fishing trawler during a cruise of 17 days.

Existing Legislation Protecting Sea Turtles

The existing Eritrean fisheries regulations state that fishing vessels operating in Eritrean waters must use TEDs in all trawl nets to reduce the mortality of turtles and other megafauna. Under trawler regulations, turtles and other megafauna are totally prohibited from being taken either at sea or on beaches, and every effort must be made to avoid catching them. In the event of incidental catches, turtles and other megafauna must be returned to the sea immediately, whether dead or alive. Although trawler crews do return the turtles caught to the sea, it is usually after the more valuable fish catch is sorted and packed. By the time the trash fish (including turtles) are dealt with, considerable time has elapsed and some turtles may have suffocated under the weight of the fish in the trawl.

Eritrea's laws are in the process of formulation. The Integrated Coastal Zone Management Proclamation, which allows for the establishment of Marine Protected Areas and includes turtle protection, was drafted in 1995. The Biodiversity Proclamation has been drafted. Eritrea is a signatory to the Convention on International Trade in Endangered Species (CITES). The focal point for the CITES Convention in Eritrea is the Wildlife Department of the Ministry of Agriculture. It seems that much has been done to prevent ivory trade in Asmara, but much remains to be done about turtles. Turtle carapaces are still sold in curio shops in Massawa and Asmara, and offered for sale by villagers on certain islands. As the result, new legislation is needed to ensure the protection of turtles. The Ministry of Marine Resources will cooper

ate with the Ministry of Agriculture to establish and implement legislation for turtle management.

A Summary of Bycatch Composition and Use in Shrimp and Fish Trawls

Data collected on bycatch between April and July 1996 show that turtles are included in less than 10% of all trawls recorded but, because of their very large size, they can form as much as 35% of the discard. Turtles are ninth in order of magnitude by species groups, when considering the percentage of bycatch.

A Best Estimate of Sea Turtle Mortality in Trawl Nets

It is estimated that 0.61 turtles are caught on average per hour trawled in Eritrean waters. Data from the two years before 1996 gives much lower rates of turtles captured (0.02 and 0.03) per hour trawled. It is more likely that data collection improved in 1996 than that turtle catch suddenly increased. Only data from future months and years will determine the correct catch rate.

The average survival rate of turtles caught in 1996 was 62%. The species caught were almost evenly distributed between green (71/month) and hawksbill (64/month). However, the reliability of the Surveillance Officers in identifying the species still needs to be verified.

It is not yet clear exactly which areas have no trawler bycatch. However, it is known that no trawling happens north of Massawa. No seasonal trends in turtle catch have been detected from the available data. It is to be hoped this will be refined through future data collection.

Possible Incentive Measures to Encourage Adoption of TED Technology by Trawler Companies

1. Vessel operators could be made to pay a certain amount of money (fines, royalty) for any turtle caught dead or alive during trawling, as an incentive to take avoidance or protective measures to reduce turtle bycatch.
2. Based on the research and trawler monitoring results, seasons could be defined and areas demarcated where TEDs must be deployed.

3. Vessels/crews/management of industrial trawlers complying with regulations and assisting in the process of identifying turtle areas and seasons could be rewarded in other ways for this assistance (e.g. reduced license fees), as opposed to fines for turtles caught.

4. TED management workshops, which must be attended by crews and operators alike, could be implemented to educate these people in the correct and efficient deployment of TEDs.

5. A TED manufacture capability could be established in Eritrea to provide suitable TEDs as required by the industrial fishing industry.

A Possible Model for Multidisciplinary Teams to Ensure Compliance with TED Legislation

Possible team members and their roles are listed below:

Surveillance officers: monitor trawlers, monitor catches, and regulate the harvest of marine products

Biologists: provide information on nesting beaches and feeding grounds; also monitor trawls

Fishermen: report on any turtles encountered whether dead or alive, and tagged turtles at sea or on shore, and on nesting areas and feeding grounds

Extension officers: report on any turtles encountered whether dead or live, and tagged turtles on nesting beaches and feeding grounds

Customs officers: regulate export of turtle products

Tourism operators: report on any turtles encountered whether dead or alive, and nesting turtles

Fishing companies: deploy TEDs

Fisheries scientists: combine all above findings into an annual report.

REFERENCES

Guidicelli, M. 1984. The Ethiopian Fisheries: situation, development needs and opportunities. Report prepared for the fishery planning and development project. Field Document 1. Rome, FAO (FI/DP/ETH/82/016).

Bycatch in Shrimp Trawls in Kenya with Specific Reference to Sea Turtles

George M. Wamukoya, Jane R. Mbendo and J. Eriya

Trawling activities in Kenya are restricted to Malindi and Ungwana Bays. Although legislation prohibits trawling within five nautical miles, this is not strictly adhered to, hence the high incidental capture of sea turtles in shrimp trawls. Recent observations have recorded turtles washed ashore with injuries sustained from incidental capture. It is therefore imperative that preventive measures be put in place to curb turtle mortality as an effort toward sea turtle conservation.

Status of Shrimp Fishery

Currently, only four trawlers have been licensed for inshore fishing compared to nine vessels that were operating in this fishery in previous years. On average, the total bycatch in Kenya is 500 tonnes per annum comprising fish of insignificant economic value, sea turtles and other organisms. At least 100-500 sea turtles have been reported caught annually as bycatch in trawl nets. Although a proportion of this bycatch is utilised, a large part is generally discarded in the sea. This is often done under conditions that give turtles no chance of survival (Wamukoya and Mbendo 1995).

Legislation on Turtles

Sea turtles are protected under the Fisheries Act, Cap 378 and the Wildlife (Conservation and Management) Act, Cap. 376. Apart from deficiencies in both Acts, there is an obvious overlap in jurisdiction, thereby resulting in poor enforcement. Also, the departments concerned do not have equal law enforcement capabilities. This is further complicated by lack of support by the law enforcement agencies, particularly the police and the judiciary--culprits are either released unconditionally or, if fined, the fines are so low that they do not deter offenders (Wamukoya et al. 1996). There is no provision for Turtle Excluder Devices (TEDs) or

reduction of bycatch in trawling, although the Director of Fisheries can promulgate any rules and regulations as may be deemed necessary to enhance sustainable use of the resource.

Proposed Legislation

Draft legislation on TEDs in Kenya has been formulated. The process has generated such enthusiasm among the trawler companies that adoption and implementation of the proposed regulations by the trawler industry will not be a problem (Wamukoya 1996). This will positively enhance implementation and monitoring of the TED requirements.

Incentives

The following possible incentive measures are proposed as means to encourage compliance with TED regulations:

1. The government could provide tax rebates on fishing equipment to trawler operators that comply with TED regulations.
2. An Award Scheme could be developed that provides appropriate labels for products of companies operating in compliance with the TED regulations.
3. A shrimp stock assessment could be conducted to demarcate commercial fishing areas clearly. This will help to reduce the conflicts between trawlers and artisanal fisheries.
4. Fishing technologies for artisanal fishermen could be improved and regulated fishing seasons and areas could be implemented to reduce conflicts between artisanal fishermen and trawlers.

5. Non-monetary rewards could be provided to employees who enforce and ensure compliance to TED regulations.

Multidisciplinary Management of Commercial Fisheries

A multidisciplinary Coastal Fisheries Management Team has been formed to address issues pertaining to the marine fishery in Kenya. The committee comprises the Fisheries Department, Kenya Wildlife Service, Coast Development Authority, Kenya Marine and Fisheries Research Institute, Kenya Ports Authority, Kenya Navy, Provincial Administration and trawler

operators. Through this committee, compliance with TED legislation and implementation will be ensured.

REFERENCES

- Wamukoya, G. 1996. Kenya to Minimise Turtle Mortality in Shrimp Fishery. *Marine Turtle Newsletter* 73: 17-18.
- Wamukoya, G. M. and J. R. Mbendo. 1995. The incidental capture of sea turtles in shrimp trawl fisheries in Kenya. 6 pp.
- Wamukoya, G. M., F. Kaloki and J. R Mbendo, 1997. Sea Turtle Recovery Action Plan for Kenya. KCCC Technical Report TR-1: 69 pp.

"At least 100-500 sea turtles have been reported caught annually as bycatch in trawl nets. Although a proportion of this bycatch is utilised., a large part is generally discarded in the sea. This is often done under conditions that give turtles no chance of survival."

TED Experience in Madagascar

Heritiana Randriamiarana, Berthin Rakotonirina and Jean Maharavo

All five species of Indian Ocean sea turtles are found in Madagascar. Their distribution is related to nesting as follows: *Caretta caretta* in the south and southeast, *Chelonia mydas* in the southwest, *Eretmochelys imbricata* in the north and *Lepidochelys olivacea* in Morondava region. The nesting area of *Dermochelys coriacea* is not known.

Accidental Capture of Turtles in Shark Nets (Jarifa) in 1996

In 1996, data were collected in the Toliara region of south Madagascar towards a PhD thesis. Four species of turtles are captured in the Toliara area. Only those captured in nets are mentioned in the table below.

The problem of turtle mortality in Madagascar differs between the south and the north. In the southwest (Toliara region) people eat turtles. The fishermen use nets or other methods like spearguns and harpoons to catch them. Sometimes the turtles are caught by hand, particularly when mating or on the beach when they are nesting. Poaching of eggs is also a common occurrence.

During nine months in Toliara region, 189 turtles were caught: 5 *Eretmochelys imbricata*, 11 *Caretta caretta* and the rest *Chelonia mydas*. These were consumed in fishing villages.

Accidental Capture of Turtles in Shrimp Trawls

Along the northwest and west coasts shrimp trawling causes problems for turtles. Madagascar has 27 small trawlers and 60 large ones operating in the shrimp fishery. The shrimp fishery is the main source of foreign exchange for Madagascar. In 1996, about 8,500 tons of shrimp were caught for export. There has been no recording of accidental capture of turtles by shrimp trawlers.

Raveloson in 1988, Rabarison in 1990, and Rakontondrasoa in 1993 have done some studies on bycatch from shrimp fisheries, but they make no mention of sea turtles in the species composition of the catches.

It is possible that the trawlers catch some turtles. But, in light of current regulations, they discard the turtles at sea without recording them. Therefore, there are no data on accidental capture of turtles by shrimp trawlers in Madagascar.

Month	J	F	M	A	M	J	J	A	S	O	N	D	Total
Species													
<i>Chelonia mydas</i>	1	7	19	3	0	0	-	-	-	23	15	20	88
<i>Caretta caretta</i>	0	0	0	0	0	0	-	-	-	1	2	0	3
Total	1	7	19	3	0	0	-	-	-	24	17	20	91

Legislation Supporting Protection of Turtles in Madagascar

National Legislation: *inter-ministerial* Decree of 23rd May 1923 and 24th October 1923 protects sea turtles in Madagascar.

Madagascar signed and ratified the International Convention on International Trade in Endangered Species of Fauna and Flora (CITES). Related to this, Ordinance No. 75-014 was proclaimed and became effective on 10d, August 1975. All five turtle species found in Madagascar are listed in the CITES appendices. To date, no fishing or export licences for turtles have been issued and none of the five species are traded commercially.

International Conventions: In addition to CITES, Madagascar has signed and ratified the Convention on Biological Diversity. Madagascar has also signed the Bonn

Convention concerning migratory species, but has yet to ratify it.

Application of TED Technology in Madagascar

Discussions with industrial shrimp fishermen indicated that they are not reluctant to use TEDs, but they question whether TEDs are really necessary and state that there should be scientific studies to confirm the applicability of TEDs. Also, the cost of modifying the nets is considered a problem.

Since TEDs are not known in Madagascar, there is the need to sensitise fishermen on the operations and opportunities for them. At the same time, there is the need for more comprehensive studies on accidental catch of turtles by shrimp trawlers to have stronger arguments for the adoption of TEDs. It should be noted that a practical demonstration of TEDs, in collaboration with trawler operators, would serve to demonstrate the advantages of the device.

"Since TEDs are not known in Madagascar, there is the need to sensitise fishermen on the operations and opportunities for them. At the same time, there is the need for more comprehensive studies on accidental catch of turtles by shrimp trawlers to have stronger arguments for the adoption of TEDs"

Summary of Turtles and Fisheries Resources Information for Mozambique

Samiro Magane, Lizefte Sousa and Hermes Pacule

Mozambique lies on the East Coast of Africa, between latitudes 10° 20' and 26° 50' South, with a tropical humid and sub-humid climate and a coastline of approximately 2,780 km.

The human population was estimated to be 16.6 million inhabitants in 1994 (World Bank 1995). As a result of the civil war, a large part of the Mozambique population has resettled along the coast and is dependent on marine resources.

The coastal and marine environment is characterised by a wide variety of habitats, including coral reefs, seagrass meadows, sandy beaches, mangroves, sand dunes, etc., which offer good conditions for marine animals, including marine mammals and sea turtles.

Five species of marine turtles are known to occur along the Mozambique coast, namely, *Caretta caretta* (loggerhead turtle), *Chelonia mydas* (green turtle), *Eretmochelys imbricata* (hawksbill turtle), *Dermochelys coriacea* (leatherback turtle) and *Lepidochelys olivacea* (olive ridley turtle) (Hughes 1971).

The first three species occur along the entire coast, while leatherback turtles are confined mainly to the southern coast and olive ridley turtles to the northern coast (Hughes 1971). Little is known about their status or feeding and developmental habitats, and existing studies focus on specific areas in the southern part of the country.

Turtles are killed accidentally and intentionally every year by fishing activities, but no catch statistics for turtles are available.

Shrimp Fisheries

There are two different shrimp fisheries in Mozambique: shallow-water and deep-water shrimp fisheries. Shallow-water shrimp are widely distributed along the coast near

mangrove areas, where juvenile shrimp grow. In semi-industrial and artisanal fisheries exploit the shallow-water shrimp.

The industrial fishery takes place on Sofala Bank which is located in the central part of Mozambique, between latitudes 16° 00'S and 21° 00'S and from 7 to 70 m deep. The semi-industrial fishery is confined to Maputo and Beira Bays. Both fisheries are carried out with outrigger trawlers that can operate with two to four nets simultaneously. Artisanal fishing is carried out along the coast with beach seines.

The main species caught by the industrial and semi-industrial fisheries are: *Penaeus indicus* (white shrimp), *Metapenaeus monoceros* (brown shrimp), *Penaeus japonicus* (flower shrimp) and *Penaeus latisulcatus* shrimp). The first two species form 75% of the total shrimp catches, with *P. indicus* the dominant species (Palha de Sousa et al, 1992). Shrimp bycatch makes up to 70% of the total catch. About 75% of the bycatch is made up of different species of fish and the remaining 25% comprises other crustaceans and cephalopods (Schultz and Baltazar, in press). Some of the most valuable fish are stored on board and used for human consumption. The bycatch is mostly discarded, but sometimes it is collected by artisanal fishermen and eaten, either fresh or dried.

Deep-water shrimp occur from latitude 17° 11' S to the southern border of Mozambique at depths between 200 and 800 meters. However, the main fishing grounds are located south of latitude 21° 00'S at depths between 400

and 600 meters. Stern or outrigger trawlers carry out this fishery and target *Haliporoides triarthrus* (pink shrimp) and *Adstaeoimpha folacea* (red shrimp), which make up 85% and 13%, respectively, of the shrimp catches (Caramelo et al, in press).

Based on survey data, it was estimated that the deepwater shrimp bycatch forms about 90% of the total catch. The main bycatch groups are fish (94%), squid (5%) and other crustaceans (lobster and crayfish) (Dengo, in press).

For both the shallow- and deep-water industrial shrimp fisheries, the incidence of sea turtles in the catches seems to be practically zero. A few cases of incidental catches have been reported, but the turtles were thrown back to the sea. No information is available from the semi-industrial fisheries.

Legislation Protecting Sea Turtles

Two State institutions are concerned with the protection of sea turtles: the National Directorate for Forestry and Wildlife (DNFFB) and the Maritime Directorate. The first is responsible for conservation and management of forestry, wildlife and protected areas, while the second is responsible for controlling the coastal and marine areas, and plays a significant role in the protection of sea turtles outside the protected areas.

Two main laws protect sea turtles: The Hunting Law, Decree No. 2627 of 7 August 1965, which is the responsibility of DNFFB, and Fishing Law No. 3/90 of 26 September 1990. The latter, which forbids any killing or catching of any sea turtle species, is the responsibility of the National Directorate for Fisheries.

The length of the Mozambique coastline (2,780 km) coupled with the lack of human and financial resources for enforcement makes the implementation of the above mentioned laws extremely difficult. In addition, the lack of implementing legislation for international conventions to which Mozambique is a contracting party, such as CITES (1981) and the Convention on Biological Diversity (1995), contributes to poor awareness among enforcement institutions and resource users of the conventions and the related national obligations.

There is an urgent need to develop more specific and clear legislation that incorporates international conventions and regional treaties for protection of sea turtles, their nesting sites and habitats.

Sea Turtle Mortality in Trawl Nets

Despite the relatively little knowledge about sea turtle populations in Mozambique, it is believed that they are being affected by the increase in fishing activities in the country, particularly the artisanal fisheries. For example, artisanal fishermen collect eggs and kill nesting females for meat (Gove and Magane, 1996).

Information about a specific area at Inhassoro, the only place where beach seine fisheries are carried out using tractors, indicates that up to 20 turtles per month can be caught, of which most are green turtles. This fishery operates for eight months of the year.

As mentioned above, incidental catches of turtles have only been reported for industrial fisheries.

Recommendations

1. Threats to sea turtles caused by the artisanal fisheries sector can be minimised through community awareness programmes that aim to educate and involve local people in turtle conservation, and in the enforcement of conservation legislation.
2. Due to a lack of precise data on sea turtle mortality caused by fishing activities, it is recommended that more effort should be made to evaluate the impact of fishing on turtle populations.
3. Although DNFFB is responsible for the conservation and management of sea turtles, it does not have the mandate to control the entire Mozambican coast. Consequently, it is suggested that the Directorate for Maritime Administration in collaboration with DNFFB be responsible for law enforcement and protection of sea turtles and their habitats, including nesting and feeding areas, outside marine protected areas.
4. To improve collaboration and coordination among the above institutions, it is suggested that other institutions like the Ministry for Environmental Affairs, National Directorate for Fisheries, Department of Biology of the Eduardo Mondlane University and the Fisheries Research Institute identify officers to coordinate turtle related activities.

REFERENCES

- Caramelo, A. M., H. Pacule, A. Dengo. Avalia9cio do estado do stock de *Haliporoides Narthfus* nas aguas de Mogambique e estado de exploragAo das pescarias de gamba. *Rev. In. Pesq. 20* (in press).
- Dengo, A. Principais recursos de peixe que acompanham as pescarias de gambas e seu estado actual de conhecimento. *Rev Inv. Pesq. 20* (in press).
- Gove, D. and S. Magane, 1996. The status of sea turtle conservation and research in Mozambique Pp 71-74 in Dias, D., R Scarlett, J. Hatton and A. Macia (ed.)
- Proceedings of the workshop - 0 Papel da investigagdo na gestdo da zona costeira. DCB, UEM, Maputo, 24 3 25 de Abril 1996.
- Hughes, G. R., 1971. Preliminary report on the sea turtles and dugong of MKambique, Mog. *Vet. J. 4 (2)*, 45-62 p.
- Palha De Sousa, L., C. Silva and E Dionfsio, 1992. Estado actual da pescaria de camar&o no Banco de Sofala. *Rev Inv Pesq. 20 (1)*: 27-39.
- Schultz, N. and L. Baltazar. Capturas da fauna acompanhante na pescaria industrial de camarado no Banco de Sofala - 1991 e 1992. *Inst. Inv. Pesq. Maputo* (in press).
- World Bank, 1995. Africa: A framework for integrated coast zone management. World Bank. Washington, DC. 139 pp.

"The length of the Mozambique coastline (2,780 km) coupled with the lack of human and financial resources for enforcement makes the implementation of the laws extremely difficult."

Some Information on the Sea Turtles of Tanzania

Winfred V. Haule, G. Kalikela and I. Mahundu

Five species of sea turtles occur in Tanzanian waters, the green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), leatherback (*Dermochelys coriacea*), olive ridley (*Lepidochelys olivacea*) and loggerhead (*Caretta caretta*) turtles. Only the first two of these are known to occur regularly.

There is still limited illegal trade in some turtle products, such as meat and oil. In places such as Dar-es-Salaam, there is a market for bracelets and carapaces sold to tourists and residents, although the volume of this trade is not known.

Existing Legislation Protecting Sea Turtles

There are two levels of legislation and agreements covering sea turtles in Tanzania: that covering the protection of the animals and their habitat at the national level, and the international controls related to trade in turtles and turtle products.

Mainland Legislation: Marine turtles are included in Fisheries Legislation on mainland Tanzania, Fisheries Act, 1970 (No. 6 of 1970). However, because of apparent ambiguities, the Minister felt it necessary to clarify this in Government Notice No. 140 published on 27, June 1975:

Definition of Fish: "For the avoidance of doubts it is hereby declared that as turtles and dugong do not fall within the scope of the Wildlife Conservation Act, 1974 (Act No. 12 of 1974) they fall within the definition of the term "fish" in the Fisheries Act, 1970, and their protection, preservation, capture and killing, or any dealing in them, are regulated by the Fisheries Act, 1970 and subsidiary legislation made thereunder."

Zanzibar Legislation: The Fisheries Act (1948) and amendments in 1988 provide an infrastructure that could be used to restrict or ban trade in turtles and turtle products, but this is not being done.

International and Regional Agreements: Tanzania is a signatory to the African Convention on the Conservation of Marine and Natural Resources (1968) under which sea turtles are considered protected species. The Convention on International Trade in Endangered Species of Flora and Fauna, (CITES), which regulates international trade in endangered species was signed by Tanzania on 29, November 1979. The CITES Management Authority is within the Wildlife Division.

In Tanzania a conservative approach to turtle conservation is recommended. Priority is given to protection of nesting beaches and mature female turtles within the framework of a Marine Protected Area, such as the recently established Mafia Island Marine Park, in which the advice, expertise and cooperation of local residents is actively sought and incorporated.

As pointed out, the Tanzanian mainland legislation on fisheries resources conservation is contained in the Fisheries Act No. 6 of 1970 and its Principal Regulations of 1989. The law empowers the Minister responsible for Fisheries to make such regulations as, among others, establishing marine parks, sanctuaries or reserves for any purpose whatsoever.

The Fisheries Principal Regulations, 1989 of the Fisheries Act, 1970, provide and empower the Director of Fisheries to make, introduce or attach any conditions to fishing licenses that are deemed necessary for the purpose of management and conservation of the fisheries resources. By law, the Director of Fisheries is the Licensing Authority.

Among the conservation measures in place being applied to shrimp trawlers is the prohibition of fishing between 6:00 p.m. and 6:00 a.m. As marine turtles orient and swim to the beaches where they lay eggs at night, prohibition of fishing at night gives them a chance to complete their nesting cycle. Fishermen are called upon to set them free whenever they are caught in their trawls.

Legal Framework for the Control of Bycatch in Shrimp Trawls

One of the conditions attached to shrimp fishing licenses is that discard of bycatch at sea is prohibited. All bycatch must be landed and sold.

Bycatch Composition in Shrimp Trawls

Between 40-80% of the catch of shrimp trawlers comprises fish, most of which are undersized and juvenile. Juvenile species that are most commonly caught include flat fishes, terapons, grunts, croakers, carangids, mackerels, lizardfishes and barracudas.

The Composition of the Bycatch from the Catches of Shrimp Trawlers in the Rufiji Fishing Area

The mean catch rate of the bycatch of finfish in the trawls of shrimp trawlers is 1,532 kg per day. The average proportion of finfish in the catches is 73.8% (range 48.8% to 88.6%) while prawns form only 26.2% (range 11.4% to 51.2%). However, the catch reported through landings shows the proportion of bycatch (finfish) in the catch as only 45.8%, with prawns forming 54.2%. The discrepancy results from the discard of 28% of the finfish bycatch at sea.

The species composition of the finfish bycatch shows that they are dominated by small size fishes like the ponyfish (*Gazza minuta*) (slipmouths), at 10.5-22%, Kelee shad (9-22%), small goatfishes (*Upeneus sulphureus*) (6-10%) and anchovies (*Thryssa vitfirostis*) (6.6-7.5%). These species have common

sizes 10- 12 cm and a maximum size of 24 cm, and are not very valuable in the market. Consequently, they are generally discarded at sea by the trawler operators.

Most of the finfish in the bycatch were immature except for the ponyfish (52% mature) and the threadfin (*Polynemus microstoma*) (80% mature).

Estimate of Sea Turtle Mortality in Trawl Nets

Despite protective legislation on the mainland coast, nesting females and almost every animal captured in nets are killed. "Incidental catch" in both artisanal and large commercial shrimp fishing vessels does occur, but the data are very scarce. However, because of the type of gear used and because the fishing activities take place in the shallow waters usually inhabited by turtles, it must be assumed that some turtles are caught, perhaps in large numbers as evidenced in Table 1.

Possible Incentive Measures to Encourage Adoption of TEDs

1. A one-day awareness seminar with captains of licensed shrimp fishing vessels on the importance of conserving turtles.
2. The international community to provide funds that could be used to provide vessel owners with TEDs.

Possible Model for Multidisciplinary Surveillance Teams to Ensure Compliance with TED Legislation

1. Involve non-governmental organisations-like conservation societies--that could provide monetary compensation incentives to operators using TEDs.
2. Financiers of shrimp fishing projects be convinced of the necessity to conserve sea turtles and hence the obligation to install TEDs in prawn trawlers.

1996			1993	
Number Fished	State	Number Fished		State
2	Alive		1	Dead
1	Alive		1	Poached
1	Alive			
4	Dead			

Workshop Evaluation

This evaluation has two parts: an evaluation of the workshop itself and an evaluation of the impact of the workshop on turtle conservation in the region. This brief report is a summary of the workshop evaluation based on 29 questionnaires that were returned by workshop participants.

Evaluation of the Workshop

Background

Participants were asked to complete three short tables and to submit any comments they felt were relevant to implementation of the workshop. The purpose of this exercise was to indicate how improvements could be made when planning and implementing future workshops.

Analysis of Evaluation Form Returns

The technical aspects of the workshop fared better in the evaluation than the logistical. The vast majority of participants considered that the TED design and installation components were highly relevant to their programmes, and that the training objectives and materials were good. There was justifiable disappointment over the low number of people that could go out on the trawler. This limited direct exposure to TED deployment, enforcement and sea trials to only seven participants, and was undoubtedly the weakest part of the programme. Several participants considered the time to be too short. They recommended that the time would have been optimised by breaking up into smaller groups of scientists, managers and technicians, for particular activities. This would better ensure that people attended only those sessions in which they were interested or able to understand. One participant made the valuable comment that gill nets pose a major problem in the

region, more so in some areas than trawl fisheries, and should have been addressed.

There clearly were very mixed feelings regarding the logistics of the workshop. While the majority thought that the venue, facilities, accommodation and food were good, some were dissatisfied with the size of the allowance for out-of-pocket expenses and with the hostel-type food and accommodation provided at Bandari College. However, only two of the 17 participants staying at Bandari College expressed extreme views on the food and accommodation. The US\$10 provided to each international participant to cover incidental expenses was considered by five people to be inadequate and the recommendation made that at least \$30 should have been provided.

Clearly, the issues of accommodation, services and allowances are important issues for some participants. It is fair to say that for future training events of this nature, the invitation letters should be absolutely clear on venue, services and allowances. This will also help to ensure that only those committed to training will attend.

It should also be stated that the workshop would not have taken place if the full costs of an international standard hotel had to be raised. The spirit in which the hosts, coordinators and sponsors responded to the request for the workshop was one of assisting individuals concerned with TEDs and trawl fisheries to be able to better undertake their tasks. Most importantly, the observation was made that the workshop will help fishing skippers to know how to use, maintain and make TEDs well.

The evaluation form returns are listed in the tables below.

Agenda, Programme and Logistics

	GOOD	MODERATE	POOR	COMMENTS
Training objectives	27	2		Transfer of TED technology adequately achieved. Trainers kept to the programme.
Training materials	28	1		Net and frames were of good quality and easy to handle. Materials generally of high standard. Not enough.
Timing and length	11	16	2	Time allocated for practical sea trials was too short to assess the effectiveness of the device. Trainers kept to their time limits. The topics were not properly scheduled. Time too short, particularly to TED deployment and sea trials. The workshop would have been more effective if split into technical, management and scientific groups to reduce dead time.
Workshop venue / Facilities	14	12	3	Did not match with the international status of the workshop.

Relevance of the workshop to your programme

	HIGH	MEDIUM	LOW	COMMENTS
TED design	25	3		Clear and applicable, TEDs simple and easy to make but the angle meter is not available locally
TED installation	18	4	2	Easy to install, well executed, but majority could not witness installation in trawl net aboard the trawler because of space limitation.
TED deployment	10	7	5	Not viewed by the majority due to lack of space on vessel--need to arrange adequate vessels for all to participate. The process is as easy as deploying ordinary nets.
Legislation/Enforcement	6	12	5	Not adequately covered--only those few on trawler had this demonstrated. All law enforcers should have been given chance. Should be introduced gradually starting with trials.
Trawler trials	6	12	4	People had the opportunity to participate in the trial--everyone should have participated in this important activity. Organisers should make proper survey before to make sure that facilities are adequate. Trial successful--net with TED had cleaner catch than net withoutTED. TED excludes big fish. Trawl time too short--more time should have been allocated to trawling to enable useful comparison. The exercise should have been done in areas where it is most likely to encounter turtles, ie <30m depth.

Evaluation of the Impact of the Workshop on Turtle Conservation

The workshop will be evaluated after 12 months to determine its impact on turtle conservation. This evaluation will include a summary of actions taken in the countries represented at the workshop (see Commitments for Follow-up listed at the beginning of this report) and an evaluation based on some

quantifiable measures of implementation of the training received at the workshop.

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APPENDIX



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