CARIBBEAN REGIONAL FISHERIES MECHANISM SECRETARIAT

WORKSHOP TO TRAIN FISHERIES STAFF AND SELECTED STAKEHOLDERS IN THE IDENTIFICATION OF COMMERCIALLY IMPORTANT MARINE SPECIES AND TO CONDUCT TRAINING IN BASIC FIELD DATA COLLECTION ACTIVITIES

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LIST OF ACRONYMS AND ABBREVIATIONS

CARICOM	Caribbean Community
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COFI	Committee on Fisheries
CRFM	Caribbean Regional Fisheries Mechanism
FAO	Food and Agriculture Organisation of the United Nations
GDP	Gross Domestic Product
DOF	Department of Fisheries
ICCAT	International Commission for Conservation of Atlantic Tunas
IPOA	International Plan of Action
NPOA	National Plan of Action

A. BACKGROUND

A meeting was held in Guyana between officials of Government, representatives of the Fisheries Department and industry officials in January 2003, at which the interpretation of the recently adopted International Plan of Action (IPOA) for sharks and Guyana's required involvement in this IPOA were discussed. At this meeting it was highlighted that the sharks caught in the gillnet fishery in Guyana are often landed dressed and finned making identification to the species level extremely difficult. Participants appreciated the fact that it is necessary that these sharks be identified down to the genus and preferably the species level for reporting to the International Commission for Conservation of Atlantic Tunas (ICCAT) and other international bodies responsible for their protection and management. Additionally, the Permanent Secretary in the Ministry of Fisheries, Crops and Livestock, expressed concern about the accuracy of the data reports being generated by the Department and the fact that certain observed trends in key fisheries could not be easily explained from data submitted by the Department. One of the recommendations coming out of this January meeting was the need to convene a workshop to deal specifically with the identification of shark species.

After a review of the Caribbean Regional Fisheries Mechanism (CFRM) Secretariat Guyana Work Program for January to December 2003, specifically the activities (i) a training workshop for all new and existing staff involved in data collection and management with the precise aim of training participants in onshore and offshore data collection, species identification, quality control and reporting, and (ii) a collaboration among a shark specialist, the CRFM and DOF personnel to determine the best means of identifying shark being caught in the gillnet fishery and to design a system for species identification during data collection; it was decided that these two activities could be combined into one training workshop since both were expected to deal with the identification of marine species. It was also decided that participation in the workshop would not be limited to only the DOF staff but would be open to representatives from all the sectors in the fishing industry in Guyana for which species identifications and data collection play a key role in their work. Hence representatives from the DOF, fishermen's cooperatives and processing plants were invited to attend the workshop.

B. OBJECTIVES

The workshop objectives were:

1. To train staff, and co-operating processors and fishers in identification of marine species of commercial importance to Guyana.
2. To improve statistical recording and reporting of activities conducted by Guyanese fishing vessels.

C. GENERAL PLENARY SESSIONS

1. Opening Ceremony.

Ms. Sherry Constantine, the Caribbean Regional Fisheries Mechanism (CRFM) Secretariat representative, delivered the opening and welcoming remarks. She welcomed the participants and noted that the meeting was timely in addressing the urgent need for the collection of catch and effort data on sharks at the individual species level. She highlighted the objectives of the workshop and then introduced the facilitators namely Ms. Dawn Maison, Principal Fisheries Officer in the Guyana Fisheries Department, Ms. Christine Chan A Shing from the Trinidad and Tobago Fisheries Division, Ms. Ingrid Peters, Mr. Jomo Glen and Mr. Brian Dey from the Guyana Fisheries Department and herself as the CRFM representative. Ms. Constantine expressed her hopes that the three days would be very informative and that the knowledge gained by participants would improve species identifications and hence data collection activities in Guyana.

2. Review of Agenda and Working Arrangements.

Ms. Constantine indicated that since the workshop started late (about 10:20 am) due to reasons beyond her control, the items on the agenda for the first day would have to be shifted around. Ms. Maison who was expected to attend another meeting at 10:30 am would deliver the first presentation on the review of the management of the shrimp and groundfish fishery as it relates to the Guiana/Brazil shelf, and then Ms. Chan A Shing would deliver the presentation entitled "Shark fisheries – International trends in management and conservation strategies, and the implications for the future of such fisheries in the Caribbean". There would then be a 10 minute refreshment break followed by the presentation entitled "Use of species guides", and then another presentation delivered by Ms. Chan A Shing on the identification of shark species caught by Guyanese fishing vessels. Ms. Constantine explained that the presentation entitled "Identification of tuna and tuna-like species occurring in Guyana's waters" would not be delivered since it was indicated to her the day before that only cavalla (*Caranx hippos*), Serra Spanish mackerel (*Scomberomorus brasiliensis*) and king mackerel (*Scomberomorus cavalla*) were caught in Guyana, and these would be covered during Ms. Peters' presentation.

The one-hour lunch break would follow Ms. Chan A Shing's presentation and when the sessions reconvened, the presentations on the identification of shrimp and groundfish and associated species occurring in Guyana's waters and techniques for sampling catch and effort and biological data would be delivered. The presentation on building partnerships in research would have to be moved to Friday morning since there would not be enough time to complete it and still have sufficient time to complete the practical session. The practical session, which was the final item on the days' agenda, would be split into two sections. Section one would deal with the identification of sharks and

section 2, the identification of the shrimp and groundfish and associated species caught in Guyana's waters.

Ms. Constantine indicated that a visit was planned for the Rosignol landing site which was to commence at 7:30 am the next morning and then on Day 3, there would be a visit to the Houston landing site commencing at 5:00 am, after which the sessions would reconvene with the final presentation on building partnerships in research, a review of the field visits and finally the closing ceremony. The agenda is attached as Appendix I

3. Introduction of Participants.

The participants of the workshop were asked to give a brief introduction about themselves. There were 17 representatives from the Guyana Department of Fisheries, 3 representatives from the processing plant B.M. Enterprise Inc., 1 representative from the processing plant Noble House Seafoods, 1 representative from Shakoor's Trading and 1 representative from the Greater Georgetown Fishermen's Cooperative. The list of participants is attached as Appendix II.

D. PRESENTATIONS DELIVERED

4. Review of the Management of the Shrimp and Groundfish Fishery as it Relates to the Guiana/Brazil Shelf, in Particular Guyana and its Implications for the Data Collection Programme.

[Presented by Ms. D. Maison]

The fisheries sector provides an important source of protein, employment and foreign exchange to the people of Guyana. This sector contributed G$159 million to the total Gross Domestic Product (GDP) in 2002, and in that same year, approximately $G 11.6 billion were earned from the export of fishery products. As a result of the importance of the industry to the people of Guyana, the government has adopted a precautionary approach towards the management and sustainable development of its fisheries resources. As such, different recommendations and criteria have been put in place for the conservation of the different categories of fisheries resources captured by Guyanese fishing vessels.

Shrimp

Four of the larger penaeids, *P. subtili; P. brasiliensis.; P. notialis;* and *P. schmitti*, and the smaller seabob shrimp, *X. kroyen,* are the main target of shrimp fishing operations in the waters surrounding Guyana. Based on the importance of these resources to Guyana and the neighboring countries of Brazil, Suriname and French Guyana, in 2002

a national workshop on shrimp and groundfish fisheries of the Brazil – Guianas Shelf was held. Recognizing the need to protect these resources, the following recommendations were made:

a) the number of vessels taking part in the penaeid shrimp and seabob fisheries should be limited at the current level and that the same approach should apply to the number and capacity of processing plants.
b) controls should be placed on the fishing mortality of smaller shrimp categories in the landings. For this purpose, closing of the fishery at peak juvenile recruitment and/or closure of areas with high density of juveniles were recommended.

At the Regional Conference on the Sustainability of Fisheries in the Brazil-Guianas Shelf held in Paramaribo Suriname in 2002, further recommendations were made for the sustainable utilization of shrimp resources. Guyana stated that it would introduce a closed season from October to November for six weeks. A flexible approach would be employed, with adjustments as more information became available. The impacts of the closed season would be evaluated after a period of three years.

Groundfish

Groundfish fisheries are important socially and economically in Guyana as they sustain the domestic fish market by providing an accessible and affordable protein source. Some of the species caught by commercial vessels are also exported and therefore earn much-needed foreign exchange. Management issues are complicated because of the variety of gears used, the multi-species nature of the fisheries and because these marine species are harvested by many countries. There is a paucity of data pertaining to their biology, productivity and even catch and fishing effort. Assessments on the available data illustrate a bleak to mediocre picture of the state of the resources. Most resources are fully to over exploited with little to no legislation in place to improve the situation.

Deep Slope (Red Snapper) Fishery

The red snapper fishery has a significant regional nature as a result of the presence of the Venezuelan fleet in all countries along the Guyana-Brazil Shelf except Brazil. Therefore, it is essential that a regional approach be taken to manage this fishery. The current nature of the fishery generates particular problems thus resulting in neither the coastal state nor the flag state giving much attention to ensuring the sustainable utilization of the resource. The available evidence from French Guiana shows strong indications that the red snapper stock or stocks are being over-exploited, and it is likely that the same applies to the species in all the countries along the Guyana-Brazil Shelf. Guyana has proposed the following measures to ensure the sustainability of the resource.

1. Specifications related to gear type, including mesh size and hook size, which serve as effective management tools should be considered.
2. The red snapper fishing fleet should be limited to those boats currently licensed to operate. No additional boats should be allowed entry into the fishery.

3. The data collected on this fishery should be analyzed to better understand the state of the resource and formulate more appropriate management measures.

Discussion:

Clarification was sought on the meaning of the word paucity. It was explained that in the context of the presentation it meant a lack of information or inadequate information. A query was raised about the management of the red snapper fishery in Guyana. It was explained that there was the need to collect information on the fishery so that the appropriate management measure, whether introducing licensing fees so that there is a reduction in the number of vessels engaged in this fishery or changing and/or extending the closed season, could be put in place. The issue was raised about the collection of data from processing plants and it was indicated that while some processing plants were very cooperative and supplied the data to the department others were not. A question about the timing of the seabob fishery was asked. It was indicated that the timing of the fishery this year was September to October however it would be later next year and later than that the year after until it becomes possible to determine the most appropriate time for the season.

5. Shark Fisheries – International Trends in Management and Conservation Strategies, and the Implications for the Future of Such Fisheries in the Caribbean.

[Presented by Ms. C. Chan A Shing]

Sharks and their relatives, the rays and chimeras, are a diverse group spanning over 400 million years of evolution. They are target species of fisheries nationally, regionally and internationally as well as bycatch of a range of major fisheries globally. Many shark fisheries have collapsed or declined largely due to a poor understanding of the biology of sharks. Most sharks carry their young internally so that there is a direct relationship between the parent stock and recruitment to a fishery. Sharks are both slow growing and late maturing. Gestation periods can range from 7 to 22 months depending on the species. Sharks (even small sharks) have been recorded to have life spans in excess of 30 years. Some species important in fisheries migrate over long distances and are therefore either targeted or caught as bycatch by a range of fleets and gears.

Growing and widespread use of sharks and evidence of tremendous waste through the practice of finnng and discarding of carcasses at sea has resulted in a global call for sustainable use of shark resources. A number of international organizations have been engaged in activities to promote sustainable use of these resources.

In 1991, the Shark Specialist Group of the International Union for the Conservation of Nature was formed through the hard work of concerned shark experts from all regions of the world. Through their efforts, the plight of sharks was placed on the CITES Agenda and the Animals Committee of CITES was directed to compile and review existing data on the biological and trade status of sharks subject to international trade.

This group remains a significant force in promoting the development of management plans for sharks globally and conducting assessments of sharks.

The International Commission for the conservation of Atlantic Tunas (ICCAT) created a sub-committee on Bycatch and a working group on sharks.

In July 1998, the Food and Agriculture Organization organized an international consultation on "Management of Fishing Capacity of Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries". The major outcome of this meeting was the development of an International Plan of Action (IPOA) for sharks for which specific guidelines were developed. Under the IPOA, countries are encouraged to develop, promote and implement National Plans of Action for Sharks.

The paper in its entirety is attached as Appendix III.

Discussion:
It was stated that the international and regional concerns for shark resources are appreciated. However, for Guyana to respond to some of these needs and in particular the need for additional information on landings and catch by species, the Guyana Fisheries Department was at a disadvantage. It was pointed out that sharks are normally landed dressed (without heads) which makes it extremely difficult to identify the species. It was explained that while the identification of carcasses poses some challenges to classification of species, it has been proven that such challenges are not insurmountable. Participants were informed that during the presentation on shark species identification some time would be devoted to going through identification sheets developed in the United States which provides notes on the identification of carcasses of some species.

6. Use of Species Guides.

[Presented by Ms. S. Constantine]

A good understanding and knowledge of the identification of different fish species is essential for their management and protection. Two of the major reasons why fish should be properly identified are that (i) correct identification is fundamental to the conservation of fish biodiversity and (ii) the lack of precise information on species composition of catches coming from different fishing grounds or localities, and on the relative frequency of species in the landings throughout the year, represents a serious handicap to rational management and conservation of fish populations currently exploited.

There are many stories documented of the possible consequences of misidentification some of which include (i) unnecessary international sanctions, (ii) unreliable historical data records, and (iii) eventual collapse of the stock. Species identification guides

provide not only a brief physical description of marine species, but also guidelines to follow for correct diagnosis of families, genera and species, and notes on the geographical distribution, habitat, ecology and biology of each species. The handouts for this presentation are attached as Appendix IV and V.

Discussion:

The query was raised that at different locations in Guyana fishers have different local names for certain species thus, compounding the problem of correctly identifying species. It was explained that when one is uncertain of the correct identification of a specimen, the fisher should be asked the local name. If he does know the local name then this fish should be found in the guide and only if the features noted in the guide are found on the fish should the fisher's identification be accepted as correct. If one is still unable to identify the fish, one of the other methods outlined during the presentation for example, taking a specimen back to the office or making a biological drawing, should be used. It was suggested that a list of all the local names used for species at the different landing sites around Guyana should be compiled.

7. Identification of Shark Species Caught by Guyanese Fishing Vessels.

[Presented by Ms. C. Chan A Shing]

Sharks are landed in substantial quantities in the Guyana fisheries. They are caught primarily by gillnets and contribute roughly 30 to 40% of the total landings made by Guyanese fishing vessels. The catch may be either consumed locally or exported processed (salted) or fresh. The need for reporting on catches by species is therefore important in light of global concerns for sharks and the need to put conservation and management measures in place.

The major methods used to identify sharks in the field are: morphology and morphometry; examination of dermal denticles or placoid scales, teeth form and number, comparison with reference specimens and counting of vertebrae.

Shark species common in the Guyana fisheries belong to the six families, Carcharhinidae (requiem sharks), Sphyrnidae (hammerhead sharks), Ginglymostomatidae (nurse or sand sharks), Triakidae (hound sharks), Alopidae (thresher sharks) and Lamnidae (mackerel sharks).

Discussion:

The issue of the preservation of shark specimens by the Department was raised. Ms. Maison indicated that this item was contained within the budget of the Department but the materials needed, for example jars and preservatives, were not yet purchased, but this project would continue to appear in the Department's annual budget. Some of the intricacies of preserving shark species were explained to participants. It was noted that the process is complex and time-consuming. Due to the size of some of the sample specimens, specialized storage bins would need to be acquired or built by the

Department. The Trinidad and Tobago Fisheries Division possessed preserved shark specimens which are kept in a storage container outside the building.

Regarding the issue raised about the ease of identifying sharks without their fins and heads on, Ms. Chan A Shing explained that it would not be easy but it was possible. She indicated that the features recommended by the guides that are not found on the head should be used during the identifications. Features such as the presence or absence of the inter-dorsal ridge and also body colour could be important features used to differentiate between families. It was highlighted that based on the fact that sharks are landed dressed in Guyana it would not always be possible to distinguish individual shark species, but identification to even the genus level, for reporting to ICCAT, would be better than the current practice of lumping species together.

8. Identification of Shrimp and Groundfish and Associated Species occurring in Guyana's Waters.

a. Identification of Species of Groundfish Occurring in Guyana's waters.

[Presented by Ms. I. Peters]

There are many similarities in physical structure and colouration between species from the same family or between different families that may cause some confusion and difficulty for data collectors when trying to identify specimens. Additionally, where species live in the same area or occupy the same ecological niche, they may school together and form part of the catch thus, compounding the problem of differentiating specimens into families and species. At different landing sites the same species may have different local names or two different species may have the same local name, which causes confusion and can lead to misidentification or erroneous data collection. Other factors that may lead to misidentification are post mortem colour changes, rarity of the species and the inexperience of the data collector. Thus, it is crucial that data collectors are aware of the anatomical, physiological and behavioural features that distinguish families and species from each other.

The common groundfish species caught in Guyanese waters are bangamary (*Macrodon ancylodon),* butterfish (*Nebris microps)*, sea trout (*Cynoscion virescens)*, grey snapper (*Cynoscion acoupa*), Chinese snook (*Centropomous pectinatus*), black back snook (*Centropomous undecimalis)* and gillbacker (*Arius parkeri).*

The common pelagic fish caught in Guyana's waters are cavalli (*Caranx hippos*), Serra Spanish mackerel (*Scomberomorus brasiliensis*), and king mackerel (*Scomberomorus cavalla*).

The gillbacker belongs to the family Ariidae, the black back and Chinese snook to the family Centropomidae, Serra Spanish mackerel and king mackerel belong to the family

Scombridae, and the grey snapper, sea trout, bangamary and butterfish belong to the Sciaenidae family.

Discussion:
No questions were raised at the end of this presentation.

b. Identification of the Most Common Snappers Caught by Guyanese Fishing Vessels.

[Presented by Ms. S. Constantine]

Snappers belong to the family Lutjanidae. They derive their name because of the behaviour of snapping their jaws when hooked. Members of this family have an oblong shape and triangular heads. Adults usually growth to a maximum size of one to two feet in length. All snappers have a single continuous dorsal fin that is often higher in the front and all have a notched tail. They have slightly upturned snouts, and large mouths with prominent canine teeth near the front of the jaw.

Adult snappers occur mostly in shallow coastal marine areas, usually over coral reefs and rocky habitats, up to depths below 200 m. However, juveniles may be found in brackish or hyper-saline waters. All are carnivorous nocturnal predators that usually feed on crustaceans and small fish.

Eight (8) genera with 20 species are usually found on the northern coast of South America. The most common species caught by Guyanese fishing vessels are the Southern red snapper (*Lutjanus purpureus*), the lane snapper (*Lutjanus synagris*) and the vermillion snapper (*Rhomboplites aurorubens*).

Discussion:
One participant noted that the species identification guide listed numerous features that should be used in the identification of each species. The question of whether there was one feature that could be used for each specimen for its correct identification was then asked. In response, it was explained that for some species, more than one feature would have to be used to correctly identify them while, for others, the presence or absence of just one feature would be definitive. It was highlighted that with experience, one would be able to determine what feature or features are the most important to correctly identify a particular species. At present however, data collectors would have to rely on all the features listed in the species guide until they have mastered the art of species identifications.

c. Identification of the Shrimp Species Caught by Guyanese Fishing Vessels.

[Presented by Ms. S. Constantine]

Shrimps are the most valuable fishery resource for countries on the northern coast of South America including Guyana. This fishery was formally established when

processing plants were built in Georgetown in the early 1960s. During this time, fleets landed shrimp in Guyana from fishing operations carried out in the entire region.

They are targeted by small to medium-sized boats operating in an intensive traditional trawl fishery. Fishing for shrimp mostly occurs in shallow water.

The most common species landed by Guyanese fishing vessels are the pink spotted shrimp (*Penaeus brasiliensis*), the southern pink shrimp (*Penaeus notialis*), the southern white shrimp (*Penaeus schmitti*), the southern brown shrimp (*Penaeus subtilis*), the white belly prawn (*Nematopalaemon schmitti*) and the Atlantic sea bob (*Xiphopenaeus kroyeri*).

Discussion:
No questions were raised at the end of this presentation.

9. Techniques for Sampling Catch and Effort and Biological Data.

[Presented by Ms. S Constantine]

The primary goal of fisheries management is to ensure long term sustainability of the fishery so that present and future generations of humans can benefit from the existence and optimal operation of the fishery. In most instances, managers seek to optimize the industry, either in terms of profits to the fisherman, or in terms of employment for the community. Fishery statistics are the primary means to measure the performance of a fishery within the social, economic, biological and environmental framework in which it is collected (FAO, 2002). The collection of fishery data is based on the catch weight, the fishing effort applied, and the biological information on the species caught. These data are then plugged into numerous fishery assessments, the results of which are used to develop appropriate management advice for the resource.

When undergoing catch and effort data and biological collection it is important that a data collector becomes familiar with the target species for which the data is to be collected. This can be done by finding out basic information on the species for example, the features that should be used when identifying the species, the fishing gears used to catch it, at what fishing grounds is it caught and at what depth it is caught.
Additionally, it is important that background information for the sampling site be compiled. This should include information on the number of vessels based at the site, the usual fishing grounds visited, the predominant fishing gear used by vessels, the pattern in gear usage, the crew size each vessel and the seasonal distribution of the catch composition so that unnecessary questions are not asked of the fisher and if there are any changes in the pattern of activities carried out at the site the data collector is able to recognize these.

Discussion:

One participant was interested in finding out how data collectors dealt with fishers who were not forthcoming in providing information. The response was that the data collector either leaves that fisher alone on that particular day because he could be having a bad day or tries to explain the reasons why the data is being collected. The data collectors outlined scenarios in which they tried to get information from fishers as these fishers drove away from the landing site. Another question was related to the validity of the data entered into logbooks. It was indicated that one way to ascertain the validity of the data was to compare the data provided by fishers to that provided by Observers. The method by which whole weights were obtained for species landed dressed was asked. In response, it was indicated that based on data collected on that particular species in the past (historical data records) an equation could be developed in order to convert the dressed weight of a specimen to the whole weight. Ms. Peters indicated that dressed weights were not currently converted to whole weights by the department, but it should be possible based on the historical data records of the Department.

10. Building Partnerships in Research – Working With Fishers.

[Presented by Ms. S. Constantine]

This presentation was not delivered due to time constraints, however, copies of a handout on the topic were distributed to the participants. This handout is attached as Appendix VI.

E. LABORATORY PRACTICAL SESSIONS

11. Identification of Sharks.

Ms. C. Chan A Shing led the practical session on the identification of shark species. Three different shark species were purchased for the practical. They were all headless with some of the fins missing, however, fin scars were intact. These samples were appropriate since they were representative of the manner in which Guyanese fishing vessels land shark species. Ms. Chan A Shing took participants step by step through the process of correctly identifying the available specimens down to the species level. Participants examined colour patterns, the relative location of fins, the distance between fins and external reproductive features and the presence or absence of an inter dorsal ridge. The value of knowledge of life history characteristics was demonstrated. The specimens identified were an immature specimen of the black tip shark (*Carcharhinus limbatus*), a Brazilian sharpnose shark (*Rhizoprionodon lalandii*) and an immature specimen of the scalloped hammerhead shark (*Sphyrna lewinii*).

12. Identification of Groundfish and Associated Species.

[Led by Ms. S. Constantine with assistance from Ms. I. Peters and Mr. J. Glen]

Participants were led through the correct procedure for the identification of families, genus and species. Once the correct family was identified and a species was suspected, participants were asked to find all the features indicated by the guide that should be used in the identification of that particular specimen. Features that should be used to differentiate the specimen from other similar appearing species were highlighted. It was brought to their attention that when doing species identifications, both sides of the specimen should be reviewed since in some cases features may be visible on one side of the specimen but not on the other. Other notable facts, for example, the change in colour of a specimen when it is handled or kept for a prolonged period of time, were highlighted to participants. This was possible since there were more than one sample of each species, all at different stages of freshness, available for review. Additionally, participants were able to appreciate the fact that juvenile specimens did not always appear the same as adults, and that some of the features noted by the guide, for example the position of the opercular flap in relation to the eye, may not always be apparent (fully developed) in juvenile specimens.

The species identified were porkfish (*Ansiotremus virginicus*), pluma porgy (*Calamus pennatula*), cavalli (*Caranx hippos*), Serra Spanish mackerel (*Scomberomorus brasiliensis*), king mackerel (*Scomberomorus cavalla*), southern red snapper (*Lutjanus purpureus*), lane snapper (*Lutjanus synagris*), vermillion snapper (*Rhomboplites aurombens*), bangamary (*Macrodon ancylodon*), butterfish (*Nabris microps*), sea trout (*Cynoscion virescens*) grey snapper (*Cynoscion acoupa*) and snook (*Centropomous pectinatus*).

F. REVIEW AND DISCUSSION OF FIELD VISITS

13. Review and Discussion of Field Visits, With Regard to Improving Identification of Shark and Groundfish Species Caught by Guyanese Fishing Vessels.

[Presented by Ms. C. Chan A Shing]

The review began with an outline of the most important features that should be examined on shark specimens to assist with their differentiation into families and individual species. This included the features that should be looked for when only carcasses are available.

Data collectors were reminded that at the landing site when the fisher is asked the local name of a species the data collector should not only rely on his knowledge. The identification should be confirmed using the species guide and the standard common

name should be recorded on data sheets. Additionally, participants (DOF) were reminded to produce a list of local names for species by landing site to assist Fisheries Officers/data collectors/data entry operators in their activities. On this list, scientific names should be written along with the local names since scientific names are common all over the world but local names may only be specific to a particular landing site or country.

It was noted that one important instance when marine species should be correctly identified was when exporting to other countries. Importers may request a particular species, which must be correctly identified if the order is to be filled correctly. Secondly, importers need to know the names of the species being imported from a particular country.

Workshop participants were encouraged to do an Internet search for the Shark Specialist Group Website. This site has a list of major shark species, information and photographs of each, occurring in the Atlantic. In the absence of a guide and a reference collection, this may prove to be an invaluable tool.

14. Review and Discussion of Field Visits, With Regard to Improving Collection of Catch, Effort and Biological Data, Including More Detailed Review of Proposed New Data Collection Forms.

[Presented by Ms. S. Constantine and Ms. I. Peters]

Data collectors were informed that there would be some changes to the data collection forms in the near future. Some of the changes on the Catch and Effort Interview Form, the form used most often by data collectors, were highlighted.

The correct way to measure the fork and total length of fish species using a tape measure or ruler was reinforced.

The question of the ordering of the features in the guide in terms of priority was raised. In response, it was indicated that the features were listed in terms of the fish structure being referred to and not in any order of priority. For example, information on a dorsal fin is located at the top of the illustration of the fish while information about an anal fin is located at the bottom of the illustration of the fish in the guide. The information regarding the anal fin may however be more important in the identification of the specimen than the information on the dorsal fin.

The question regarding the preparation of a list of local species names by landing sites and a reference collection was raised again. It was explained that this would be done for all species but that the fishers at different sites would not be encouraged to change their local names. The list would only be for the staff of the Fisheries Department to identify situations where the same species may be called by different local names.

One of the participants noted that the identification of fish species is important for everyone handling fish but especially so for Fisheries Department Staff. He went on to say that there is no excuse for not being able to identify the species after the training received.

The question regarding why shrimp were not identified during the practical sessions was raised. It was explained that this was not done due to time constraints but the guides provide good descriptions of the species caught by Guyanese vessels and can be used to identify shrimp by simply applying the same principles and methodologies learnt for the identification of the other species.

Participants were reminded not to create features or "doctor" the features listed in the guides to arrive at an identification of a specimen. They were also urged to combine the use of one or more guides to assist with the identification since some guides may outline features that others may not. Additionally, a guide may have a feature that is definitive in placing specimens into families and species but this feature may not be noted in another guide.

C. GENERAL PLENARY SESSIONS (Continued)

15. Closing Ceremony.

During the closing ceremony participants were asked to make brief comments on the workshop. Listed below are some of the comments made.

(i) I appreciate the way the guides were used during the practical session and field visits to correctly identify marine species. Incorrect methodology was used in the past for species identifications but the situation is now remedied.

(ii) The workshop was very good. The correct identification of species can easily be done with practice. FD staff needs to spend time using their guides correctly to identify fish species.

(iii) Now that the DOF staff knows the correct way to identify species, it will improve their job performance.

(iv) This workshop will enhance our ability to report landings data by species especially for sharks since ICCAT and Japan require reporting by species. The FD staff now needs to spend some time doing the identifications.

(v) I learnt some very interesting things over the past few days and realize that if we do not use what was learnt on the use of the species guides we could face some major difficulties.

Participants were awarded certificates of participation followed by adjournment of the workshop.

G. REFERENCES

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H. APPENDICES

Appendix I

AGENDA

Day 1 (20th August 2003)

i. Registration (*0830-0900h*)
ii. Opening Ceremony *(0900-0920h)*
iii. Review of Agenda and Working Arrangements *(0920-0930h)*

1. Shark fisheries – International trends in management and conservation strategies, and the implications for the future of such fisheries in the Caribbean [C. Chan A Shing] *(0930-0950h)*.
2. Review of the management of the shrimp and groundfish fishery as it relates to the Guiana/Brazil Shelf, in particular Guyana and its implications for the data collection programme [D. Maison and I. Peters] *(0950-1030h)*.

Morning refreshment break (1030-1045h)

3. Use of species guides [S. Constantine, C. Chan A Shing, and I. Peters] (*1045-1105h*).
4. Identification of shark species caught by Guyanese fishing vessels [C. Chan A Shing] *(1105-1120h)*
5. Identification of tuna and tuna-like species occurring in Guyana's waters [S. Constantine] *(1120-1140h)*
6. Identification of shrimp and groundfish and associated species occurring in Guyana's waters [I. Peters and J. Glen] *(1140-1200h)*
7. Techniques for sampling catch and effort and biological data:
   Section 1: Catch and effort data collection
   Section 2: Biological data collection
   Section 3: Brief introduction to proposed new data forms
   [S. Constantine, I. Peters and J. Glen] *(1200-1230h)*.

Lunch (1230-1330h)

8. Building partnerships in research – working with fishers [S. Constantine and I. Peters] (*1330-1400h*)
9. Laboratory practical sessions [C. Chang A Shing, S. Constantine, I. Peters, and J. Glen] *(1400 –1700h, with 15 minute afternoon refreshment break at 1530h)*

Day 2 (21st August 2003)

11. Visit to Rosignol landing site *(0730-1230h)*

Lunch (1230-1330h)

11. Continued. *(1330-1630h)*

Day 3 (22nd August 2003)

12. Visit to Houston landing site (*0500-0730h*)
13. Review and discussion of field visits, with regard to improving identification of shark, tuna, tuna-like and groundfish species caught by Guyanese fishing vessels. [C. Chang A Shing, S. Constantine, I. Peters, and J. Glen] *(0800-1000h)*

Morning refreshment break (1000-1015h)

14. Review and discussion of field visits, with regard to improving collection of catch, effort, and biological data, including more detailed review of proposed new data collection forms. [I. Peters, J. Glen and S. Constantine] (*1000 – 1200h*).
15. Workshop Closure.

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Appendix III

International trends in management and conservation strategies for sharks and the implications for the future of such fisheries in the Caribbean.

Christine Chan A Shing

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Introduction

The mere mention of the word sharks generally evokes reactions of awe and fear largely fuelled by sensational reports of shark attacks, reinforced by movies promoting the monster image of sharks. Sharks and their relatives, the rays and chimeras are a diverse group spanning over 400 million years of evolution. They are target species of fisheries nationally, regionally and internationally, and bycatch of a range of major fisheries globally. In spite of this, the group remains poorly understood and require long term, focused research in a number of areas.

Sharks are apex predators essentially occupying top levels of the food chain. They therefore play an important role in maintaining the health of marine ecosystems (Mc Auley *et a*l, 2002) Their commercial value contribute to fishing and tourism earnings as food, as artifacts from shark parts and as creatures of interest to be studied and observed with fascination while diving and shark watching. Chemical compounds derived from various shark parts are reported to have a variety of health and pharmaceutical uses particularly in the treatment of cancer and arthritis. Apart from these uses, shark fins are the basis of a thriving Asian market, which has been driving widespread trade in shark products as well as encouraging waste in the harvesting of the resources, where carcasses are discarded at sea and fins only retained for sale, a practice described as "finning."

Growing widespread use of sharks and evidence of tremendous waste through the practice of fining resulted in a global outcry to encourage sustainable use of shark resources. Sharks (and their relatives) are particularly vulnerable to exploitation due to their peculiar life history characteristics. Sharks are generally slow growing, late maturing species. Most sharks carry their progeny internally and gestation periods are extended, 7-22 months but commonly 7-12 months, for most commercially important species. Currently only a few countries have management mechanisms in place for their shark fisheries (www.fao.org/fi/faocons/shark.asp). Concern for the sustainability of shark fisheries in light of their biological characteristics has led to the development, at the international level, of a Plan of Action in support of the conservation and management of sharks. In this paper the specific characteristics of sharks, which direct

the need for improved control of fishing for sharks and related resources will be presented. The development and status of international action in support of the management and conservation of shark resources will be reviewed. The implications of these developments for Caribbean (CARICOM) countries will be examined.

Characteristics of sharks to be considered for biological sustainability

(1) Distribution & Migrations

Sharks have been roughly categorized as pelagic sharks, which are both coastal and oceanic; deep water sharks and coastal sharks. Pelagic sharks are wide ranging with considerable movement across wide geographic ranges. These sharks in particular are captured by both target and non-target fisheries and by various fleet types of various nationalities. Such sharks include the blue shark (*Prionace glauca*), the tiger shark (*Galeocerdo cuvier*), the oceanic white tip (*Carcharhinus longimanus*), the thresher sharks (*Alopias spp*), the mako shark (*Isurus oxyrinchus*), the black tip shark (*Carcharhinus limbatus*), the great hammerhead (*Sphyrna mokarran*), the scalloped hammerhead (*Sphyrna lewini*) and the lemon shark (*Negaprion brevirostris*). Deep water sharks, such as six gill and seven gill sharks, are of limited commercial importance in this region. The coastal sharks tend to be most common in inshore waters. They are captured by a range of fishing fleets and gears. Examples of inshore sharks include the small tail shark (*Carcharhinus porosus*), the bull shark (*Carcharhinus leucas*) and the nurse shark (*Ginglymostoma cirratum*).

(2) Reproductive Biology

Most sharks that are commercially exploited carry their young internally (*viviparous or ovoviviparous*) and litter sizes are small. The young called pups take a long time to develop compared to most bony fish. Even small coastal sharks have gestation periods ranging from about seven (7) months in *Mustelus higmani* and *Rhizoprionodon porosus* to ten (10) months in *M. canis*. Large pelagic sharks can have gestation periods ranging from seven (7) months in the great hammerhead (*S. mokarran*) to 12 and 15 months in the blacktip shark and oceanic white tip shark, and the silky shark respectively. In addition to the extended gestation periods, individual sharks may or may not reproduce each year. The gestation period may be followed by a recovery period which can last for one or two years before the individual shark can produce young again. In some small coastal sharks, such as *Rhizoprionodon lalandi,* the Brazilian sharpnose, and *Mustelus higmani*, females with term pups were found to be carrying eggs in various stages of development in the ovary, suggesting that the females may be capable of reproducing immediately after the birth of the current batch of pups. For these sharks, individual females with term pups were found in the same catch, with other females with smaller pups or eggs.

Sharks tend to take a relatively long time to attain sexual maturity. For example it may take a tiger shark up to six (6) years to attain sexual maturity. Blue sharks may take 4-5 years, lemon sharks just over 6 years and bull sharks about 6 years.

Some sharks are solitary while others demonstrate a high degree of aggregation, segregated either by sex or size and or reproductive state. Most female sharks tend to move inshore during pupping periods to release their pups. Schools of pup bearing females are often targeted by inshore fishermen thereby extracting both the current and future generations.

Holden (1977) notes that there is some evidence that supports increases in fecundity as the stocks decline. Hoenig and Gruber (1990) noted that for elasmobranches the relationship between stock and recruitment is quite direct. Therefore in spite of apparent density dependent responses to stock declines there are strict limitations on the number of young that can be produced based on the number of adults in the stock. Unlike most other bony fish, this relationship between parental stock and recruitment success is a major consideration in the development of management strategies for elasmobranches. The life history pattern of this group therefore renders them particularly susceptible to over fishing.

Growth/Longevity/Natural Mortality

Generally sharks are reported to grow slowly (Oliver, 1996) achieving maximum size over a relatively long time depending on the species. Hoenig and Gruber (1990) states that this may largely be because sharks have a low natural mortality and high longevity. They note that sharks are among the longest lived fishes. For example Ketchen (1975) and Jones and Geen (1977) report ages of 65 to 70 years for Spiny dogfish (*Squalus acanthias*); Hoenig 1979 report ages of up to 27 years and 30 years for the Bull shark (*C. leucas*) and dusky shark (*C. obscurus*) respectively. Brown and Gruber (1988) report an estimated age of 21 years for the lemon shark (*N. brevirostris*). It was noted by Hoenig and Gruber (1990) that the oldest ages recorded were for small sharks and that both small and large sharks tend to be long lived.

Natural mortality of sharks tends to be low as sharks are top predators, hardly predated upon by other species. Cannibalism is frequently recorded among some species Castro (1983).

Branstetter (1990) suggests that in general slow growing species use a number of strategies to offset early natural mortality. For sharks, young are either born at relatively large sizes and/or birth takes place in protected nursery grounds. Nursery or pupping grounds have been broadly identified for a number of species (Branstetter, 1981; Casey *et al*, 1985Clerk and Von Schmidt, 1965 and Williams and Schaap, 1992).

Table 1 is a list of shark species known to occur in the waters of Guyana and the biological characteristics to be considered for management and conservation.

The Development and status of International Action in Management and Conservation of Sharks

It is clear from the above mentioned life history characteristics of sharks, that unrestrained harvesting of sharks can contribute to the decline of shark populations. A number of international organizations have been engaged in activities to promote sustainable use of shark resources.

In 1991, the Shark Specialist Group of the International Union for the Conservation of Nature was formed through the hard work of a group of concerned shark experts from all regions of the world. This group played a major role in having sharks highlighted on the CITES Agenda in 1994. At that time sharks were the only fishery issue brought before the CITES conference. In recognition of the depletion of shark populations throughout the world, the CITES parties passed an unprecedented resolution that directed the Animals Committee of CITES to compile and review existing data on the biological and trade status of sharks subject to international trade. The Shark Specialist Group remains a significant force in promoting the development of management plans for sharks globally and conducting assessments of sharks under CITES.

The International Commission for the Conservation of Atlantic Tunas (ICCAT) was established to provide an effective programme of international cooperation in research and conservation specifically for highly migratory species such as tunas and tuna-like species. Within the scope of it's competence ICCAT created a sub-committee on bycatch and a working group on sharks. This group held it's first meeting in February 1996. Countries are currently required to report on shark bycatches.

In November 1995 the Code of Conduct for Responsible Fisheries was adopted by the FAO conference and in December 1995 the Kyoto Declaration and Plan of Action was articulated. Both called for the "Conservation of biological diversity and the sustainable use of its component species, as well as the minimization of waste and discards." As indicated previously this has particular significance for sharks and shark fisheries.

In 1997 the FAO Committee on Fisheries (COFI) recommended that FAO collaborate with Japan and the United States to organize an expert consultation to develop and propose guidelines leading to a Plan of Action for Shark Conservation and Management. Consequently two meetings were held.

In April 1998 a Technical Working Group of experts met in Tokyo to focus on strategies for the conservation and management of sharks. In July that year a preparatory meeting for an international consultation on "Management of Fishing Capacity of Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries" was held in Rome. The actual consultation was held in October later that year. One of the major outcomes of these meeting was the development of an International Plan of Action (IPOA) for sharks. This IPOA for sharks was endorsed by the member nations of COFI at its 23rd Session in February 1999.

Objective of the IPOA Sharks

"To ensure the conservation and management of sharks and their long term sustainable use."

Guiding principles associated with achieving this objective are:

- *Participation*: which requires states contributing to fishing mortality of sharks to participate in their management
- *Sustaining stocks*: which requires the application of the precautionary principle to ensure that total fishing mortality for each stock are kept within sustainable limits
- *Social economic contribution*: nutritional and socio-economic considerations, which requires management to recognize that in poor countries/regions where sharks constitute an important source of diet and or income, catches should be managed sustainably to provide a continued source of food, employment and income to associated communities.

The IPOA sharks were elaborated under the Code of Conduct for Responsible Fisheries. It is voluntary but all states are encouraged to implement it. It prescribes a process for states, regional bodies or arrangements to deal with issues of shark conservation and management. It requires states to conduct assessments of shark resources and develop and implement Shark Management Plan, if there is a need to do so base on the results of assessment.

In 2000, FAO elaborated precise guidelines for the development and implementation of Shark Plans and Shark Assessment Reports at the national, regional, international levels. They also provided a framework for the preparation of joint approaches to shark management and conservation for trans boundary species of sharks.

The guidelines cover:

(1) all the elements of the IPOA for Sharks
   (a) Species Conservation
   (b) Biodiversity maintenance
   (c) Habitat protection
   (d) Management for sustainable governance

(2) the four dimensions of the FAO Sustainable Development Reference System.
   - Ecological
   - Economic
   - Social

- Governance

The guidelines also define appropriate requirements at the sub-national, national, sub-regional, regional and global levels for IPOAs and NPOAs. These include:

- development of appropriate legal, institutional and management frameworks and provision of human resources and capacity building requirements
- fishery monitoring and research requirements (specialist training, in species identification species catalogues and field guides; information acquisition and analysis, database development including common databases for trans boundary species, common criteria for classifying the conservation status of species and their stocks
- fishery management controls on catch and effort
- protection of critical habitats
- programmes for full utilization of captured species as well as release of live sharks
- development and promotion of shark bycatch reduction
- information for development and promotion of Shark Plans and Shark Assessment Reports.

Implications of International Shark Management and Conservation Strategies for the future of Shark fisheries in the Caribbean

1. Data Collection systems for sharks and related species will need to be enhanced.
   - In most countries where sharks are landed catch and effort data are generally not recorded by species and most data collectors have not been trained to record landings by species. The recording of data by species is essential to conservation and management approaches and maintenance of biodiversity.
   - Biological studies on sharks need to be conducted to provide necessary data for assessments. It will also provide the data to identify and evaluate any observed density dependent responses to population changes.
   - Socio economic studies on the value of shark fisheries in the region will be necessary

- Assessment of shark resources will be required as input to National Plans of Actions for Shark Conservation and Management.

- Specific management plans will need to be developed consistent with the International Plan of Action for sharks.

2. Human resource capability for assessment of shark resources will need to be improved.

   - A fundamental requirement will be the need to train data collectors in species identification and other data collection methodologies for sharks.

   - Training in stock assessment methodologies must include shark assessment methodologies.

3. There may be the threat of possible trade sanctions as increasingly natural resource conservation and management issues are being aligned to the global trade agenda.

4. The possible impact of conservation and management strategies on dependant coastal communities need to be evaluated.

5. Appropriate legal and institutional frameworks for shark conservation and management may need to be developed.

6. Regional (national) participation in global initiatives directed at sharks conservation and management will be expected. An example of this is the CITES assessments of the status of sharks resources/species and appropriate informed responses with regard to the listing of shark species at both the national/regional levels.

7. Countries or the region will be required to respond to the increasing data/information needs by regional or international regulation bodies.

8. There may be a need for further collaboration on the regional level in the interest of shark conservation and management.

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Table 1. Biological Characteristics of Common Shark Species of Guyana

Species	Gestation Period	Litter Size	Age/Size at Maturity	Maximum Age	Maximum Length	Size at Birth	Location
FAMILY CARCHARHINIDAE - Genus Carcharhinus							
C. acronotus blacknose shark	-	3-6	♂ 97-106 ♀ 103 cm	-	200 cm	38-50 cm	
C. altimus Bignose shark	-	3-15	-	-	300cm	70-90 cm	
C. brevipinna spinner shark	12-15 months	3-15	♂ 159-203 ♀ 170-200	-	278 cm	60-75 cm	
C. faliformis silky shark		2-14	♂ 187-217 cm ♀ 213-230 cm	-	330 cm	70-87 cm	
C. isodon Finetooth shark	-	1-6	♂ 140 ♀ 150	-	189-200cm	51-64 cm	
C. leucas bull shark	10-11 months	1-13	6 yrs 250 cm	14-16 yrs	340 cm	56-81 cm	S. Africa
C. limbatus Blacktip shark	10-12 months	1-10 4-7 common	4 yrs ♂ 135-180 cm ♀ 120-190 cm	12 yrs	255 cm	38-72 cm	
C. longimanus Oceanic whitetip	12 months	1- 15	♂ 175-198 cm ♀ 180-200	-	395 cm	6-65 cm	USA Cuba

Species	**Gestation Period**	**Litter Size**	**Age/Size at Maturity**	**Maximum Age**	**Maximum Length**	**Size at Birth**	**Location**
			cm				
C. obscurus dusky Shark	Staggered periods of 8-9 months or prolonged 16 months	3-14	6 yrs ♂ 340 cm ♀ 257-300 cm	18 yrs	400cm	69-100 cm	
C. signatus night shark	-	4-12	-	-	280 cm	60 cm	Cuba
C. plumbeus Sandbar Shark	8-12 months 11-12 months	1-14 5-12 common	3-10 yrs ♂ 131 cm ♀ 144-183	13 yrs	300 cm	56-75 cm	USA S. Africa
C. porosus smalltail shark	9-10 months	2-7	♂ 75-78 ♀ 84 about	About 9 yrs	150 cm	31-40 cm	T&T
GENUS – GALEOCERDO							
Species	Gestation Period	Litter Size	Age/Size at Maturity	Maximum Age	Maximum Length	Size at Birth	Location
G. cuvier	Just over 12 months	10-82	4-6 yrs ♂ 226-290 cm ♀ 250 350 cm	At least 12 yrs	9.1 m	51-76 cm	USA
GENUS – ISOGOMPHODON							
I. oxyrhynchus	-	-	-	-	244 cm		

Species	Gestation Period	Litter Size	Age/Size at Maturity	Maximum Age	Maximum Length	Size at Birth	Location
daggernose shark							
GENUS – NEGAPRION							
N. brevirostris lemon shark	10-12 months		6-5 yrs	27 yrs at least	3.4 m		
GENUS – PRIONACE							
P. glauca blue shark	9-12 months		4-5 yrs	20 yrs at least	6.5 m		
GENUS – RHIZOPRIONODON							
R. lalandii Brazillian sharpnose	7 months	1-4	♂ 40-50 cm ♀ 54 cm		64cm	33-34 cm	Brazil T&T
R. porosus Caribbean sharpnose	10-11 months	2-6	♂ 60 cm ♀ 80 cm	-	110 cm	31-39 cm	
R. terranovae	10-11 months	1-7 4-6 common	♂ 65-80 cm ♀ 85-90 cm	-	110 cm	29-37 cm	
FAMILY SPHYRNIDAE - GENUS Sphyrna							
S. tudes Smalleye hammerhead	7-9 months	6-9			150 cm	30cm	T&T
S. tliburo	-	4-16	♂ 52-75	-	150 cm	35-40 cm	

Species	**Gestation Period**	**Litter Size**	**Age/Size at Maturity**	**Maximum Age**	**Maximum Length**	**Size at Birth**	**Location**
bonnethead shark			cm ♀ 84 cm				
S. media	-	-	About 82 cm	-	150 cm	34 cm	
Species	Gestation Period	Litter Size	Age/Size at Maturity	Maximum Age	Maximum Length	Size at Birth	Location
S. mokarran great hammerhead	7 months	13-42	♂ 234-269 cm ♀ 250-300 cm	-	Over 6 m	50-70 cm	Florida
S. lewini scalloped hammerhead (3yrs at first capture)	-	15-31	10-15 yrs ♂ 180 cm ♀ 212-250 cm	23 + yrs	5 m		
FAMILY - TRIAKIDAE - GENUS Mustellus							
M. higmani smalleye smooth hound	7 months	1-7 3-6 commonly	♂ 43 cm ♀ 48 cm	-	64 cm 58 cm	21-24 cm	
M. canis dusky smooth hound	10 months (USA)	4-20	2 yrs ♂ 82 cm ♀ 90 cm	-	150 cm	34-39 cm	
FAMILY - LAMNIDAE - GENUS Isurus							
I. oxyrinchus	-	-	♂ 195 cm	-	394 cm	60-70 cm	Australia

Species	**Gestation Period**	**Litter Size**	**Age/Size at Maturity**	**Maximum Age**	**Maximum Length**	**Size at Birth**	**Location**
shortfin mako			♀ 280 cm				Cuba
FAMILY - GINGLYMOSTOMATIDAE - GENUS Ginglymostoma							
G.cirratum Nurse or sand sharks	-	21-28	♂ 225 cm ♀ 230–240 cm	24-25 yrs (Inaguara)	430 cm	27-30 cm	
FAMILY – ALOPIDAE - GENUS Alopias							
A.. superciliosus bigeye thresher	-	2	♂270-400 cm ♀ 355–430 cm	-	461cm	105-106cm	
A. vulpinnus thresher shark	-	2-4	♂ 319 cm ♀ 376 cm	-	549cm	114-150	

Appendix IV

Notes on Fish Species Identification

What are the basics of fish classification?

Scientists classify all plants and animals, including fish and other marine organisms according to the scheme, Kingdom; Phylum; Class; Order; Family; Genus and Species, based on identifiable traits which they have in common.

Kingdom:- All fish are from the animal kingdom

Phylum:- Chordata

Class:- Fish are divided into two classes. Osteichthyes contains all the bony fishes found in lakes and in the ocean. Chondrichthyes contains all cartilaginous fish e.g. sharks.

Order:- Bony fish belong to the order Teleosts, which contains a large number of families.

Genus:- The scientific name of fish consists of two Latin words. The first word is the genus name. This is the name given to a group of species, which share a common ancestor, and usually have similar anatomical and physiological characteristics.

Species:- The second is the species name. This name is given only to animals that are sexually compatible and produce fertile offspring.

Why is it important that I properly identify fish?

A good understanding and knowledge of the identification of different fish species is essential for their management and protection. There are two major reasons why fish should be properly identified. These are:

1. Correct identification is fundamental for the conservation of fish biodiversity. There may be several endangered and threatened fish species whose presence will depend in large part on a better understanding of their evolutionary history and ecological and habitat requirements. Research will help contribute to not only how species adapt to their environment but also how new species arise.

2. The lack of precise information on species composition of catches coming from different fishing grounds or localities, and on the relative frequency of species in the landings throughout the year, represents a serious handicap to

rational management and conservation of fish populations currently exploited.

What are the possible consequences of misidentification?

There are many stories documented of the possible consequences of misidentification. Three examples are given below.

1. On an international scale, one particular country was consistently misidentifying bluefin tuna thereby giving an overestimation of their catch rates to ICCAT. This placed that country at the risk of unnecessary international sanctions from the ICCAT committee.

2. Consistent misidentification of a species makes your historical records unreliable. Imagine a scenario where you want to allocate catch quotas to each fisherman based on his catch history. If the data collector has been recording 50lbs of albacore for fisherman A when he really was catching yellowfin tuna, this particular fisherman will have no quota of yellowfin tuna allocated to him. This poses serious problems for the fisherman because a) his gear may be targeting only yellowfin tuna and not albacore and/or b) yellowfin tuna fetches a higher price on the market than albacore therefore, resulting in a loss of revenue for the fisherman.

3. The worst possible scenario is that misidentification may lead to collapse of your stock. Take for example a data collector consistently mistakes mahogany snapper for mutton snapper. The person doing the stock assessment may use parameters for mutton snapper from a different location but with the same habitat, as the input parameters for the analysis. The entire assessment will be incorrect and the analyses may indicate that the fishery is presently under exploited leading the fisheries biologists to recommend expansion of the fishery. Consequently, the fishermen are given incentives (e.g. cheaper fuel prices and the waivering of duty on boat engines and equipment) by the government to help expand the fishery. The fishermen also make economic investments (some may take loans) to purchase bigger, more advanced boats and equipment specifically designed to target this species. After two years or even less time, the stock collapses. Who is to blame?

How do I use species identification guides?

Species identification guides provide:

- A brief physical description of fish species.

- Guidelines to follow for correct diagnosis of families, genera and species.
- Notes on geographical distribution, habitat, ecology and biology of each species.

Trying to identify a specific fish from the numerous species contained in a fish identification manual can be a perplexing task. Therefore, it is advised that you use the following guidelines to help in your identification.

1. Choose a specimen that is in a good state. Not one that is rotting or has bruises and body parts missing.

2. Find out background information for the species. Consider the following:-
   - Which gear was used to catch the specimen?
   - Where was the specimen caught? (e.g. reef, seagrass bed, mid-water column)
   - At what depth was the species caught?

3. Take a few moments to look closely at the fish specimen. Look at the general shape of the body, colouration, special marks or spots and certain distinct structures etc.

4. Decide whether the specimen is a bony fish or a cartilaginous fish.

5. Identify a family for which the species most closely resemble. You may do this by using one of the following:-
   - The introductory text that begins each species group chapter will give you general information for the family (e.g. sizes, colours, habitat etc.). You may use the process of elimination to remove most of the families from the list of potential families by simply verifying whether the features listed on the drawing for a particular family is present on your fish specimen. If it is not present, then you should reject the family.
   - You may ask yourself the question "Which other species does this one resemble?" Your answer should be based upon the body shape and the presence of certain distinct structures such as special spines etc.

6. When you think you have identified a family, which your specimen most closely resembles, you should then go through the pages in that chapter specifically dealing with that family until you find a photograph very similar to your fish specimen. Look at the write up and the information on what marks/colours/features to look for. Look for these on the specimen and if you do not find them, try the next fish whose photograph looks most similar to your specimen.

7. After you have convinced yourself that you are looking at a specimen of the same species as noted in the text, record the species common name or species code on your data collection sheet. Next to the photograph of your specimen, you will find its common name, scientific name and family's common name and scientific names.

8. If you are unable to identify the specimen (or you are uncertain of your identification for the species) it is recommended that you:-
   - Ask a fisherman what he thinks is the name of the specimen (fishers are usually good at identifying fish but they use a lot of local names so ***beware***!!!) and then try to locate it in your manual. Look for the features that the manual recommends and decide if it is correct.
   - If you still cannot identify the specimen it is recommended that you take a good quality photograph and a sample back to your supervisor for assistance.

Why is my specimen not found in any species identification guide?

1. The user may be observing a morphological feature or body pattern phase that was found not to be useful for species identifications or was not accounted for in the guide.

2. The user does not have a clear or accurate view of the specimen or its important identification features.

3. Colours, markings and anatomical differences that distinguish one fish species from similar appearing species may be quite subtle therefore easy to miss.

4. Many fish may be seen damaged and with faded colours and therefore may not be in the same condition as those in the photographs provided by the guide.

5. Many fish exhibit the ability to change their pigmentation and natural variations in colouration may occur within a population and across a geographic area.

6. Identification of certain fish species e.g. parrot fish is made difficult due to dramatic changes in shape, colour and markings that occur in most species as they mature. Occasionally, the maturation phases of certain fish are so dramatic that they may be confused as a different species altogether. The phases include *juvenile*, *intermediate* and *adult*.

What should I do when I cannot identify a fish specimen?

There are certain steps you are advised to take when you encounter problems in the identification of specimens. To facilitate identification in the near future you may use one of the following methods which are ranked in order of desirability.

1. You may take a sample and accompany this by a colour photograph of the fish and try to compare the features with those described in the fish identification text at a later date.

2. If you do not have a camera you may take a sample specimen and perform the identification at a later time when it is convenient

3. Attempt to memorize common features of the fish and then look up the fish on your return to office. This method is not recommended, and you are advised to resist the temptation as the guide may ask you to make a count of certain features in order to complete the identification. Also, you may have a number of specimens you cannot identify and it will be impossible to memorize all the features of each specimen.

It is very important to note at this point that you must make sure that you properly label the specimens/photographs etc. so that you make the right entries on your data collection forms. Labels should be written in pencil and placed in the fish's mouth for fresh samples and on the fish's body before the photograph is taken. This is crucial if you take back many samples or photographs.

How should I choose which specimens to take back to the office with me?

When you encounter a fish specimens that you cannot identify it is important that you take specimens in the best possible condition back to the office with you.

Choice of specimen

- The specimen chosen should be a whole fish; not gutted, headed or damaged.
- More than one specimen should be taken since certain ones may show features that others may have lost when they were captured, handled or died.
- Specimens should be taken of all maturity stages (juvenile, intermediate and adult) if one is able to discern the different ones.

Purchase of specimen

- When purchasing fish, ensure you get information on the common name, gear, location, depth etc. from the fisherman.

Preservation and transport of specimen

- Ensure that the specimens get back to the office before they start to rot because that may affect your ability to correctly identify the species.

- Fresh fish is best because you are most certain that you will see most if not all of the important features needed to identify the specimens.
- If the office is far from the sampling location you may want to travel with a cooler containing ice in which to place the specimens.
- Place the specimens in separately well labeled (location, gear, depth etc.) plastic bags and place in the ice in the cooler.

How do I take a photograph of a fish specimen?

1. Place the fish in a well lit area so that there are no shadows falling on it and ensure the fins are clearly displayed.

2. Ensure that the fish is on a horizontal surface, placed so that the head of the fish will be facing to the left in the picture and that the fish is flat.

3. Remove any debris from the area immediately surrounding the fish.

4. Place an object below the fish so that you can get an estimate of the size of the specimen. You may use a large coin, ruler or even your camera's lens cover.

5. Ensure that the camera is sharply focused.

6. Allow the specimen to completely fill the frame.

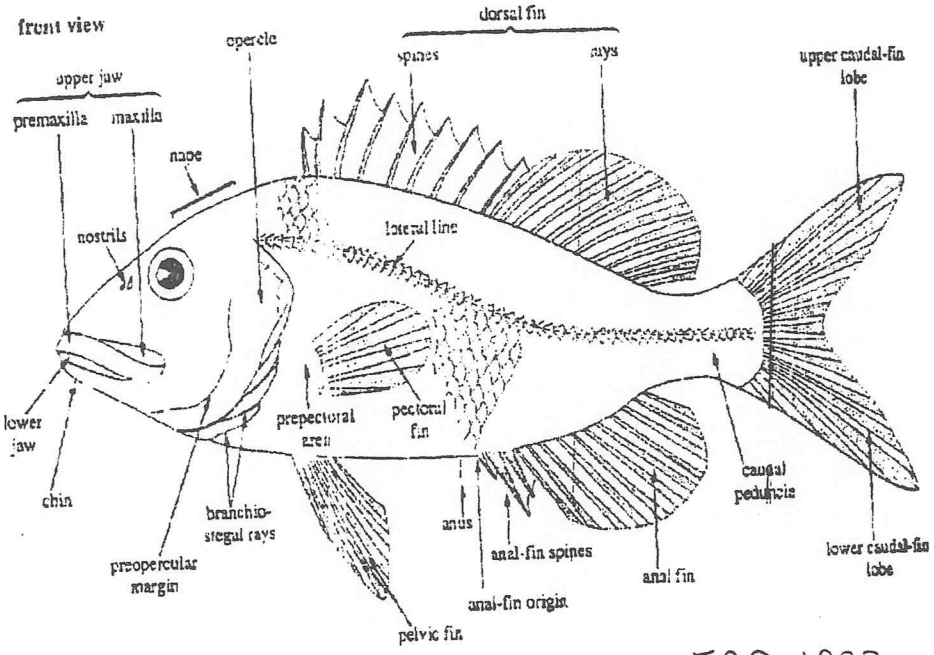
7. Take the photograph vertically over the center of the specimen.

8. Do not leave your camera with the film in the sun or locked in the car as excessive heat will discolour the film.

Appendix V

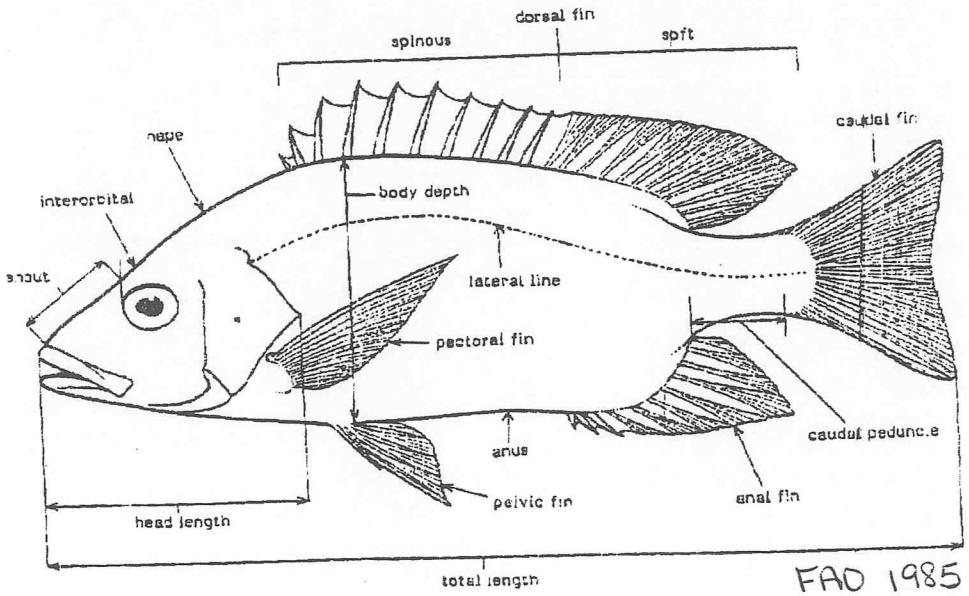
External Morphology and Measurements of Bony Fish

ANATOMY OF A BONY FISH

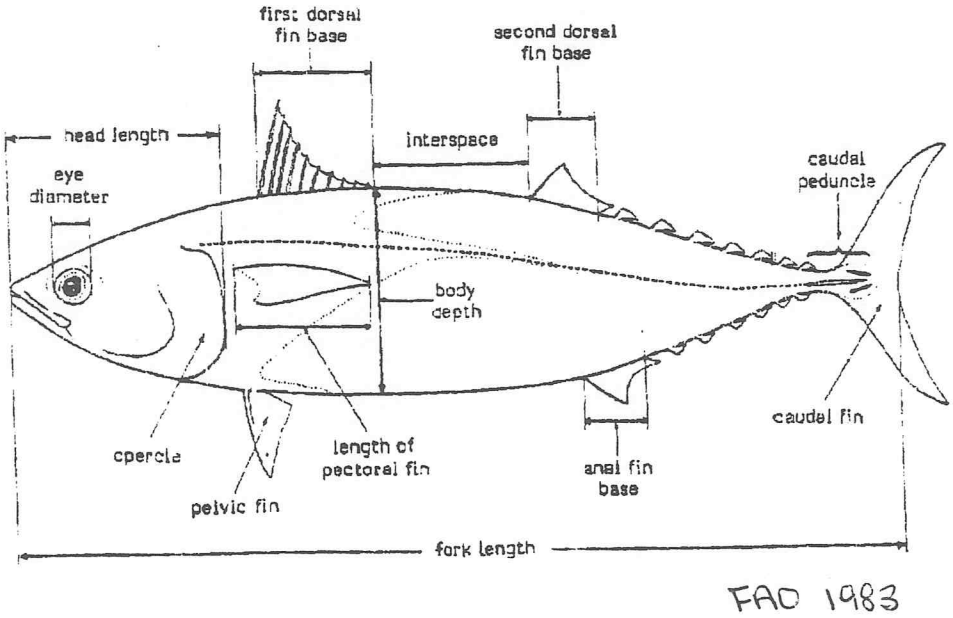


FAO 1993

MEASUREMENTS USED FOR MOST BONY FISH SPECIES



MEASUREMENTS USED SPECIFICALLY FOR TUNAS AND TUNA-LIKE SPECIES



Appendix VI

Working Effectively With Fishermen

Build trust with empathy and humility

- Adopt an attitude that builds trust and helps communication.
- Try to see yourself as the fishermen see you.
- Humility is never out of place.

Be friendly and polite to all, while fostering a few good informants

- Try to be friendly, interested and cooperative with all fishermen in your area, while also attempting to develop a small group of very knowledgeable fishermen who want to help.
- These can provide exceptionally good data, and facilitate the collection of fish samples.

Respect privacy and confidentiality

- Respect the privacy of the information a fisherman gives you. If no one else is in ear-shot of your conversation then assume that what you heard is for your ears and your supervisor's computer only.
- Fishermen are understandably cautious about certain types of information, such as gear type and fishing ground. They may only reveal such information to you after a long period of assessing your discretion. Betray trust, and you will have lost a valuable partner.

Respect other's knowledge

- Recognize that most of the fishermen you talk to know far more about fish and fishing than you do.
- Respect his knowledge, even if you do not understand all of it, or think he may be mistaken.

Know your place and know your job

- See fishermen as your partner, not simply as a source of data.
- Your status as a fisheries employee does not make you a fishermen's superior.
- Because you will spend a great deal of time with fishermen, and because you work for the fisheries division, you may be expected by some fishermen to speak for the Department: you do not.

- Be very clear of what your role is:
  - You are there to collect information for scientific research.
  - The information you collect is used exclusively to estimate the amount of fish in the sea and how much the entire fishery takes, not how much any individual takes.
  - You may also have the opportunity to help fishermen to better appreciate the value of good fisheries data and scientific research.
  - Without being rude, you should emphasize that you are on a mission of learning, not teaching, and certainly not policing.
- Be very clear on what your role is not:
  - It is not your job to answer fishermen's questions or complaints about fishing regulations, or about other fishermen's activities.
  - You do not represent the fisheries department or the government in any matters of policy or enforcement.
  - You are not there to collect any information of a financial or taxation nature.

Minimize inconvenience and intrusion

- Understand that a fisherman's life can be very hard.
- Be sensitive to his mood and preoccupations.
- Try not to come between him and his fish or his market.
- Apologize if you impose upon him.
- Pay fairly and promptly for fish samples.

Avoid confrontation

- Do not take sides in any fishermen's disputes.
- If a bad situation develops: back off and report to your supervisor in the fisheries division.

Enjoy your work

- It is one of the most interesting and pleasant jobs anyone any one could have.