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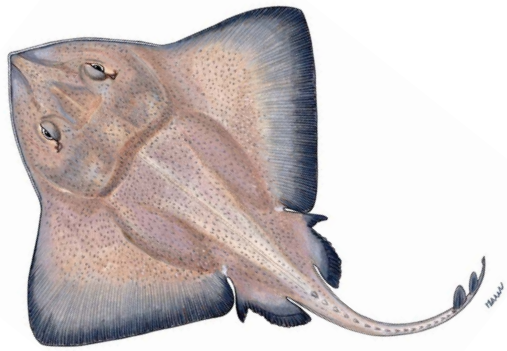
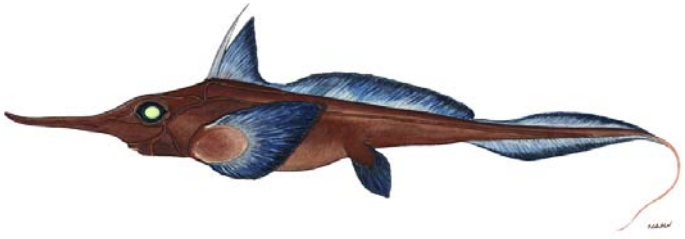
Report of the

REGIONAL WORKSHOP ON THE DEVELOPMENT OF SPECIES IDENTIFICATION GUIDES FOR DEEP-SEA CARTILAGINOUS FISHES OF THE INDIAN OCEAN

Flic en Flac, Mauritius, 16-18 January 2013





Illustrations of ***Centroselachus crepidater***, ***Bathyraja richardsoni*** and ***Harriotta raleighana*** by Emanuela D'Antoni (FAO)

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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PREPARATION OF THIS DOCUMENT

This report gives a full account of the regional workshop on the "Development of Species Identification Guides for Deep-sea Cartilaginous Fishes of the Indian Ocean", which was held in Flic en Flac, Mauritius, from 16 to 18 January 2013.
The workshop was a follow-up of a first workshop, held in Rome in December 2009, which was organized to identify and review the key issues for vulnerable deep-sea species that could be addressed when developing user-friendly identification tools for corals, sponges and chondrichthyans. A discussion group (http://dgroups.org/fao/dsf/dsf-sharks) was also set up from July to December 2012 to share experiences among scientists, fishery observers and fishery workers on a number of topics related to the development of identification tools for deep-sea cartilaginous fishes.
The objective of the workshop was to discuss, share experiences and finally draft recommendations for the development of field products aimed at facilitating the identification of Indian Ocean deep-sea cartilaginous fishes.
The report provides the record of the presentations and of the discussions held during the workshop as well as the conclusions and recommendations agreed upon by participants.

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ABSTRACT

The regional workshop on the "Development of Species Identification Guides for Deep-sea Cartilaginous Fishes of the Indian Ocean" was held in Flic en Flac, Mauritius, from 16 to 18 January 2013. It was attended by 15 participants from a wide range of countries and fields of expertise, including taxonomy, bioecology of cartilaginous fishes and the fishing industry. The general objective of the workshop was to discuss, share experiences and finally draft recommendations for the development of field products aimed at facilitating the identification of Indian Ocean deep-sea cartilaginous fishes. The key goals were: to draft the final list of species to be included in the field product (or products); to define the format of the field product and how the species should be depicted; to agree on which information for each species should be included; to define the best way to help the user avoid confusing the species with similar ones; and finally to draft a proposal for the training of fishers and fishery observers to be carried out on board fishing vessels operating in the Indian Ocean.

ABBREVIATIONS AND ACRONYMS

CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
COFI	Committee on Fisheries
EEZ	exclusive economic zone
EIO	eastern Indian Ocean
RFMA	regional fisheries management arrangement
RFMO	regional fisheries management organization
SEAFO	South East Atlantic Fisheries Organisation
SIODFA	Southern Indian Ocean Deepsea Fishers Association
VME	vulnerable marine ecosystem
WIO	western Indian Ocean
EIO	eastern Indian Ocean

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REPORT OF THE EXPERT WORKSHOP

Introduction

1. Within the framework of the FAO Deep-sea Fisheries in the High Seas Programme, a workshop on the "Development of Species Identification Guides for Deep-sea Cartilaginous Fishes of the Indian Ocean" was organized in Flic en Flac, Mauritius, from 16 to 18 January 2013.

2. The workshop was attended by 15 participants from a wide range of countries and fields of expertise, including taxonomy, bioecology of cartilaginous fishes and the fishing industry (Appendix 1).

3. The meeting was opened by Jessica Sanders, FAO Policy, Economics and Institutions Branch, who welcomed the participants and invited participants to introduce themselves.

4. The agenda (Appendix 2) and objectives of the Workshop were introduced by Edoardo Mostarda, FAO Consultant. It was explained that the workshop was a direct follow-up to the discussion group that took place between July and December 2012 through the Dgroups platform.

5. The general objective of the workshop was to discuss, share experiences and finally draft recommendations for the development of field products aimed at facilitating the identification of Indian Ocean deep-sea cartilaginous fishes. It was pointed out that, in consideration of the vastness of the region and different types of fisheries catching deep-sea chondrichthyans, the discussion was going to focus on the southwestern and southeastern Indian Ocean.

6. The participants were told that a number of specific objectives were to be reached by the end of each session. The key goals were the following:

- draft the final list of species to be included in the field product (products);
- define the format of the field product;
- decide how the species should be depicted;
- determine which information for each species should be included;
- define the best way to help the user avoid confusing the species with similar ones (keys, similar species, etc.);
- draft a proposal for the training of fishers and fishery observers to be carried out on board fishing vessels operating in the Indian Ocean.

Background information

7. Before starting the discussions on the specific objectives of the workshop, the participants were reminded of the main programmes that were of particular relevance to the work to be discussed and of the results achieved through the Dgroups discussion. Moreover, Dave Ebert gave a presentation on the work done on deep-sea cartilaginous fishes in the Indian Ocean.

Relevant FAO programmes

FAO Programme on Deep-sea Fisheries in the High Seas

8. Jessica Sanders presented the FAO Programme on Deep-sea Fisheries in the High Seas. Through the adoption of the FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas, FAO was requested by the Committee on Fisheries (COFI) to carry out a number of supporting activities to create awareness and facilitate the implementation of the FAO Deep-sea

Guidelines. Building on these requests, FAO has initiated a programme with the aim of assisting States, institutions, the fishing industry and the regional fisheries management organizations and arrangements (RFMO/As) in the implementation of the FAO Deep-sea Guidelines. The objective is to improve the current management systems through more and better information and tools, as well as to foster better engagement and communication among stakeholders, and capacity building. The four-year programme seeks to establish a knowledge baseline in relation to these fisheries and related ecosystems. It contains four major components: (i) support tools for the implementation of the FAO Deep-sea Guidelines; (ii) a vulnerable marine ecosystem (VME) information system and knowledge; (iii) pilot implementation activities for enhanced management of deep-sea resources; and (iv) global coordination, monitoring and evaluation, and dissemination of information. The programme is seen as a multidonor programme, where components or elements of components can be supported through a modular approach.

9. In the discussion that followed the presentation, it was noted that capacity and quality of data collection largely depend on the region and the obligations that people have with their countries or regional management bodies. In the Indian Ocean, there is currently no regional management body in the high seas that can facilitate the use of data on a more aggregate level and without violating confidentiality. However, the South East Atlantic Fisheries Organisation (SEAFO) has a scientific committee that provides the Commission, the highest decision-making body of the Organisation, with scientific advice and recommendations on conservation and management measures and promotes research cooperation among Parties.

10. Subsequently, the participants discussed the measures put in place by the different regional fisheries bodies with the competence to manage deep-sea high seas fisheries to manage VMEs and the way these are being identified based on the criteria recommended in the FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas. It was stressed that these measures varied regionally and that efforts were being undertaken to strengthen them and that, in terms of vulnerable species, most RFMOs still referred primarily to sponges and corals rather than to sharks.

FAO FishFinder Programme

11. Edoardo Mostarda presented the FishFinder Programme (former Species Identification and Data Programme), which had been conceived in the early 1970s by Walter Fischer (who recognized the need for fish identification tools to improve the quality of fishery statistics). It was stressed that, after 40 years, there was still a need to improve marine resources identification in many regions where the percentage of catches reported to the species level was still low.

12. The objectives of the FishFinder Programme are to improve the identification of marine organisms of actual and potential interest to fisheries by developing and disseminating tools to facilitate species identification in fisheries and by providing a global and coherent system of scientific and common nomenclature. Priority is assigned to resources of major commercial importance or threatened species and to developing countries and/or regions facing difficulties in species identification. The main activities of the programme are: to secure the best up-to-date information (calling upon knowledgeable specialists in taxonomy); to compile information on species distribution in order to produce distribution maps; to draw reliable and accurate illustrations of marine organisms and their anatomical details; and to produce and distribute, through different media, species identification information for fishery purposes. The principal outputs of the programme are publications such as species catalogues, regional catalogues, field guides, pocket guides, CD–ROMs, synopses, fact sheets available on the Web, species distribution maps and scientific illustrations.

Results of the Dgroups discussion

13. The results of the discussion group on "Species Identification Guides for deep-sea sharks, batoids and chimaeras" carried out through the DGroups platform were presented. The discussion group was set up in July 2012 with the objective of drafting recommendations for the production of a field identification product for deep-sea chondrichthyans of the Indian Ocean. It was noted that many of the goals had not been achieved and that many issues could not be solved outside of a face-to-face discussion.

14. The first Dgroups discussion regarded the selection of the species to be included in a comprehensive catalogue following certain criteria proposed by the author. No comment was made in this discussion, so it was assumed that everyone agreed with the approach employed and the resulting list of species to be included in the catalogue.

15. The second discussion focused on the type and format of field products. Some examples were posted on the website and participants were asked to comment and add examples.

16. In the last discussion, the participants were asked to extract, from the list of Indian Ocean species, the ones that should unquestionably be included in a field product. Even if the topic was very specific, the comments were general and regarded the need of whether or not to take into consideration the rare species, how to treat the genera represented in the Indian Ocean by many species, and the necessity of including dichotomous keys or just the species that are similar.

Presentation on the Indian Ocean chondrichthyan fauna

17. As a basis for the technical discussions, Dave Ebert presented his work entitled "Deep-sea Indian Ocean Sharks: Biodiversity and Identification of Charismatic Predators".

18. The public's perception of sharks often conjures up images of a large, fearsome, toothy predator, with its large dorsal fin cutting its way through the water surface. However, the reality is that sharks come in a variety of sizes and shapes, from the whale shark (*Rhincodon typus*), the world's largest fish, to the dwarf pygmy sharks (*Squaliolus* spp.), and these enigmatic fishes occupy most marine, and some freshwater, habitats. In addition, the batoids and chimaeras, along with the sharks, form a distinctive group of fishes collectively referred to as the chondrichthyans. There are more than 500 species of sharks, together with almost 650 batoid and 50 chimaera species, bringing the overall total to about 1 200 species of sharks and shark-like fishes. The diversity of sharks and their relatives has increased exponentially in the past decade with more than 200 new species having been described since 2000. Since 2007, about 147 new species have been described, an average of 24.5 new species per year. This represents almost 20 percent of all shark species that have been described, which compares with about 200 species that had been described in the previous 30 years (1970–1999). Most of the new species discovered in the past decade have come from the Indo-Australian region, followed by the southern African and western North Pacific regions. Many of these newly discovered species are deep-sea inhabitants, mostly at depths in excess of 200 m. The discovery of new species combined with the taxonomic resolution of species complexes has led to a scientific renaissance in chondrichthyan taxonomy, and highlights the importance of taxonomy for proper identification and management of these charismatic predators.

19. The Indian Ocean is one of the more diverse regions for chondrichthyans, but it has been insufficiently studied, especially the deep sea. Some 123 sharks, 63 batoids and 18 chimaeras occur in the Indian Ocean deep sea, representing about 17 percent of all known chondrichthyan species. The majority of species are within three major orders (Squaliformes, Carcharhiniformes and Rajiformes), but mostly within nine families (including the Squalidae, Centrophoridae, Etmopteridae, Somniosidae, Dalatiidae, Scyliorhinidae, Arhychobatidae, Rajidae and Chimaeridae). These families collectively comprise 162 (79.4 percent) of all Indian Ocean deep-sea chondrichthyans.

20. The family Rajidae is the most diverse with 39 species, followed by the Scyliorhinidae with 34 species, and the Chimaeridae, Centrophoridae, and Etmopteridae, with 18, 16, and 16 species each, respectively. Of these totals, about 23.7 percent (29 species) of sharks, 31.7 percent (20 species) of batoids, and 44.4 percent (8 species) of chimaeras have only been described since 2002. The number of species found between the Eastern and Western Indian Ocean, FAO Areas 51 and 57, is remarkably similar in numbers with 80 shark species found in each region, 32 (FAO Area 57) and 34 (FAO Area 51) batoid, and 12 (FAO Area 57) and 9 (FAO Area 51) chimaera species. However, only about one-third of sharks and less than 5 percent of batoids and 17 percent of chimaeras occur in both FAO Areas, highlighting a high degree of regional endemism within the Indian Ocean deep sea. Finally, much of the research and new species identification in the Indian Ocean deep sea has occurred off Australia and Indonesia, and in the southwestern area off South Africa, Mozambique, and some of the seamounts on the southern Madagascar Ridge.

21. The northern Indian Ocean, especially off East Africa, including many of the western Indian Ocean Islands, the Arabian Sea, and the Bay of Bengal, still remains relatively unexplored.

Overview of the different field products commonly used by participants

22. Participants were asked to illustrate the features of guides they had found useful for identifying chondrichthyans or other species groups in the field.

23. Two software products conceived to compile dichotomous and multiaccess keys (Lucid) and species factsheets (Factsheets fusion) developed by the University of Queensland (www.lucidcentral.org) were illustrated. In their database, the multiaccess keys built using Lucid have character information about the taxa that are to be identified. When a character in the key is selected (e.g. presence or absence of the anal fin) the taxa that have that character are retained, while the ones with a different character are discarded. The same process is repeated with the remaining taxa. The advantages of the multiaccess keys over the dichotomous keys are the following: (i) users can start with any character they choose and proceed in any order they prefer; (ii) characters that are difficult to distinguish can be avoided; and (iii) if all the taxa except the one matching the specimen cannot be eliminated, the user will at least be left with a small group of taxa that can then be compared more closely. It was noted that although this software cannot be used in the field, in cases where a computer is available, such as up on the bridge deck of fishing vessels, it could facilitate the identification of the more rare or uncommon species.

24. A foldable leaflet aimed at identifying the 15 species of skates occurring in Alaskan waters was shown. This product was characterized by having the general characters of a typical skate on the front side and all the species displayed with their nomenclature and condensed diagnostic features on the backside.

25. Subsequently, the publications that the FAO FishFinder Programme has produced, during about 40 years of its activity, were illustrated. The **species catalogues** are worldwide, annotated and illustrated inventories of species for each of the world's major commercial groups of fishery resources. They include general information on the group and information by species including scientific nomenclature, international and local names, diagnostic features, geographical distribution, biology, fisheries and relevant literature. The **regional guides** are addressed primarily to field workers in all sectors of fisheries and are designed as comprehensive, coded, annotated and illustrated inventories of the species of interest in the region covered. They are based on contributions of a large group of taxonomists and fishery workers. The **field guides** to commercial species entering fish landings of individual countries or groups of countries are aimed particularly at national data collectors in need of quick identification of species in markets and landing places for the specific purpose of improving statistical and other fisheries data by species. These field guides are based on illustrations, with a minimum of text, including nomenclature (scientific, FAO, national and local names), information on size, habitat, and fishing gear. The **species synopses** are detailed descriptions

of one (occasionally several) species of interest for fisheries, and the **pocket guides** provide a quick reference for the identification of species in the field.

26. Peter Kyne showed a typical guide used to identify bird species, characterized by having the species illustrations or photos on one page and their descriptions on the facing one. Rarely are identification features marked and written on the plates themselves, while a distribution map is included for each species.

Identification of users and requirements. Fishers, fishery observers, working environment, data collection and level of expertise

27. The discussion on the working environment and users' involvement in data collection, focused on the reported experiences of some of the participants working on commercial fishing vessels operating in the Indian Ocean. It was noted that all Indian Ocean high seas trawlers either have observers or collect data as part of the Southern Indian Ocean Deepsea Fishers Association (SIODFA) Programme.

28. The fishing operations and work station on board bottom trawlers were described. The catch is hauled from the sea to be suspended, then dropped on to a conveyor belt that allows for a sorting of what has just been caught. The sorting process can take many hours and during this phase the bycaught sharks are set aside. Afterwards, they are identified by the crew or fishery observers and basic data (e.g. length, weight and sex) are collected. It was reported that some large sharks do not reach the factory and are discarded directly from the deck.

29. The participants reported that the crew members are generally knowledgeable about the species they deal with and generally interested in knowing more and being engaged in scientific work. It is important to provide recognition and feedback of the crew's role in species identification to create incentives for their continued participation.

30. The guides should hence be geared toward use by the crew, as well as the observers.
The discussion on longline fishery in the southern Indian Ocean and the area of competence of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) highlighted different working conditions, with observers often operating in limited space or outdoors. Another difference regards the selectivity of the fishing gear, which results in a narrower list of cartilaginous fishes being caught. The catch composition is also very different and includes many skates and rays. Moreover, while the identification process on board the bottom trawls occurs in the factory and the observers have time to examine most of the specimens, on board the longliners, as the CCAMLR protocol allows the bycaught specimens to be cut off immediately after capture, the observers have to identify them rapidly and from the upper deck. These factors led the participants to recommend the production of a small waterproof pocket guide that should be specific for the CCAMLR area, and this could be funded by the member countries.

General discussion

31. During the discussions, a number of general topics were raised by the participants.

32. It was noted that the fisheries in deep-sea areas (exclusive economic zones [EEZs]) were constantly changing and moving farther and farther offshore and that, therefore, there was a need to adapt monitoring and identification systems to address these evolving fisheries. As little information is available on deep-sea cartilaginous fishes, the identification guides should be adaptable as more information becomes available or as the fisheries change. In this direction, it was recommended that an electronic database be developed that could be consulted onboard and from which to extract the needed information. This database should be global and give the user the opportunity to query data relating to the fishing area, fishing gear, depth range, etc.

33. There was a general demand for shark guides that deal with other issues, including guides for identification of fins and guides that deal with fish products (e.g. trunk of shark or frozen product). These would be particularly useful at landing sites in cases where the caught sharks are processed directly onboard and only parts of them are accessible to fishery observers.

34. The participants recommended that an archive of photographs of deep-sea chondrichthyans be developed. The photographs should follow specific standards to be described in the field guide. An e-mail address to where the photographs can be sent could also be added.

35. It was stressed that the presence of different habitats in the Indian Ocean could lead to a completely different array of species caught by the deep-sea fisheries. This can be true not only when comparing the northern and southern areas, but also if the fishery occurs in the southeastern or southwestern areas of the Indian Ocean.

36. Producing a field guide or pocket guide with species known to occur only in certain areas, possibly endemic, and using these guides in areas where they do not occur could generate unnecessary confusion among users. On the other hand, in some cases, the absence of species from determinate areas could be best explained by the lack of an adequate sampling and/or their low density, and not including them could lead the user never to record them.

37. The participants proposed to start by producing a printed guide for a selected area that includes the species that are known to occur there, together with the species that are similar (and for these an indication of the area of known occurrence). Separately, an electronic product that allows for the extraction of all the species known to occur in the area the user is headed for could be developed. This electronic product would have the advantage of being easily updatable but would require the vessel to have the equipment to download, print and laminate the species accounts.

38. The participants noted that the guides should also be useful at landings points in addition to on board industrial fishing vessels. However, it was stressed that other issues should be taken into account when developing these guides. For example, the uncertainty regarding the location where the fishery takes place is a common issue. In Indonesia, the identification of cartilaginous fishes is carried out at markets and landing sites but rarely is there an indication of the location where the fishing activity really takes place. In eastern Africa, there are commercial fleets that fish for deep-sea resources offshore in the EEZs but do not reach the high seas basins, plateaus and ridges of the Indian Ocean. These fleets focus their fishing efforts along the continental slope, and there the chondrichthyan fish fauna can be qualitatively and quantitatively very different.

39. Specific guides to be used at landing sites should be produced for the western Indian Ocean countries, or it would be better to have a coastal guide for a group of countries (e.g. Kenya, Mozambique, the United Republic of Tanzania, South Africa and Madagascar). This guide should be more comprehensive, that is, include a combination of deep-sea and coastal species, and could take into account the possibility of having to deal with frozen and/or cut products.

40. Another important area that should be taken into consideration is the northern Indian Ocean (Arabian Sea, India, and other areas in the north), where the targeted and non-target fisheries for sharks are growing rapidly, and Indonesia, where the fishing pressure on sharks is high at the moment. This would require a separate discussion to look into information gaps and also a series of workshops.

41. The participants agreed with the decision of starting to develop a field guide for the southern Indian Ocean, also in consideration of the quality of information currently available from surveys carried out by Australians and South Africans. However, it was recommended that this project be considered a pilot programme that should be replicated in other regions.

Selection of the species to be included in the field guide

42. Regarding the approach to be used for the selection of the species to be included in the field guide, and in consideration of the limitation in the number of species that it should include in order to be manageable and portable, the participants discussed whether more importance should be given to the ones that are easily identifiable and more common or whether it should focus more on the ones that can be mistaken or are rare.

43. An updatable guide could be useful to overcome this issue. In fact, a first set of species sheets including common and easily identifiable species could be produced by FAO and distributed. Afterwards, once the users gain the ability of identifying the ones included, new species sheets could be produced, and these could be printed and laminated by the crews and added to the guide.

44. It was pointed out that some chondrichthyan groups seem to be caught more commonly than others, show a high species diversity and have slight differences among the species that make them difficult to identify. These genera (e.g. *Etmopterus*, *Centrophorus*, *Squalus* and *Apristurus*) could be treated differently by developing small A4-sized laminated posters displaying the main characters of a generic representative of the group on the front page and the entire array of species on the back page displaying their distinguishing features, thus allowing the users to at least become used to them visually. This product could be a quick reference guide for these groups and would have to go together with a more detailed and comprehensive catalogue that could be available on the bridge.

45. Before going into the detailed analysis of the species lists, the participants pointed out that it was necessary to set a limit to the number of species to be included.

46. The participants agreed that a maximum number of pages rather than of species had to be set in order to produce a relatively manageable guide. The limit was set at about 40 pages.

47. Moreover, it was noted that, most of the times, the field identification guides were just a collection of fact sheets of important species occurring in a certain area. Limited space is given to the keys necessary to reach the species level, and users tend to leaf through the guides trying to recognize the illustrations that resemble the specimen they have in front of them.

48. In cases where there are many species for a single genus with a wide but patchy distribution, priority should be given to the ones that occur frequently in the catches. However, giving full information about the common species and poor information about the rare ones could result in users never identifying the latter.

49. The inclusion of keys to the species level could reduce this risk. However, these would often be very complex, especially for users without a scientific background.

50. It was agreed that guides to the orders and families should be included in the field guide, while the guides to the genera and species should be accessible through the comprehensive catalogue that can be consulted on the bridge-deck.

51. In general, it was decided to give priority to the species that are believed to be more commonly caught by the southern Indian Ocean fisheries and, if possible in terms of space available, to include some of the rare ones, especially the ones that can be identified without difficulty. The participants decided to give the former species a space that would most probably take up about one or two pages (full species account), and to display three or four species of the rare ones on a single page (simplified species account) showing their main distinctive features as captions with arrows, and other useful information such as the nomenclature, size, depth range and area of known occurrence.

52. First, a checklist of all known described extant deep-sea sharks, batoids and chimaeras occurring in the Indian Ocean (see Appendix 3) was provided in phylogenetic order, including the

species scientific name (with authority), common names and whether they occur in the eastern or western Indian Ocean (EIO and WIO, respectively).

53. The list of deep-sea Indian Ocean sharks, comprising a total of 120 species belonging to 8 orders and 23 families, was reviewed.

54. The participants decided to give a more extensive treatment to the families that have a relatively high number of species with slight interspecific differences. These are the Squalidae (13 species), Centrophoridae (13 species), Etmopteridae (16 species), Somniosidae (8 species), Dalatiidae (6 species) and Scyliorhinidae (34 species).

55. The order Squaliformes is represented in the Indian Ocean by seven families. The participants agreed that the field guide should include a key the families for this order.

56. The family Squalidae (dogfish sharks) is composed of two genera, *Cirrhigaleus* and *Squalus*, which are represented in the Indian Ocean by 2 and 11 species, respectively. The two species of *Cirrhigaleus*, seem to be geographically separated, with *C. australis* occurring only in the southeastern borders of the Indian Ocean, and *C. asper* scattered in the southwestern Indian Ocean. The latter species was selected to be included in the field guide in consideration of its apparent wider distribution.

57. It was pointed out that the species belonging to the genus *Squalus* also appeared to manifest a clear geographic separation. Moreover, there seems to be taxonomic confusion regarding *Squalus blainville, S. megalops* and *S. mitsukurii* in the western Indian Ocean, so that this species complex is in need of a critical revision of its systematic status. Both *S. blainville* and *S. megalops* found in the western Indian Ocean are probably different species and *S. megalops sensu lato* appears to be a species-complex rather than a single species. *Squalus megalops* is possibly an Australian endemic, with very similar nominal *megalops*-like species from off southern Africa. *Squalus mitsukurii* can also be considered a well-defined species subgroup. *S. altipinnis*, *S. chloroculus*, *S. crassispinus*, *S. edmundsi*, *S. hemipinnis*, *S. montalbani* and *S. nasutus* are Australian endemics and, as their habitat seems to be restricted to the continental slope, these were considered unlikely to be caught by the high-seas fishing fleets.

58. *Squalus megalops* and *S. mitsukurii* were chosen to be included in the field guide as representatives of two subgroups of species with specific characteristics, remarking that the taxonomic status is still provisional and that further investigation from around the world will likely result in more taxa being recognized. For all caught specimens belonging to the genus *Squalus*, it was decided that a remark be included recommending that the specimens be collected when possible or that a photograph be taken.

59. The family Centrophoridae (gulper sharks and birdbeak dogfish) is represented in the Indian Ocean by two genera, *Centrophorus* and *Deania*, comprising 10 and 3 species, respectively.

60. Of the genus *Centrophorus*, the two most commonly caught species are the gulper shark (*C. granulosus*) and the leafscale gulper shark (*C. squamosus*), both with worldwide distribution. These species should both be included in the field guide. Although adults of the leafscale gulper shark can easily be identified, being the only species having lateral trunk denticles with leaf-like flattened crowns on elevated narrow-to-broad pedicels extending above the denticle bases, it was noted that young specimens of the gulper shark (size less than 80 cm) present similar shaped dermal denticles, and this information should be added in the species account.

61. Other wide-ranging species that could be confused with the gulper shark and leafscale gulper shark are *Centrophorus moluccensis* and *C. atromarginatus*, even if the latter is known only from the northwestern and northeastern parts of the Indian Ocean.

62. Of the other *Centrophorus* species, *C. lusitanicus* has been recorded both in the western Indian Ocean and Taiwan Province of China. This species is identifiable by having a very long dorsal-fin base. Species with a restricted distribution are *Centrophorus seychellorum*, known only from two specimens from Seychelles, and *C. westraliensis*, endemic to western Australia.

63. The *Deania* species are distinct from the *Centrophorus* by having a much longer snout. It was decided to provide a full species account of *Deania calcea* and to include the other two Indian Ocean species as similar ones.

64. The family Etmopteridae (lanternsharks) is represented in the Indian Ocean by two genera, *Centroscyllium* and *Etmopterus*, comprising 2 and 14 species, respectively.

65. The two genera can be separated by looking at the upper and lower teeth, which are similar in *Centroscyllium* and dissimilar in *Etmopterus*. It was decided not to include the two species of *Centroscyllium* because their distribution is limited.

66. Regarding the genus *Etmopterus*, it was noted that it could be possible to divide into subgroups the 15 species based on their geographic distribution and texture of dermal denticles along the sides of the body. Dermal denticles can have a linear or scattered arrangement. Other species have a smooth or velvety appearance as their denticles are truncated at the end. This character is easily recognizable and does not require specific expertise by the user. A series of pictures could highlight these different patterns and, if the genus level is reached, can allow users to easily cut back the possible species. Another important character is the flank marking that most of these species have in the precaudal and caudal region. This character is difficult to see in some species but can be very distinctive in other ones.

67. In general, most of the *Etmopterus* species occurring in the eastern Indian Ocean seem not to extend their range as far as the western Indian Ocean.

68. A general discussion on the taxonomic status of this genus highlighted that, as for the *Squalus*, several species complexes can be recognized. Several *Etmopterus* species are poorly known and of uncertain validity. Spotty exploration of deep benthic habitats in which the genus occurs suggests that the present classification of species is still highly tentative regardless of improvements on the account by Compagno.[1]

69. For example, *Etmopterus baxteri*, whose distribution seemed, until recently, to be restricted to southern Chile, now, after recent molecular studies combined with morphological information, seems to have a broader distribution in the Southern Hemisphere, showing a high degree of cryptic diversity. Genetic studies have evidenced that *E. baxteri* from the Indian Ocean is actually *E. granulosus*.

70. The subgroups that were defined are the following:

- Species with smooth skin: *Etmopterus pusillus, E. bigelowi.*
- Species with rough skin and dermal denticles in regular longitudinal lines also on dorsal surface of head: *Etmopterus brachyurus, E. sculptus, E. molleri, E. lucifer, E. sentosus*.
- Species with rough skin and dermal denticles in regular longitudinal lines only on body and not on head: *Etmopterus fusus, E. baxteri, E. evansi, E. granulosus*.
- Species with rough skin with dermal denticles not in longitudinal lines: *E. compagnoi, E. unicolor, E. viator, E. gracilispinis.*

[1] Compagno, L.J.V. 1984. *FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes*. FAO Fish Synopsis 125, Vol. 4, Pt. 1. Rome, FAO and UNDP. 349 pp. (also available at ftp://ftp.fao.org/docrep/fao/009/ad122e/ad122e00.pdf).

71. It was decided to provide a full species account of a representative of the first three groups. For the smooth-skinned *Etmopterus*, it was decided that *E pusillus* be included; *E. sculptus* for the species with dermal denticles in regular lines on the dorsal surface of the head and body; and *E. granulosus* for the species with dermal denticles in regular lines only on the body.

72. The similar species belonging to each group will be differentiated on the basis of the flank markings and known geographical distribution.

73. The family Somniosidae (sleeper sharks) is represented in the Indian Ocean by 6 genera and 8 species. To reach the species level, the key to the genera was considered difficult to use. Therefore, as all of the species, with the exception of *Scymnodalatias sherwoodi* were considered common in the catches of the southern Indian Ocean fisheries, it was decided to include a full species account for seven of them: *Centroscymnus coelolepis*, *Centroscymnus owstoni*, *Centroselachus crepidater*, *Proscymnodon plunketi*, *Scymnodalatias albicauda*, *Somniosus antarcticus* and *Zameus squamulosus*.

74. The same approach was used for the kitefin sharks (family Dalatiidae), which are present in the Indian Ocean with 5 genera and 6 species, 5 of which were selected to be included in the field guide with a full species account. These are: *Dalatias licha*, *Euprotomicrus bispinatus*, *Heteroscymnoides marleyi*, *Isistius brasiliensis* and *Squaliolus aliae.*

75. The family Scyliorhinidae (catsharks) is represented in the Indian Ocean by 8 genera and 34 species. The most speciose group is the *Apristurus* with at least 12 species with several undescribed species, followed by the *Bythaelurus* and *Cephaloscyllium*, both with 6 species.

76. The scyliorhinids of the genus *Apristurus* are characterized by long, laterally expanded snout and head, enlarged nostrils with reduced anterior nasal flaps and very long labial furrows.

77. The genus *Apristurus* can be divided into three groups based on a number of morphological characteristics:

- The *Apristurus longicephalus* group, represented by *A. longicephalus* and *A. australis*, both characterized by very long and slender snouts.
- The *Apristurus brunneus* group, which also includes *A. sinensis*, *A. platyrhynchus*, *A. saldanha*, *A. investigatoris*, *A. indicus* and *A. melanoasper*, characterized by species having slender bodies and upper labial furrows longer than lowers.
- The *Apristurus spongiceps* group, which includes *A. microps*, *A. ampliceps*, *A. bucephalus*, and *A. pinguis*, characterized by species having stout bodies and upper labial furrows subequal to or shorter than lowers.

78. Moreover, it was noted that many *Apristurus* species are endemic to Australia. For example, of the species belonging to the *Apristurus spongiceps* group, three of them are endemic to Australia (*A. ampliceps*, *A. bucephalus* and *A. pinguis*) while *A. microps* is found in the Indian Ocean only off South Africa. Therefore, even if these species have similar characters, it was considered unlikely to catch *A. microps* and one of the three other species in the same haul. This information should be included in the field guide.

79. It was decided to provide a full species account of a representative of the three above-mentioned groups: *Apristurus longicephalus* for the *Apristurus longicephalus* group; *A. melanoasper* for the *Apristurus brunneus* group; and *A. microps* for the *Apristurus spongiceps* group.

80. The genus *Bythaelurus* is represented in the Indian Ocean by six species. Five of them are very rare: *Bythaelurus alcocki* is known only from the holotype (and the only known specimen of this species, from the Indian Museum of Calcutta), and may have been lost. It was presumably small (< 30 cm total length) and was captured in the Arabian Sea. *Bythaelurus incanus* is known only from one specimen caught on the continental slope off Ashmore Reef, northwestern Australia. *Bythaelurus*

immaculatus is a deepwater bottom-dwelling shark only known from the south China Sea and *Bythaelurus hispidus* is only known from off southeastern India and the Andaman Islands. *Bythaelurus clevai* is known only from the holotype collected in 1986 in a trawl off Tulear, southwest Madagascar.

81. The only relatively common species is *Bythaelurus lutarius*, a deepwater catshark endemic to East Africa, apparently patchily distributed from Somalia and Mozambique. It was decided to include this species in the field guide together with *B. clevai*, which, although uncommon, was recorded offshore in the western Indian Ocean and could thus be caught by the high seas fisheries.

82. The genus *Cephaloscyillium* is represented in the Indian Ocean by six species. All the species show a restricted geographic and depth distribution. They occur along the outer continental shelf and upper slope. *Cephaloscyllium albipinnum*, *C. cooki*, *C. hiscosellum* and *C. speccum* are endemic to Australia, while *C. silasi* is known only from off Quilon, India. The balloon shark, *Cephaloscyillium sufflans*, is most probably a southwestern Indian Ocean endemic, occurring offshore from South Africa and Mozambique. As parts of its range are in areas where trawl fisheries occur and juveniles of this species are often encountered as bycatch, it was decided to include this species in the field guide with a full account.

83. *Figaro boardmani* and *Galeus gracilis* are both endemic to southern and northern Australian waters, respectively. Both are found on the upper continental slope and do not appear to extend their distribution far offshore. Therefore, it was decided not to include them in the field guide.

84. The genus *Holohalaelurus* is represented by five species all occurring off the eastern coast of Africa. The taxonomy of this genus has recently been reviewed and there has been much confusion historically with other species of this genus in northeastern South Africa and southern Mozambique. With the exception of *Holohalaelurus regani*, which is well known and has shown an increase in the estimated population size in the last years, information on the other species is poor and seems related to the fact that they occur in areas where no detailed data are collected. Records of all these species would be important from a conservation and managerial standpoint and, hence, it was decided to include them in the field guide, specifying that the area of possible capture would probably be restricted to the upper continental slopes of the western Indian Ocean.

85. The New Zealand catshark, *Parmaturus macmillani*, is known only from two New Zealand specimens, and three off southeastern Africa, in about 1 000 m. During a recent survey in the southwestern Indian Ocean, a number of specimens thought to be *P. macmillani* were caught, but further investigation revealed them to be a new species. Therefore, it was decided to include a generic representative for *Parmaturus*, highlighting the fact that comparison of Indian Ocean specimens with true *P. macmillani* from New Zealand suggest that the Indian Ocean specimens are of a different species that is currently under investigation.

86. The genus *Scyliorhinus* is represented by two species, both occurring in the western Indian Ocean. *Scyliorhinus capensis* is a relatively large yellowspotted catshark endemic to southern Namibia and most of South Africa and is moderately common on the offshore banks, while *Scyliorhinus comoroensis* is known only from the Comoros. It was decided to include the latter species in consideration of the fact that the area of known occurrence is poorly studied and, therefore, its distribution could be broader.

87. The family Proscylliidae is represented in the Indian Ocean by two genera, *Ctenacis* and *Eridacnis*. Both are small-to-dwarf sharks, living on the outer continental and insular shelves and upper slopes on or near the bottom. The only species showing a wide-ranging distribution in the Indo-West Pacific, compared with the limited ranges of other members of the genus *Eridacnis*, is the pigmy ribbontail catshark *E. radcliffei*. For this reason, it was decided to include this species in the field guide, together with *Ctenacis fehlamnni.*

88. Finally, *Pseudotriakis microdon* and *Carcharhinus altimus*, belonging to the families Pseudotriakidae and Carcharhinidae, respectively, were added to the list of species to be included with a full species account.

89. The final list of deep-sea shark species to be included in the field guide with full species accounts was compiled (Appendix 6).

90. Afterwards, the participants went back through the shark species list and determined the families that, for having very distinctive species, would be suitable for being displayed as simplified species accounts. These families are the Chlamydoselachidae, Hexanchidae, Echinorhinidae, Oxynotidae, Pristiophoridae, Squatinidae, Heterodontidae, Parascylliidae, Mitsukurinidae, Odontaspididae, Pseudocarchariidae, Alopiidae and Cetorhinidae.

91. More in detail, it was decided to include simplified species accounts for:

- Four of the five species of Hexanchiformes (families Chlamydoselachidae and Hexanchidae) occurring in the Indian Ocean. It was noted that these species are easily identifiable because they have 6 or 7 gill slits and a single dorsal fin. As there was a general agreement that the users would reach the order and family level without difficulty, it was decided to display the species on a single page as simplified species accounts showing the species' key features and basic info (nomenclature, size and distribution). However, it was pointed out that *Chlamydoselachus anguineus* can be distinguished by *C. africana* only by the examination of internal characters such as the number of vertebrae and intestinal valve turns. Therefore, it was decided to include only *Chlamydoselachus anguineus* with a remark highlighting the existence of another species know only to occur in the western Indian Ocean.

- *Echinorhinus brucus* and *E. cookei* (family Echinorhinidae, bramble and prickly sharks); *Oxynotus bruniensis* and *O. centrina* (family Oxynotidae, rough sharks).

- The two species of sawsharks (family Pristiophoridae) occurring in the Indian Ocean; *Squatina africana* as representative of the angelsharks (family Squatinidae) and *Heterodontus ramalheira* for the bullhead sharks (family Heterodontidae). All the latter species occur off the coast in rather deep habitats but not far offshore. Therefore, it should be reported that these are unlikely to be found in the catches of the high seas fisheries.

- Four species of the order Lamiformes: the goblin shark *Mitsukurina owstoni* (family Mitsukurinidae), the smalltooth sand tiger shark *Odontaspis ferox* (family Odontaspididae), the crocodile shark *Pseudocarcharias kamoharai* (family Pseudocarchariidae) and the bigeye thresher shark *Alopias superciliosus* (family Alopiidae).

92. The final list of deep-sea shark species to be included in the field guide with simplified species accounts was compiled (Appendix 7).

93. Subsequently, the list of deep-sea Indian Ocean batoids, comprising a total of 63 species belonging to 10 families, was reviewed (see Appendix 4).

94. In general, it was noted that the information available on the species being caught in the southern Indian Ocean high seas is scanty, and batoids are caught by bottom trawls very infrequently. Moreover, some families of batoids occur in deep-sea habitats but have been caught only on the upper continental slope and around islands in the western Indian Ocean (e.g. families Narcinidae and Torpedinidae).

95. Three main families of skates were considered likely to be caught in the Indian Ocean high seas: Arhynchobatidae, Rajidae and Anacanthobatidae. These families can be easily distinguished. The Arhynchobatidae are known as softnose skates for having a very flexible rostral cartilage, which can be totally lacking. On the contrary, the Rajidae have a stout and solid rostrum up to the snout tip. Finally, the Anacanthobatidae have a stiff rostrum and very distinctive anterior pelvic-fin lobes that are slender, "leg-like" and separated from posterior lobes.

96. The Plesiobatidae and Hexatrygonidae, represented by *Plesiobatis daviesi* and *Hexatrygon bickelli*, respectively, have a scattered distribution but were considered likely to be caught in the Indian Ocean high seas.

97. There was a lengthy discussion on which species should be included in the field guide and if the much more detailed information coming from the data collected in the Southern Ocean (CCAMLR) could be utilized for the Indian Ocean. It was noted that the batoid species assemblages found in the Southern Ocean are completely different from the ones occurring in the Indian Ocean.

98. Therefore, the participants agreed that, for the purposes of the field guide and in order to avoid confusion among users, only a general representative of the families Arhynchobatidae, Rajidae and Anacanthobatidae and the two species belonging to the Plesiobatidae and Hexatrygonidae should be included. It was considered likely that if a batoid species were caught by bottom trawls in the Indian Oceans, it would be a new species. This should be indicated and it should be recommended that the caught specimens be preserved for further investigation.

99. Finally, the list of deep-sea Indian Ocean chimaeras, comprising a total of 18 species belonging to 2 families, was reviewed (see Appendix 5).

100. For this group, the suggested approach was to include a key to the families, to separate the shortnose chimaeras (Chimaeridae) from the longnose chimaeras (Rhinochimaeridae), and then, within the Chimaeridae, to separate the genus *Chimaera* from the genus *Hydrolagus* based on the respective presence or absence of the anal fin.

Information to be included in the field guide

101. The participants compiled a list of information that each full species account would have to include (see Appendix 8):

- The nomenclature of the species must include the scientific name, with authority.
- The inclusion of the FAO 3-alpha code at the species level was recommended. In some cases, codes are available for higher-level taxa, but their use was not considered necessary. The existence of a different set of three-digit codes, approved by the Ministry of Fisheries of New Zealand, was pointed out. As these seem to generate confusion among users, it was decided to use only the FAO codes.
- The English, French and Spanish FAO common names must be included and, where available, also the Japanese, Korean and Portuguese common name.
- The order and family of the species must be displayed. Each order should be colour coded, and it should also be visible when the guide is closed.
- The species' main illustration should be a scientific colour drawing, at least for the ones that will have a full species account. The species that will have a simplified species account could be depicted by a line drawing.

- Some anatomical details, which are difficult to catch by looking at the entire specimen's colour drawing (dermal denticles, teeth, underside of head, nostrils), should be depicted with line drawings or photographs, where available.

- At least a photograph of the entire specimen should be included. Priority should be given to photographs showing the specimens immediately after capture over ones of preserved individuals.

- The description of each species' main features should possibly be with captions and arrows pointing out the different characters on the drawing. Paragraphs of text should be avoided if possible, even if a description of the species coloration was considered useful.

- A key to the orders and families must be included and should be user friendly, with more illustrations and less text. Special attention should be given to the key to the families of the order Squaliformes.

- The first species representative of each family could include a summary of the basic diagnostic features of all members of the family.

- The size must be indicated as the maximum known length and, where possible, the average size of caught specimens.

- In consideration of the lack of data on deep-sea shark distribution, the known geographical distribution of each species should be displayed on a map divided into four quadrants (Northwestern Indian Ocean, Northeastern Indian Ocean, Southwestern Indian Ocean, and Southeastern Indian Ocean) by highlighting the known occurrence in each quadrant. Symbols could be added to each quadrant to indicate whether the species is very common, common, rare or if its presence is questionable (question mark).

- The known depth range should be included as text (e.g. 300–1 200 m).

- A Remarks section should provide information about reproduction, life-history characteristics, habitat preferences (e.g. at broad scale, slope, seamounts), key biological features, reproduction, maturity, diet and elements to report (e.g. whether elasmobranch pups are expelled when on deck). Moreover, the juveniles of some gulper sharks, dogfish sharks and skates have very different characteristics compared with the adults, and this information should be included in the field guide.

- A description of similar species should be on the front page, and other information not essential for identifying the species could go on the back page.

- The inclusion of information on fisheries was not considered significant for this field product, also considering the fact that it will be provided in the catalogue.

- The field guide should include a page on instructions for taking photographs of new species.

- The guide binding should foresee at least one ring large enough to hang up in the factory.

102. A summary table of the information to be included in the field guide is provided in Appendix 8.

103. The species included with simplified accounts should be described by a line drawing and photograph. Moreover, field identification features should be indicated by using captions and arrows

highlighting the characters that can be used to identify the species accurately and separate it from all other species. The species nomenclature (scientific name with authority and FAO names), the known depth range and a small distribution map should also be reported.

Format of the field identification guide

104. The participants discussed the advantages and disadvantages of producing a field product in different sizes. The discussion focused on four possible formats: a standard A4 page size (21.0 × 29.7 cm); a smaller B5 version (17.6 × 25.0 cm); a pocket format (14.0 × 14.0 cm) and a large poster.
105. During the discussion, another format was proposed – a small poster of the size of an A4 sheet focusing on groups of species particularly difficult to identify (see above the discussion on the genera *Etmopterus* and *Centrophorus*).

106. Based on the discussion regarding the working conditions for the different fisheries operating in the Indian Ocean, it was stressed that different types of working environments should require different types of products.

107. The bottom-trawl fisheries are characterized by having large and protected working environments where the catch is processed and the identification of chondrichthyan species takes place (factories). In this case, it was pointed out that there would be no need to have a small product and the advantages of the larger products would be significant.

108. On the other hand, the longline fisheries are characterized by having completely different working conditions, so that the species identification often occurs on deck in situations in which a worker may be exposed to bad weather in the form of rain and wind. A smaller guide would be more appropriate in this case.

109. The portability of the guide would be a major advantage also in cases where the collection of data occurs at landing points.

110. Afterwards, the pros and cons of the different formats were addressed:

111. The participants noted that the advantages of a large guide would be: (i) the possibility of displaying large illustrations and photographs; (ii) more space for information and photographs; (iii) facility to leaf through, especially if fishery workers are wearing gloves. The disadvantages would be related to its size, heaviness and manageability, which would allow the user only to employ it in an indoor working environment.

112. The idea of an intermediate-sized guide was rejected as it was considered not sufficiently practical in terms of portability and the chance to include a number of important pieces of information.

113. The pocket format was considered useful just for being an easy to carry tool but had all the negative points related to its size (constraints in the size of illustrations and photographs and limited space for information).

114. Finally, posters were considered useful for displaying higher-rank keys (keys to the orders or families) and, more common genera, and they could also focus on endangered or threatened species for informational and educational purposes. Although posters have the advantage of providing plenty of space for large illustrations and photographs, they cannot easily include diagnostic features and a sufficient number of species. Furthermore, it was noted that it is not always possible to find a place to hang them up.

115. The smaller poster was considered a good compromise for selected species groups (e.g. the skates of Alaska) and those that have slight differences in some of their characteristics (e.g. *Etmopterus* flank markings). These could also be used as quick guides and should also be electronic.

116. A number of participants proposed that two or three products be produced for use in different situations and for different purposes. In addition to the more comprehensive catalogue, which could be consulted on the bridge-deck, it was considered useful to have both a quick reference guide including species that are already known to users and that can allow them to rapidly confirm the presumptive species (pocket guide or small poster), and a more structured guide, one that includes keys to reach the species level and more information and photographs, that can be used when the identification of the species is difficult.

Training programmes

117. One of the most important tasks required in order to upgrade the quality of fishery data by species is, together with the production of effective identification tools, the training of personnel responsible for the collection of such data. Diagnostic features of families, genera and species, even if carefully explained and well illustrated, are not always easy to verify by an untrained worker. In cases where highly technical features represent the only means of separating closely related species, the field worker should either be trained to recognize them or be persuaded to leave this task to a specialist.[2]

118. In this direction, a proposal for the development of a training programme was made. The participants agreed that as the first field guide was going to be utilized mainly on board bottom trawlers operating in the southern Indian Ocean, with their home port in Mauritius, it would be ideal to start a training programme for both the fishery observers working on board the fishing vessels and the scientists working at the Albion Fisheries Research Centre in Mauritius. In this case, the specimens that could not be identified on board could be brought directly to the research institute for a more thorough examination.

Conclusions and recommendations

119. As a result, the participants agreed that a set of identification guides was needed for the Indian Ocean region and that these should be developed with different levels of priority:

1. A more-detailed catalogue in printed and electronic version to be used on the bridge deck – **higher priority.**
2. Field products/guides including different species to be included according to the different fisheries:
    a. onboard guide for deep-sea trawlers (A4 format waterproof) – **higher priority;**
    b. pocket guides for use on deck of longliners or at landing sites – **lower priority.**
3. Posters:
    a. for informational and/or educational purposes for crew – annotated posters with a select group of common species – **lower priority;**
    b. small posters (A4 format) for select species groups (e.g. the skates of Alaska) and those that have slight differences or characteristics (e.g. *Etmopterus* flank markings) or to include all species commonly caught once more information is available – **higher priority.**

[2] Fischer, W. 1989. The significance of FAO's biosystematics program in the enhancement of world fisheries. *Reviews in Aquatic Sciences*, 1(4): 683–692.

4. Electronic database and/or software:

    a. a system to store species fact sheets (e.g. Fact Sheets Fusion or iMarine) in order to give the opportunity to add new species to the identification guides – **higher priority;**

    b. non-hierarchical keys to facilitate identification (e.g. Lucid software) could be useful where a computer is available, not for initial use, but to be developed at a later stage – **lower priority.**

The workshop agreed on a number of points including: (i) the species to be included in the field guide; (ii) the information to be included in such a guide; and (iii) the development of a training programme aimed at fishery observers and scientists.

APPENDIX 1

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APPENDIX 2

Agenda

Day 1: Wednesday 16 January 2013

09:00 **Plenary:**

- Opening session and designation of note takers for the different sessions
- Introductions of participants
- Overview of workshop objectives and expected outputs

10:30 *Refreshment break*

11:00 **Plenary:**

- Presentation of the FAO Activities on Deep-sea Fisheries in the High Seas and the FishFinder Programme
- Summary of the results of the Dgroups discussions
- Questions

12:30 *Lunch*

14:00 **Plenary:**

- Presentation of the background information available on deep-sea elasmobranchs diversity in the Indian Ocean
- Moderated discussion

15:30 *Refreshment break*

16:00 **Plenary:**

- Identification of users and requirements. Description of fishers and fishery observers working environment, their involvement in data collection and level of expertise.
- Moderated discussion

17:30/18:00 *Day closure*

Day 2: Thursday 17 January 2013

09:00 **Plenary:**

- Sharing of experiences on the use of different field products for the identification of cartilaginous fishes and comparative overview of the ones commonly used by participants.
- Moderated discussion

10:30 *Refreshment break*

11:00 **Plenary**

- Type and format of the Field products (Size, type of depiction of the species)
- Moderated discussion

12:30 *Lunch*

14:00 **Plenary:**

- Selection of the species to be included in a field identification product for the Indian Ocean
- Moderated discussion (Selection criteria: common and rare species, vulnerability; commercial importance. For each family and genera: assessment of the level of expertise required to identify a species; risks of misidentification with similar species)
- Compilation of the list of deep-sea species

15:30 *Refreshment break*

16:00 **Plenary:**

- Information to be included (Nomenclature, how to highlight the species distinctive characters, diagnostic features, similar species, distribution map, habitat, fishery etc.)
- Moderated discussion

17:30 *Day closure*

Day 3: Friday 18 January 2013

09:00 **Plenary:**

- Inclusion of diagnostic taxonomic keys. Keys to the families, genera and species. Case by case assessment of the diagnostic features complexity level in relation to users' expertise and capabilities
- Moderated discussion

10:30 *Refreshment break*

11:30 **Plenary:**

Continued

- Summary and review of the key conclusions and recommendations for the develop

12:30 *Lunch*

14:00 **Plenary:**

- Planning of training activities for the users of the Field Identification Products

15:30 *Refreshment break*

16:00 **Plenary:**

Continued

- Closing of the workshop

APPENDIX 3

List of deep-sea shark species known to occur in the Indian Ocean

HEXANCHIFORMES			
CHLAMYDOSELACHIDAE			
Chlamydoselachus africana	**Southern African frilled shark**	**WIO**	
Chlamydoselachus anguineus	**Frilled shark**	**WIO?**	**EIO**
HEXANCHIDAE			
Heptranchias perlo	**Sharpnose sevengill shark**	**WIO**	**EIO**
Hexanchus griseus	**Bluntnose sixgill shark**	**WIO**	**EIO**
Hexanchus nakamurai	**Bigeyed sixgill shark**	**WIO**	**EIO**
SQUALIFORMES			
ECHINORHINIDAE			
Echinorhinus brucus	**Bramble shark**	**WIO**	**EIO**
Echinorhinus cookei	**Prickly shark**		**EIO**
OXYNOTIDAE			
Oxynotus bruniensis	**Prickly roughshark**		**EIO**
Oxynotus centrina	**Angular roughshark**	**WIO?**	
SQUALIDAE			
Cirrhigaleus asper	**Roughskin dogfish**	**WIO**	
Cirrhigaleus australis	**Southern Mandarin dogfish**		**EIO**
Squalus altipinnis	**Western highfin spurdog**		**EIO**
Squalus blainville	**Longnose dogfish**	**Likely a different species**	
Squalus chloroculus	**Greeneye spurdog**		**EIO**
Squalus crassispinus	**Fatspine spurdog**		**EIO**
Squalus edmundsi	**Edmunds' spurdog**		**EIO**
Squalus hemipinnis	**Indonesian shortsnout spurdog**		**EIO**
Squalus lalannei	**Seychelles spurdog**	**WIO**	
Squalus megalops	**Shortnose dogfish**	**WIO?**	**EIO**
Squalus mitsukurii	**Shortspine dogfish**	**WIO?**	
Squalus montalbani	**Philippine spurdog**		**EIO**
Squalus nasutus	**Western longnose spurdog**		**EIO**
CENTROPHORIDAE			
Centrophorus atromarginatus	**Dwarf gulper shark**	**WIO**	**EIO?**
Centrophorus granulosus	**Gulper shark**	**WIO?**	**EIO?**
Centrophorus harrissoni	**Dumb gulper shark**	**WIO?**	
Centrophorus isodon	**Blackfin gulper shark**	**WIO**	**EIO?**
Centrophorus lusitanicus	**Lowfin gulper shark**	**WIO**	
Centrophorus moluccensis	**Smallfin gulper shark**	**WIO**	**EIO**
Centrophorus seychellorum	**Seychelles gulper shark**	**WIO**	
Centrophorus squamosus	**Leafscale gulper shark**	**WIO**	**EIO**
Centrophorus westraliensis	**Western gulper shark**		**EIO**
Centrophorus zeehaani	**Southern dogfish**		**EIO**

Deania calcea	**Birdbeaked dogfish**	**WIO**	**EIO**
Deania profundorum	**Arrowhead dogfish**	**WIO**	
Deania quadrispinosum	**Longsnout dogfish**	**WIO**	**EIO**
ETMOPTERIDAE			
Centroscyllium kamoharai	**Bareskin dogfish**		**EIO**
Centroscyllium ornatum	**Ornate dogfish**	**WIO**	**EIO**
Etmopterus baxteri	**New Zealand lanternshark**	**WIO?**	**EIO?**
Etmopterus bigelowi	**Blurred smooth-dogfish**	**WIO**	**EIO**
Etmopterus brachyurus	**Shorttail lanternshark**		**EIO**
Etmopterus compagnoi	**Brown lanternshark**	**WIO**	
Etmopterus evansi	**Blackmouth lanternshark**		**EIO**
Etmopterus fusus	**Pygmy lanternshark**		**EIO**
Etmopterus gracilispinis	**Broadbanded lanternshark**	**WIO?**	
Etmopterus granulosus	**Southern lanternshark**	**WIO**	**EIO?**
Etmopterus lucifer	**Blackbelly lanternshark**		**EIO?**
Etmopterus molleri	**Slendertail lanternshark**		**EIO**
Etmopterus pusillus	**Smooth lanternshark**	**WIO**	**EIO**
Etmopterus sculptus	**Sculpted lanternshark**	**WIO**	
Etmopterus sentosus	**Thorny lanternshark**	**WIO**	
Etmopterus unicolor	**Brown lanternshark**		**EIO**
Etmopterus viator	**Traveller lanternshark**	**WIO**	
SOMNIOSIDAE			
Centroscymnus coelolepis	**Portuguese shark**	**WIO**	**EIO**
Centroscymnus owstonii	**Roughskin dogfish**	**WIO**	**EIO**
Centroselachus crepidater	**Longnose velvet dogfish**	**WIO**	**EIO**
Proscymnodon plunketi	**Plunket dogfish**	**WIO**	**EIO**
Scymnodalatias albicauda	**Whitefin dogfish**	**WIO?**	**EIO**
Scymnodalatias sherwoodi	**Sherwood dogfish**		**EIO**
Somniosus antarcticus	**Frog shark**	**WIO**	**EIO**
Zameus squamulosus	**Velvet dogfish**	**WIO**	**EIO**
DALATIIDAE			
Dalatias licha	**Kitefin shark**	**WIO**	**EIO**
Euprotomicrus bispinatus	**Pygmy shark**	**WIO**	**EIO**
Heteroscymnoides marleyi	**Longnose pygmy shark**	**WIO**	
Isistius brasiliensis	**Cookiecutter shark**	**WIO**	**EIO**
Squaliolus aliae	**Smalleye pygmy shark**		**EIO**
Squaliolus laticaudus	**Spined pygmy shark**	**WIO**	
PRISTIOPHORIFORMES			
PRISTIOPHORIDAE			
Pliotrema warreni	**Sixgill sawshark**	**WIO**	
Pristiophorus nancyae	**African dwarf sawshark**	**WIO**	
SQUATINIFORMES			
SQUATINIDAE			

Squatina africana	**African angelshark**	**WIO**	
Squatina pseudocellata	**Western angel shark**		**EIO**
Squatina tergocellata	**Ornate angelshark**		**EIO**
HETERODONTIFORMES			
HETERODONTIDAE			
Heterodontus ramalheira	**Whitespotted bullhead shark**	**WIO**	
ORECTOLOBIFORMES			
PARASCYLLIIDAE			
Parascyllium sparsimaculatum	**Sparsely spotted carpetshark**	**EIO**	
LAMNIFORMES			
MITSUKURINIDAE			
Mitsukurina owstoni	**Goblin shark**	**WIO**	**EIO**
ODONTASPIDIDAE			
Odontaspis ferox	**Smalltooth sand tiger shark**	**WIO**	**EIO**
Odontaspis noronhai	**Bigeye sand tiger shark**	**WIO?**	
PSEUDOCARCHARIIDAE			
Pseudocarcharias kamoharai	**Crocodile shark**	**WIO**	**EIO**
ALOPIIDAE			
Alopias superciliosus	**Bigeye thresher shark**	**WIO**	**EIO**
CETORHINIDAE			
Cetorhinus maximus	**Basking shark**	**WIO**	**EIO**
CARCHARHINIFORMES			
SCYLIORHINIDAE			
Apristurus ampliceps	**Roughskin catshark**		**EIO**
Apristurus australis	**Pinocchio catshark**		**EIO**
Apristurus bucephalus	**Bighead catshark**		**EIO**
Apristurus indicus	**Smallbelly catshark**	**WIO**	
Apristurus investigatoris	**Broadnose catshark**		**EIO**
Apristurus longicephalus	**Longhead catshark**	**WIO**	**EIO**
Apristurus melanoasper	**Fleshynose catshark**	**WIO?**	**EIO?**
Apristurus microps	**Smalleye catshark**	**WIO**	
Apristurus pinguis	**Fat catshark**		**EIO**
Apristurus platyrhynchus	**Spatulasnout catshark**		**EIO**
Apristurus saldanha	**Saldanha catshark**	**WIO**	
Apristurus sinensis	**South China catshark**		**EIO**
Bythaelurus alcockii	**Arabian catshark**	**?**	
Bythaelurus clevai	**Madagascar catshark**	**WIO**	
Bythaelurus hispidus	**Bristly catshark**	**WIO**	**EIO**
Bythaelurus incanus	**Dusky catshark**		**EIO**
Bythaelurus lutarius	**Mud catshark**	**WIO**	
Cephaloscyllium albipinnum	**Whitefin swellshark**		**EIO**
Cephaloscyllium cooki	**Cook's swellshark**		**EIO**
Cephaloscyllium hiscosellum	**Australian reticulate swellshark**	**EIO**	

Cephaloscyllium silasi	**Indian swellshark**	**WIO**	
Cephaloscyllium speccum	**Speckled swellshark**		**EIO**
Cephaloscyllium sufflans	**Balloon shark**	**WIO**	
Figaro boardmani	**Australian sawtail catshark**		**EIO**
Galeus gracilis	**Slender sawtail catshark**		**EIO**
Holohalaelurus favus	**East African spotted catshark,**	**WIO**	
Holohalaelurus grennian	**Grinning izak**	**WIO**	
Holohalaelurus melanostigma	**Crying izak catshark**	**WIO**	
Holohalaelurus punctatus	**African spotted catshark**	**WIO**	
Holohalaelurus regani	**Izak catshark**	**WIO**	
Scyliorhinus capensis	**Yellowspotted catshark**	**WIO**	
Scyliorhinus comoroensis	**Comoro catshark**	**WIO**	
PROSCYLLIIDAE			
Ctnenacis fehlmanni	**Harlequin catshark**	**WIO**	
Eridacnis radcliffei	**Pygmy ribbontail catshark**	**WIO**	**EIO**
Eridacnis sinuans	**African ribbontail catshark**	**WIO**	
PSEUDOTRIAKIDAE			
Planonasus parini	**Dwarf False catshark**	**WIO**	
Pseudotriakis microdon	**False catshark**	**WIO**	**EIO**
TRIAKIDAE			
Iago garricki	**Bigeyed houndshark**		**EIO**
Iago omanensis	**Longnose houndshark**	**WIO**	
Mustelus stevensi	**Western spotted gummy shark**		**EIO**
CARCHARHINIDAE			
Carcharhinus altimus	**Bignose shark**	**WIO**	**EIO**

APPENDIX 4

List of deep-sea batoid species known to occur in the Indian Ocean

TORPEDINIDFORMES			
NARCINIDAE			
Benthobatis moresbyi	Moresby's blind ray	**WIO**	
Narcine lasti	Western numbfish		**EIO**
Narcine tasmaniensis	Tasmanian numbfish		**EIO**
Heteronarce garmani	Natal electric ray	**WIO**	
Heteronarce molli	Soft electric ray	**WIO**	
Heteronarce prabhui	Quilon electric ray	**WIO**	
TORPEDINIDAE			
Tetronarce macneilli	Short-tail torpedo ray		**EIO**
Tetronarce tokionis	Longtail torpedo ray		**EIO**
RHINOBATIFORMES			
RHINOBATIDAE			
Acroteriobatus variegatus	Stripenose guitarfish		**EIO**
RAJIFORMES			
ARHYNCHOBATIDAE			
Bathyraja ishiharai	Abyssal skate		**EIO**
Bathyraja richardsoni	Richardson's skate		**EIO**
Bathyraja smithii	African softnose skate	**WIO**	
Bathyraja tunae	Cristina's skate	**WIO**	
Insentiraja subtilispinosa	Western looseskin skate		**EIO**
Notoraja azurea	Blue skate		**EIO**
Notoraja hirticauda	Ghost skate		**EIO**
Notoraja lira	Broken ridge skate		**EIO**
Notoraja sticta	Blotched skate		**EIO**
Pavoraja alleni	Allen's skate		**EIO**
Pavoraja arenaria	Sandy skate		**EIO**
Pavoraja nitida	Peacock skate		**EIO**
RAJIDAE			
Amblyraja hyperborea	Boreal skate		**EIO**
Amblyraja reversa	Reversed skate	**WIO**	
Dipturus acrobelus	Deepwater skate		**EIO**
Dipturus campbelli	Blackspot skate	**WIO**	
Dipturus canutus	Grey skate		**EIO**
Dipturus crosnieri	Madagascar skate	**WIO**	
Dipturus doutrei	Javelin skate	**WIO**	
Dipturus gudgeri	Bight skate		**EIO**
Dipturus healdi	Heald's skate		**EIO**
Dipturus johannisdavesi	Travancore skate	**WIO**	
Dipturus lanceorostratus	Rattail skate	**WIO**	
Dipturus oculus	Ocellate skate		**EIO**

Dipturus pullopunctatus	Slime skate	**WIO**	
Dipturus springeri	Roughbelly skate	**WIO**	
Dipturus stenorhynchus	Prownose skate	**WIO**	
Dipturus wengi	Weng's skate		**EIO**
Fenestraja maceachrani	Madagascar pygmy skate	**WIO**	
Fenestraja mamillidens	Prickly skate	**WIO**	
Leucoraja compagnoi	Tigertail skate	**WIO**	
Leucoraja pristispina	Sawback skate		**EIO**
Leucoraja wallacei	Yellowspot skate	**WIO**	
Malacoraja spinacidermis	Prickled skate	**WIO**	
Neoraja stehmanni	South African pygmy skate	**WIO**	
Okamejei arafurensis	Banda skate		**EIO**
Okamejei heemstrai	Narrow skate	**WIO**	
Okamejei leptoura	Thintail skate		**EIO**
Rajella barnardi	Bigthorn skate	**WIO**	
Rajella caudaspinosa	Munchkin skate	**WIO**	
Rajella challengeri	Challenger skate		**EIO**
Rajella dissimilis	Ghost skate	**WIO**	
Rajella leopardus	Leopard skate	**WIO**	
Rajella ravidula	Smoothback skate	**WIO**	
Anacanthobatis marmoratus	Spotted legskate	**WIO**	
Anacanthobatis ori	Black legskate	**WIO**	
Cruriraja andamanica	Andaman legskate	**WIO**	**EIO**
Cruriraja hulleyi	Roughnose legskate	**WIO**	
Cruriraja parcomaculata	Roughnose legskate	**WIO**	
Sinobatis bulbicauda	Western legskate		**EIO**
Sinobatis caerulea	Indigo legskate		**EIO**
MYLIOBATIFORMES			
PLESIOBATIDAE			
Plesiobatis daviesi	Giant stingaree	**WIO**	**EIO**
UROLOPHIDAE			
Urolophus expansus	Wide stingaree		**EIO**
HEXATRYGONIDAE			
Hexatrygon bickelli	Sixgill stingray	**WIO**	**EIO**

APPENDIX 5

List of deep-sea chimaera species known to occur in the Indian Ocean

CHIMAERIFORMES			
CHIMAERIDAE			
Chimaera argiloba	Whitefin chimaera		**EIO**
Chimaera fulva	Southern chimaera		**EIO**
Chimaera lignaria	Carpenter's chimaera		**EIO**
Chimaera macrospina	Longspine chimaera		**EIO**
Chimaera notafricana	Cape chimaera	**WIO**	
Hydrolagus africanus	African rabbitfish	**WIO**	
Hydrolagus homonycteris	Black ghostshark		**EIO**
Hydrolagus lemures	Blackfin ghostshark		**EIO**
Hydrolagus marmoratus	Marbled ghostshark		**EIO**
Hydrolagus ogilbyi	Ogilby's ghostshark		**EIO**
Hydrolagus trolli	Pointy-nosed blue chimaera	**WIO?**	
RHINOCHIMAERIDAE			
Harriotta haeckeli	Smallspine chimaera	**WIO**	**EIO**
Harriotta raleighana	Narrownose chimaera	**WIO**	**EIO**
Neoharriotta pinnata	Sicklefin chimaera	**WIO**	
Neoharriotta pumila	Dwarf chimaera	**WIO**	
Rhinochimaera africana	Paddlenose chimaera	**WIO**	**EIO**
Rhinochimaera atlantica	Atlantic longnose chimaera	**WIO**	
Rhinochimaera pacifica	Pacific longnose chimaera		**EIO**

APPENDIX 6

List of deep-sea shark species to be included in the field guide with a full species account

SQUALIFORMES			
SQUALIDAE			
Cirrhigaleus asper	Roughskin dogfish	**WIO**	
Squalus megalops	Shortnose dogfish	**WIO?**	**EIO**
Squalus mitsukurii	Shortspine dogfish	**WIO?**	
CENTROPHORIDAE			
Centrophorus granulosus	Gulper shark	**WIO?**	**EIO?**
Centrophorus squamosus	Leafscale gulper shark	**WIO**	**EIO**
Deania calcea	Birdbeaked dogfish	**WIO**	**EIO**
ETMOPTERIDAE			
Etmopterus granulosus	Southern lanternshark	**WIO**	**EIO?**
Etmopterus pusillus	Smooth lanternshark	**WIO**	**EIO**
Etmopterus sculptus	Sculpted lanternshark	**WIO**	
SOMNIOSIDAE			
Centroscymnus coelolepis	Portuguese shark	**WIO**	**EIO**
Centroscymnus owstonii	Roughskin dogfish	**WIO**	**EIO**
Centroselachus crepidater	Longnose velvet dogfish	**WIO**	**EIO**
Proscymnodon plunketi	Plunket dogfish	**WIO**	**EIO**
Scymnodalatias albicauda	Whitefin dogfish	**WIO?**	**EIO**
Somniosus antarcticus	Frog shark	**WIO**	**EIO**
Zameus squamulosus	Velvet dogfish	**WIO**	**EIO**
DALATIIDAE			
Dalatias licha	Kitefin shark	**WIO**	**EIO**
Euprotomicrus bispinatus	Pygmy shark	**WIO**	**EIO**
Heteroscymnoides marleyi	Longnose pygmy shark	**WIO**	
Isistius brasiliensis	Cookiecutter shark	**WIO**	**EIO**
Squaliolus aliae	Smalleye pygmy shark		**EIO**
CARCHARHINIFORMES			
SCYLIORHINIDAE			
Apristurus longicephalus	Longhead catshark	**WIO**	**EIO**
Apristurus melanoasper	Fleshynose catshark	**WIO?**	**EIO?**
Apristurus microps	Smalleye catshark	**WIO**	
Bythaelurus clevai	Madagascar catshark	**WIO**	
Bythaelurus lutarius	Mud catshark	**WIO**	
Cephaloscyllium sufflans	Balloon shark	**WIO**	

Holohalaelurus favus	East African spotted catshark	**WIO**	
Holohalaelurus grennian	Grinning izak	**WIO**	
Holohalaelurus melanostigma	Crying izak catshark	**WIO**	
Holohalaelurus punctatus	African spotted catshark	**WIO**	
Scyliorhinus comoroensis	Comoro catshark	**WIO**	
PROSCYLLIIDAE			
Ctenacis fehlmanni	Harlequin catshark	**WIO**	
Eridacnis radcliffei	Pygmy ribbontail catshark	**WIO**	**EIO**
PSEUDOTRIAKIDAE			
Pseudotriakis microdon	False catshark	**WIO**	**EIO**
CARCHARHINIDAE			
Carcharhinus altimus	Bignose shark	**WIO**	**EIO**

APPENDIX 7

List of deep-sea shark species to be included in the field guide with a simplified species account

HEXANCHIFORMES			
CHLAMYDOSELACHIDAE			
Chlamydoselachus anguineus	Frilled shark	**WIO?**	**EIO**
HEXANCHIDAE			
Heptranchias perlo	Sharpnose sevengill shark	**WIO**	**EIO**
Hexanchus griseus	Bluntnose sixgill shark	**WIO**	**EIO**
Hexanchus nakamurai	Bigeyed sixgill shark	**WIO**	**EIO**
SQUALIFORMES			
ECHINORHINIDAE			
Echinorhinus brucus	Bramble shark	**WIO**	**EIO**
Echinorhinus cookei	Prickly shark		**EIO**
OXYNOTIDAE			
Oxynotus bruniensis	Prickly roughshark		**EIO**
Oxynotus centrina	Angular roughshark	**WIO?**	
PRISTIOPHORIFORMES			
PRISTIOPHORIDAE			
Pliotrema warreni	Sixgill sawshark	**WIO**	
Pristiophorus nancyae	African dwarf sawshark	**WIO**	
SQUATINIFORMES			
SQUATINIDAE			
Squatina africana	African angelshark	**WIO**	
HETERODONTIFORMES			
HETERODONTIDAE			
Heterodontus ramalheira	Whitespotted bullhead shark	**WIO**	
LAMNIFORMES			
MITSUKURINIDAE			
Mitsukurina owstoni	Goblin shark	**WIO**	**EIO**
ODONTASPIDIDAE			
Odontaspis ferox	Smalltooth sand tiger shark	**WIO**	**EIO**
Odontaspis noronhai	Bigeye sand tiger shark	**WIO?**	
PSEUDOCARCHARIIDAE			
Pseudocarcharias kamoharai	Crocodile shark	**WIO**	**EIO**
ALOPIIDAE			
Alopias superciliosus	Bigeye thresher shark	**WIO**	**EIO**

APPENDIX 8

Summary table of the information that each species account should provide

Key pieces of information	Description (if available)
Nomenclature	• Species name (including species authority) • FAO names • Common name (En, Fr, Sp, Jp, Kor, Port)
Codes	• FAO 3-alpha codes for species and higher level, where available
Taxonomic systematics	• Order (colour coding for each Order, which should also be visible when closed) • Family
Line drawings and/or colour photographs (both live and on deck)	• Main illustrations as colour drawings • Photographs of entire specimen and/or details • Details in line drawings or photographs (where colour drawing not available)
Distinguishing features	• Description of main features possibly with captions and arrows • Key to the Orders and Families – modified to be user-friendly (more illustrations, less text) • First representative of the Family with information about all members of the Family • Maximum known size and when possible average size
Formatting	• Colour attribution visible when guide is closed • Size: A4
Distribution	• Map divided in quadrants at the beginning of the Guide and information for each species as NWIO, NEIO, SWIO, SEIO • Note when a species is rare or common caught by IO quadrant
Depth range	• Common known depth range, e.g. 300 – 1 200 m
Remarks	• Where possible, short interesting facts, e.g. information about reproduction, life-history characteristics including age, growth, etc. • Habitat preferences, e.g. at broad scale – slope, seamounts • Key biological features, e.g. size, age/growth, reproduction, maturity, diet • Elements to report, e.g. if elasmobranch pups expelled when on deck
Classification of occurrence	• Where available • Note when specimens are needed
Similar species	• Description of similar species to differentiate them from others • All similar species on the front page if possible and other information, such as Habitat, Remarks and Distribution on the back • (depicted in photographs or if not available line drawing)

The regional workshop on the "Development of Species Identification Guides for Deep-sea Cartilaginous Fishes of the Indian Ocean" was held in Flic en Flac, Mauritius, from 16 to 18 January 2013. It was attended by 15 participants from a wide range of countries and fields of expertise, including taxonomy, bioecology of cartilaginous fishes and the fishing industry. The general objective of the workshop was to discuss, share experiences and finally draft recommendations for the development of field products aimed at facilitating the identification of Indian Ocean deep-sea cartilaginous fishes. The key goals were: to draft the final list of species to be included in the field product (or products); to define the format of the field product and how the species should be depicted; to agree on which information for each species should be included; to define the best way to help the user avoid confusing the species with similar ones; and finally to draft a proposal for the training of fishers and fishery observers to be carried out on board fishing vessels operating in the Indian Ocean.

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