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Accord relatif aux Pêches dans le Sud de l'Océan Indien

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Report of the Workshop on Deepwater Sharks in the Southern Indian Ocean Fisheries Agreement (SIOFA) Area

Convener of the WSDWS-2023

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Abstract

This paper provides to the SC8, for its further consideration, the adopted report of the Workshop on Deepwater Sharks in the Southern Indian Ocean Fisheries Agreement (SIOFA) Area, hereafter called WSDWS-2023.
The meeting was held at the premises of the Spanish Institute of Oceanography, Santa Cruz de Tenerife, Spain, in a hybrid format, 20–21 March 2023.
The main recommendations arising from the Workshop have been highlighted in grey within the text, and are to be furthered considered by the SIOFA SC.

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Report of the Workshop on Deepwater Sharks in the Southern Indian Ocean Fisheries Agreement (SIOFA) Area

Spanish Institute of Oceanography, Santa Cruz de Tenerife, Spain / Hybrid Format

20 – 21 March 2023

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Agenda item 1 – Opening of the workshop on deepwater sharks in the SIOFA Area

1. The Workshop on Deepwater Sharks in the SIOFA Area was convened by the Vice-Chair of the Scientific Committee (SC), Dr Sebastián Rodríguez Alfaro.
2. The Executive Secretary, Mr Thierry Clot, made an opening statement. He began by thanking the European Union (EU) for funding the workshop and the upcoming SC meeting. He then welcomed the participants to the workshop, which provides an excellent opportunity for discussing the latest developments and challenges in the conservation of deepwater sharks in the SIOFA fisheries, and expressed his wish for a productive meeting.
3. The Convener noted that the conservation of deepwater sharks in the SIOFA Area has been a recurrent issue in the meetings of the SC and that it is important to make progress on this issue, including work towards conducting an assessment of deepwater shark bycatch, species characterisation, potential measures to reduce bycatch further, and a review of the species of concern. He expressed his hope that this workshop would serve as a platform for constructive discussions, exchange of ideas, and sharing of best practices.
4. The SC Chair, Mr Alistair Dunn, said he looked forward to fruitful discussions and to hearing the outcomes of the workshop, which would be taken up at the SC meeting. He also thanked the Oceanographic Centre of the Canary Islands, Spanish Institute of Oceanography for hosting the workshop and the EU for providing funding for it.
5. The list of participants is attached (**Annex A**).
6. In this report, paragraphs with key recommendations and advice to the MoP and SC have been highlighted in grey.

Agenda item 2 – Administrative arrangements

Agenda item 2.1. Adoption of the workshop objectives and agenda

7. The workshop objectives and agenda (**Annex B**) were adopted as per SC Circular 2023-06.
8. The objectives of the workshop are as follows:
    i. An assessment of the stock status of deepwater shark species caught in the SIOFA Area
    ii. Recommendations on deepwater sharks management measures, particularly on shark bycatch mitigation measures
    iii. A review of the list of species of concern in CMM 2022/12 (Sharks)
    iv. An identification guide to assist the recording of deepwater shark species by the vessel crew and scientific observers
9. The list of documents is attached (**Annex C**).

Agenda item 2.2. Appointment of rapporteurs and facilitators

10. Mr Alexander Meyer (Urban Connections, Tokyo) was appointed to act as rapporteur, with assistance from delegates.

11. The Workshop noted and welcomed the attendance of Dr Teresa Moura (Portuguese Institute for Sea and Atmosphere (IPMA)) and Mr Paul J. Clerkin (Virginia Institute of Marine Science) at the Workshop as invited experts.

Agenda item 3 – Assessment of the stock status of the deepwater shark species involved in SIOFA fisheries

12. The Convener called the Workshop's attention to WSDWS-2023-09 as a useful background document that provided a summary of previous discussions and recommendations concerning deepwater sharks in the reports of the SC and the Meeting of the Parties (MoP).

Agenda item 3.1. Review of available data

13. The Convener summarised the available shark data. He explained that the Secretariat issued a data call for the workshop covering any data besides data previously submitted as part of the annual data submission processes. No additional data were submitted by CCPs. Therefore, the available data are the data in the CatchEffort database and Observer database with data from 2000 to 2021 as submitted by SIOFA CCPs under Conservation and Management Measure (CMM) 2022-02 (Data Standards). Specifically, these consist of:

    i. Aggregated catch (2000–2017): date of fishing event(s) (YY-MM), spatial location (1 degree resolution), target species, fishing gear type, shark species, weight of catch;

    ii. Haul by haul catch (2000–2021): date of fishing event (YY-MM-DD), spatial location (high resolution), target species, fishing gear type, shark species, weight of catch;

    iii. Observer database (2008; 2012–2021): target species, fishing gear type, length measurements, weight measurements, sex determinations (M or F), maturity determinations (from 1 to 9).

14. The Data Officer, Mr Pierre Peries, presented paper WSDWS-2023-11, which explained the work done to prepare a dataset of public catch and effort data on deepwater sharks and to analyse the confidentiality of these data. Considering CMM 2016/03 (Data Confidentiality), most of the data held by the Secretariat could not be released because of the overlapping restrictions preventing the showing of catch and effort data on a 5° spatial resolution, on a monthly basis and originating from only one vessel at the same time. Longer temporal and larger spatial aggregations up to the whole SIOFA area resulted in data to be also mostly confidential. As a result, datasets of public catch and effort data are not operational for the objectives of the Workshop.

15. The Workshop noted that the SC will discuss data access and standards at its upcoming meeting and recommended that, as part of those discussions, the SC consider how to address limitations on accessing the necessary data at the necessary resolution for conducting scientific analyses.

16. The Workshop noted *Better data collection in shark fisheries – Learning from practice* (United Nations Food and Agriculture Organization (FAO), 2021, FAO Fisheries and Aquaculture Circular No. 1227, Rome), and its conclusions for improving the feasibility of delivering surveys, which include better identification, especially of lookalike species, categorisation of deepwater sharks by ecological and fisheries features, involvement of shark experts across all survey processes, self-critical restructuring and revision of surveys as appropriate, and incorporation of the latest technological developments.

Agenda item 3.2. Approaches to determine the stock status of deepwater sharks

17. The EU presented WSDWS-2023-07, which provided a tagging and sampling protocol for deepwater sharks. The EU developed a tagging and sampling protocol to accomplish the requirements of the EU funded project "Improving scientific advice on deep-water sharks in the SIOFA Area" aiming to improve the knowledge of deep-water sharks caught in SIOFA fisheries. The Spanish longline fishery in SIOFA targets mainly benthopelagic and demersal species such as toothfish (*Dissostichus* spp.) and wreckfish (*Polyprion americanus*). However, deepwater sharks are frequently caught as bycatch, namely Portuguese dogfish (*Centroscymnus coelolepis*), birdbeak dogfish (*Deania calcea*), Kitefin sharks (*Dalatias licha*) and gulper sharks (*Centrophorus* spp.), among others. Most of these species are included in CMM 2022/12 (Sharks) as species at "high risk" and "of concern" and it has therefore been deemed necessary to obtain all available information for the provision of robust scientific advice. This clear and simple protocol is intended to help collect data from these species and will be implemented in the near future.

18. The Workshop noted that it may be useful in future to invite experts from the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) to assess the SIOFA deepwater skates tagging efforts and share their experience and expertise.

19. The EU presented WSDWS-2023-05, which summarised results from tagging activities conducted on deepwater sharks, including the tags used, fishing gears, species survival capacity, handling on board, and the horizontal and vertical movements of *Centrophorus squamosus*. The EU has conducted tagging surveys in the north of Spain (Cantabrian Sea, Northeast Atlantic) at depths between 900 and 1100 m during 2012-2022. Surveys were carried out from a commercial longline vessel that was used to catch deepwater sharks in this area in the 1990s. Conventional tags and electronic archival tags (Mini PATs) were used. A total of 890 specimens were tagged corresponding to 15 species. The target species were *Centrophorus squamosus*, *Centrophorus granulosus*, *Centroscymus coelolepis*, *Deania calceus* and *D. profundorum*. Additionally, other sharks such as *Galeus melastomus*, *Hexanchus griseus*, *Etmopterus spinax* or skates *Leucoraja circularis*, *Dipturus* spp. found in the study area were also tagged.

20. Conventional and electronic tagging data have revealed that *Centrophorus squamosus* can make long migrations. Tag release points revealed that it moved both to the west (Galician waters) and to the north (Porcupine Bank) from the tagging area, suggesting that it follows well-defined preferred pathways rather than moving randomly. The inferred trajectories indicated that this species alternates periods constrained to specific geographical regions with quick and prompt movements covering large distances. Different vertical movements were observed among individuals, with no consistent pattern. *Centrophorus squamosus* is found at a mean depth of around 940 m but makes large vertical displacements along the water column ranging from 500 to 1600 m depth. Results suggest that this species can swim either following the slope contour on the bottom or in midwater.

21. The tagging activities showed that it is possible to tag deepwater sharks, but it is very challenging. Furthermore, all deepwater shark species can be tagged but not all have the same chance of survival. Survival depends on the biology of each species and the fishing gear operations. Based on the EU's tagging activities, higher soaking times were found to lower survival rates.

22. There are a number of other factors worth considering for improving post-tagging survival rates but that the EU has not yet evaluated. For example, specimens caught in longlines are believed to have higher survival rates than those caught in gillnets, which, in turn, have higher survival rates than those caught by trawls. Lower depths are believed to result in a higher chance of survival. Tagging in the winter season is preferable due to the colder temperature at

the surface. Only size 10 circle hooks were used in the tagging activities, and other hooks could result in higher survival rates.

Agenda item 3.3. Development of a risk assessment framework (e.g., Productivity Susceptibility Analysis (PSA))

23. The EU presented WSDWS-2023-06, which proposed a stock assessment advice framework that is consistent with various international agreements and can be applied to a variety of stocks and species, both bycaught and targeted, across a range of fisheries and management bodies. The framework combines a Productivity Susceptibility Analysis (PSA) with a hierarchical stock assessment framework.

24. The first step is to use the PSA as a risk screening exercise to prioritise stocks and to evaluate potential mitigation measures. It is proposed to include estimates of uncertainty and to adopt a risk approach to allow the identification of uncertainties and knowledge gaps that impact on management objectives. Although a PSA can help identify species at risk and the benefit of potential mitigation measures, it does not provide estimates of current stock status levels relative to target and limit reference points, required to estimate fishing pressure and impacts, such as for predicting the consequences of alternative management actions, and monitoring the response of a stock to management. Therefore, a hierarchical assessment framework is proposed that can be applied to a range of data-limited, moderate and rich situations. Quantitative PSA, length-based indicators, biomass dynamic models or more complex models should be considered. The framework will follow the principle of risk equivalence, defined as the probability of a stock being depleted below a limit reference point or not being maintained at a target reference point being equal, irrespective of the stock assessment method used to provide management advice and the amount of data available.

25. Australia presented WSDWS-2023-03, which provided an update on the ecological risk assessment (ERA) of deepwater chondrichthyan species that was last presented at the second meeting of the Stock Assessment and Ecological Risk Assessment Working Group (SERAWG) in March 2020 (See SERAWG-02-10). The updated assessment uses PSA and Sustainability Assessment for Fishing Effects (SAFE) to assess the risk of chondrichthyans to demersal trawl, midwater trawl, “shallow demersal trawl” (Saya de Malha bank fishery), demersal longline and pelagic longline gears (targeting oilfish) in SIOFA fisheries.

26. The species list is identical to that which was used previously and was developed using logbook and observer records in the SIOFA database and information from annual reports submitted by SIOFA Contracting Parties. The vertical and horizontal overlap was updated based on new fishing effort data from 2015 to 2019. Species distribution data was collated from multiple mapping sources (AquaMaps, FAO GeoNetwork and IUCN) with the sensitivity of the risk scores to data from each of these mapping sources also assessed. Life history attribute data was sourced from the CSIRO database that underpins the CSIRO ERA online tool and was available for most species with updates made to the database in the intervening period.

27. A greater number of false positives (i.e., results where low or medium risk species are assessed as high risk) in the PSA is to be expected due to the precautionary manner in which PSA scores attributes and deals with missing data. SAFE is a much more reliable tool for situations where good quality and coverage of effort data are available and there is a high level of confidence around the species distribution data used in the assessment. Several species were classified as either at high or extreme risk according to SAFE, including some deepwater shark species that are still reported as retained in large numbers in the SIOFA area, including *Dalatias licha* in the demersal longline fishery. The choice of mapping source (AquaMaps, FAO GeoNetwork and IUCN) had a significant effect on the risk score of

chondrichthyan species in SAFE across all five fisheries and therefore any assessment of overall species-level risk and the effectiveness of conservation and management measures within the SIOFA Area must consider the underlying reliability of predicted distributions from these mapping sources. Consequently, it is recommended that further investigation is undertaken into the different mapping sources to determine which of these provides the most accurate representation of distribution for the different deepwater chondrichthyans in the SIOFA Area.

28. The Workshop encouraged the EU and Australia to coordinate and share information with each other as they continue to develop risk assessment methods.

29. The EU presented WSDWS-2023-10, which provided a preliminary analysis of the Spanish longline fishery operating in the SIOFA Area, covering the period from 2015 to 2022 and using logbook data and observer data. A total of 20 fishing trips were conducted during this period, corresponding to 2715 fishing sets. Observer data included information on the fishery and biological sampling for 10 of these 20 trips.

30. The longline fishery caught a wide range of species but 11 accounted for 99% of the catch in weight. These 11 species included six species or group of species of sharks, four species or group of species of fish and one skate. Portuguese dogfish (*C. coelolepis*) was the most abundant bycatch species, consisting of more than 50% of the total catches, followed by Patagonian toothfish (*D. eleginoides*).

31. The spatial distribution varied among species, with sharks bycaught mostly in Areas 2 and 3. Conversely, fish species seemed to have a wider spatial distribution. A shift was observed with regard to the dominant species caught, as sharks were more frequently bycaught at the beginning of the timeseries while fish were more abundant towards the end. *Centroscymnus coelolepis* was, however, a constant bycatch throughout the timeseries analysed. Fishing sets with higher bycatch of sharks had, on average, a higher number of hooks deployed compared to those with lower bycatch of sharks.

32. Biological sampling of the most abundant bycaught sharks showed a higher proportion of females for most species. In addition, caught females showed a higher mean size compared to males. There was a depth segregation in the distribution of the most abundant shark species with some species being bycaught in shallower sets and other species found in deeper waters.

33. The Workshop encouraged the EU to analyse whether any trends can be identified across deepwater shark specimens that are from the same species but caught at different depths.

34. The Workshop held a general discussion on the assessment of the stock status of the deepwater shark species involved in the SIOFA fisheries based on the papers presented.

35. The Workshop reviewed the data available and noted that there is considerable uncertainty around deepwater shark species involved in the SIOFA fisheries, both in terms of their taxonomy and their distribution, with most fishery-dependent data.

36. The Workshop noted the need to improve the quantity and quality of data collected, as well as its accessibility. To that end, the Workshop noted the need to improve data collection through means such as increased observer coverage or revised observer protocols and e-monitoring, as well as to improve the tools for correct identification and standardised measurement.

37. The Workshop noted that the FAO has conducted a workshop on the use of still and video cameras to record deepwater shark and VME indicator catches by scientific observers. A video recording and report are available online.

38. The Workshop welcomed the recently launched EU research project on improving scientific advice on deep-water sharks in the SIOFA Area (MoP09-INFO-15), and noted that this project

is expected to produce more, higher-quality data for more accurately assessing the status of deepwater shark stocks.

39. The Workshop noted that a high number of deepwater sharks are being caught as bycatch, despite the limited data currently available. Furthermore, many of these species are known to be highly susceptible to fishing and to have low biological productivity. The precautionary principle requires that actions be taken to reduce the bycatch of these species.

40. The Workshop noted that additional spatial distribution data would help to identify other areas where deepwater shark species aggregate and that may therefore benefit from spatial management measures.

41. The Workshop recommended that the SC:

    i. note that Australia has updated the chondrichthyan ERA following the provision of new catch and effort data for the period 2015-2019.

    ii. note minor revisions have been made to the methodology, but improved distribution data in 2022 allowed comparison of individual species risk rankings across various mapping sources (AquaMaps, FAO GeoNetwork and IUCN).

    iii. note several chondrichthyan species were classified as either at high or extreme risk in SAFE across SIOFA fisheries with some of these species (e.g., *Dalatias licha*) still reported as retained in large numbers in the SIOFA Area (Annex C).

    iv. note the choice of mapping source (AquaMaps, FAO GeoNetwork and IUCN) had a significant effect on the species assessed at high or extreme risk in each fishery, and therefore, the choice of distribution mapping source has a major influence on assessment of overall species-level risk.

    v. further investigate the methods used by the different mapping sources to assess the underlying reliability of their predicted distributions and subsequently, what the most appropriate mapping source for deepwater chondrichthyans is in the SIOFA Area.

    vi. recommend to the MoP that, as a precautionary measure, that catches of *Centrophorus granulosus*, *Dalatias licha* and *Deania calceus* be managed until further analysis can be conducted to determine the sustainable catch.

    vii. conduct future updates to Australia's chondrichthyan ERAs using solely the SAFE tool given that SAFE is a more quantitative approach that reduces the likelihood of false positives and difficulties in determining "risk equivalence" as in the PSA, without precluding other studies from being conducted with other methodologies.

Agenda item 4 – Potential Management objectives

42. The EU presented WSDWS-2023-08, which outlined planned work towards delivering Specific Objective 3 (SO3), "Advice on potential management options and research needs", under the study commissioned by the EU on improving scientific advice on deep-water sharks in the SIOFA Area. This work includes a review of the current and previous management measures, including assessment of strengths and weaknesses of existing measures and consideration of how existing measures could be improved; a review of management measures employed by other jurisdictions; and the provision of mitigation measure recommendations.

43. SIODFA presented WSDWS-2023-02, which provided an analysis of the shark bycatch taken during two trips on a bentho-pelagic factory trawler in 2012 and 2014 with a first detailed and reliable identification of the shark species composition of the bycatch. Data were collected

during two trips and 113 days at sea, and data from 3493 deep-sea shark were recorded. 31 species were recorded from 14 genera. Length, maturity, reproduction, distribution and dietary data were recorded. Over a dozen of the species encountered were previously undescribed. The results of this analysis imply that a single, simple conservation measure for deep-sea sharks will not be feasible, and that discussion is needed to identify/document the objectives of shark conservation in this fishery, what may be achievable and how it might be obtained.

44. The Workshop noted that the invited expert, Mr Paul Clerkin, who conducted the abovementioned studies, is available to conduct the same type of study again in 2024 and that the fishing industry intends to support said study. The Workshop recommended that the SC include 12,000 euros in the SC budget to cover Mr Clerkin's travel between the United States and Mauritius for conducting the study.

45. The Workshop noted that a similar study was conducted by the FAO on the same vessel in 2009. (See Sanders, J., 2023, *Vessel trip report on aimed bottom trawling for orange roughy in the southwestern Indian Ocean, June–July 2009,* FAO Fisheries and Aquaculture Circular No. 1235, Rome, FAO.)

46. The FAO presented WSDWS-2023-04, which described the current global catches and adopted measures for deepwater sharks by deep-sea regional fisheries management organisations (RFMOs) in the Pacific, Atlantic, Mediterranean, and Indian Oceans. Deepwater shark fisheries are largely unregulated in most regions of the Areas Beyond National Jurisdiction (ABNJ) except perhaps in the Northeast Atlantic. Commercial demersal fisheries for sharks currently occur in the Northwest Atlantic (thorny skate), North East Atlantic Fisheries Commission (spurdog), Mediterranean (various species), Indian Ocean (various species), and occasionally the South Pacific (various species). Most species have declined, and some are now closed for targeted fishing. Whereas landed sharks are well-recorded, discarded sharks, which are not landed, are poorly recorded in most regions. It should also be noted that few measures actually reduce incidental shark mortality in other fisheries. The Deep-sea Fisheries (DSF) Project will support SIOFA and the other regions to improve deepwater shark assessments, with a focus on discarded species.

Agenda item 4.1. Deepwater shark bycatch mitigation measures, including potential gear modifications and other mitigation measures
Agenda item 4.2. Potential management measures
Agenda item 4.3. Consideration of interim measures

47. The Workshop discussed deepwater shark bycatch mitigation measures, potential management measures, and potential interim measures.

48. The Workshop noted that there are three fisheries in the SIOFA Area that interact with deepwater chondrichthyans: the bentho-pelagic trawl fishery, the toothfish longline fishery in Subareas 3b and 7, and the longline fishery in Subarea 2. The Workshop recommended that measures for each should be considered separately.

49. Regarding the bentho-pelagic trawl fishery, the Workshop noted that the deepwater sharks that are caught are not commercially important to the fishing vessel and are usually dead when caught and can therefore not be released or tagged. The Workshop recommended that if potential management measures were considered, they should be focused on minimising shark bycatch and maximising data collection.

50. The Workshop recommended that the deepwater shark species caught in the bentho-pelagic fishery could be categorised based on how commonly they are caught, noting that some species are rarely caught and are very difficult to identify, while for others that are more

commonly caught, such as southern lantern shark, there is an opportunity for monitoring and biological data collection for better understanding their biological parameters.

51. The Workshop did not identify any gear modifications that would effectively reduce the relatively low rate of deepwater shark bycatch in the bentho-pelagic trawl fishery or increase the survivability of those sharks that are caught.

52. Regarding the toothfish longline fishery in Subareas 3b and 7, the Workshop noted that there is almost no deepwater shark bycatch, but there is a considerable amount of skate bycatch. The Workshop noted that CCAMLR has established effective protocols for move-on rules and tagging for skates in its toothfish longline fisheries and recommended that the SC consider the implementation of similar measures for the SIOFA toothfish longline fishery.

53. Regarding the longline fishery in Subarea 2, the Workshop noted that deepwater shark species in general and Portuguese dogfish (*Centroscymnus coelolepis*) in particular, form the predominant catch in that area, and noted that these are commercially important species. Furthermore, the Workshop noted that in 2022, Portuguese dogfish constituted the second highest species of catch among all demersal fish in the SIOFA Area, and that the annual catch of Portuguese dogfish in 2022 was the second highest on record.

54. The Workshop noted that two approaches could be taken with regard to Portuguese dogfish bycatch: 1. to define it as a commercial fishery and to take measures to ensure it is sustainably managed or 2. to take measures to reduce and mitigate Portuguese dogfish bycatches. The Workshop recommended that the SC assesses both options for providing guidance to the MoP.

55. The Workshop recommended that, if the aim is to define a commercial Portuguese dogfish fishery and to take measures to ensure it is sustainably managed, the SC should enhance biological data collection efforts and conduct CPUE and other relevant analyses towards conducting a stock assessment to determine the sustainable level of Portuguese dogfish catch. The outcomes of the EU project as presented in MoP9-Info-15 will help on the elaboration of scientific advice.

56. The Workshop noted that if Portuguese dogfish catch continues at recent levels, bycatch mitigation measures would nevertheless be needed for other vulnerable deepwater shark species associated with Portuguese dogfish catch.

57. The Workshop noted that a number of studies have shown the effectiveness of using nylon traces as a shark bycatch mitigation measure, including for demersal longline fisheries, and recommended that the SC recommend that the MoP consider the use of nylon traces instead of wire traces or heavy braided traces as a mitigation measure.

58. The Workshop noted that the EU's preliminary analysis of the Spanish longline fishery suggested that fishing sets with higher bycatch of sharks had, on average, a higher number of hooks, and recommended that the SC recommend that the MoP develop a mitigation measure for reducing the number of longline hooks set. The Workshop requested the EU to provide more information to the SC regarding the number of hooks currently being used for further discussion.

59. The Workshop noted that the EU's tagging activities suggested that reduced soak times resulted in higher survival rates for deepwater sharks and recommended that the SC consider the development of measures for reducing the soak times of longlines.

60. The Workshop noted that the Spanish longline vessel operating in Subarea 2 has implemented a move-on rule as a voluntary measure. The Workshop noted that the move-on rule has been triggered very frequently, suggesting that it is ineffective in reducing shark bycatch, and

recommended that the SC discuss potential ways to enhance its effectiveness, such as increasing the move-on distance.

61. The Workshop noted the importance of releasing deep-water sharks caught in good conditions and using tagging studies to understand post-release mortality.

62. The Workshop recommended that the SC conduct further research to better understand the habitats and behaviour of deepwater sharks in this area, such as nursery grounds, areas were females concentrate, hotspots, etc., towards informing measures such as the setting of spatial management measures and protection of large, especially pregnant females.

63. The Workshop noted that a number of new technologies for mitigating deepwater shark bycatch, such as electromagnetic pulse generators, are being developed and trialled.

64. The Workshop recommended that the SC note the high and increasing level of Portuguese dogfish bycatch and recommend that the SC develop interim measures for reducing catch, such as catch limits and/or effort limits.

Agenda item 5 – Species of concern in CMM 2022/12 (Sharks)

Agenda item 5.1. Review and update of the list of species of concern in CMM 2022/12 (Sharks)

65. The Workshop reviewed the list of species at high risk and of concern in CMM 2022/12 (Sharks) and recommended that it be updated by incorporating the species found to be at high or extreme risk based on the chondrichthyan ERA update conducted by Australia (WSDWS-2023-03). The proposed updated list is attached as **Annex C**.

Agenda item 6 – Shark identification

66. SIODFA presented WSDWS-2023-01, which proposed alternative methods to using identification guides to identify deepwater sharks. Field studies in the Southwest Indian Ocean suggest that no matter how good a fish identification guide may be, using them successfully can be difficult in some situations due to personnel's lack of previous experience identifying the species of concern, difficulty involved with using keys to deal with the complexity of separating species which are similar in appearance and the variation in seemingly intuitive obvious characters such as body types and colouring. The impact of other responsibilities of the observers that compete for their availability, and the inherent difficulty of resolving the shark species in question was also noted. Potential ways forward include better definition of the problem to be addressed (specifically determining the purpose of monitoring and recording the nature of the shark bycatch), formal training in shark identification for crews, development of a photographic protocol and use of an appropriate shark taxonomy expert, development of a more user-friendly shark-species identification aide, and development of shark species identification artificial intelligence.

Agenda item 6.1. Deepwater shark identification guides and potential SIOFA identification guide

67. The Workshop noted that FAO's DSF Project can develop a more practical species identification guide for deepwater sharks and recommended that the SC review the guide when it is completed, and use it as a basis for developing deepwater shark species identification guides for each fishery in the SIOFA Area that interacts with deepwater sharks.

68. The Workshop recommended that the SC develop, as an identification assistance resource, a photographic archive of species that CCPs could use on a trial and voluntary basis. The method of species identification would need to be included in the archive, e.g. identified by a taxonomist, observer guide, etc. Each photo and the information associated with each photo should be linked to the logbook or observer record of the fishing event it originated from along with genetic subsample of species where possible for verification. The release of any data from the archive would need to be done in accordance with the relevant SIOFA CMMs and protocols.

69. The Workshop recommended that as a future step, the SC consider moving towards the development of an AI identification process and library.

70. The Workshop noted the scientific importance of documenting biodiversity, taxonomy and life history of less commonly encountered and under-studied shark species as well as the description of new species in the area. The Workshop requested voluntary specimen collection by observers and vessels, noting that there are many institutes interested in these specimens and would be willing to support their processing and transport financially.

Agenda item 7 – Recommendations to the Scientific Committee

71. The Workshop noted that the SC will discuss data access and standards at its upcoming meeting and recommended that, as part of those discussions, the SC consider how to address limitations on accessing the necessary data at the necessary resolution for conducting scientific analyses.

72. The Workshop recommended that the SC:

    i. note that Australia has updated the chondrichthyan ERA following the provision of new catch and effort data for the period 2015-2019.

    ii. note minor revisions have been made to the methodology, but improved distribution data in 2022 allowed comparison of individual species risk rankings across various mapping sources (AquaMaps, FAO GeoNetwork and IUCN).

    iii. note several chondrichthyan species were classified as either at high or extreme risk in SAFE across SIOFA fisheries with some of these species (e.g., *Dalatias licha*) still reported as retained in large numbers in the SIOFA Area (Annex C).

    iv. note the choice of mapping source (AquaMaps, FAO GeoNetwork and IUCN) had a significant effect on the species assessed at high or extreme risk in each fishery, and therefore, the choice of distribution mapping source has a major influence on assessment of overall species-level risk.

    v. further investigate the methods used by the different mapping sources to assess the underlying reliability of their predicted distributions and subsequently, what the most appropriate mapping source for deepwater chondrichthyans is in the SIOFA Area.

    vi. recommend to the MoP that, as a precautionary measure, that catches of *Centrophorus granulosus*, *Dalatias licha* and *Deania calceus* be managed until further analysis can be conducted to determine the sustainable catch.

    vii. conduct future updates to Australia's chondrichthyan ERAs using solely the SAFE tool given that SAFE is a more quantitative approach that reduces the likelihood of false positives and difficulties in determining "risk equivalence" as in the PSA, without precluding other studies from being conducted with other methodologies.

73. The Workshop noted that the invited expert, Mr Paul Clerkin, who conducted the abovementioned studies (WSDWS-2023-02), is available to conduct the same type of study again in 2024 and that UFI intends to support said study. The Workshop recommended that the SC include 12,000 euros in the SC budget to cover Mr Clerkin's travel between the United States and Mauritius for conducting the study.

74. The Workshop noted that there are three fisheries in the SIOFA Area that interact with deepwater chondrichthyans: the bentho-pelagic trawl fishery, the toothfish longline fishery in Subareas 3b and 7, and the longline fishery in Subarea 2. The Workshop recommended that measures for each should be considered separately.

75. Regarding the bentho-pelagic trawl fishery, the Workshop noted that the deepwater sharks that are caught are not commercially important to the fishing vessel and are usually dead when caught and can therefore not be released or tagged. The Workshop recommended that if potential management measures were considered, they should be focused on minimising shark bycatch and maximising data collection.

76. The Workshop recommended that the deepwater shark species caught in the bentho-pelagic fishery could be categorised based on how commonly they are caught, noting that some species are rarely caught and are very difficult to identify, while for others that are more commonly caught, such as southern lantern shark, there is an opportunity for monitoring and biological data collection for better understanding their biological parameters.

77. Regarding the toothfish longline fishery in Subareas 3b and 7, the Workshop noted that there is almost no deepwater shark bycatch, but there is a considerable amount of skate bycatch. The Workshop noted that CCAMLR has established effective protocols for move-on rules and tagging for skates in its toothfish longline fisheries and recommended that the SC consider the implementation of similar measures for the SIOFA toothfish longline fishery.

78. Regarding the longline fishery in Subarea 2, the Workshop noted that two approaches could be taken with regard to Portuguese dogfish bycatch: 1. to define it as a commercial fishery and to take measures to ensure it is sustainably managed or 2. to take measures to reduce and mitigate Portuguese dogfish bycatches. The Workshop recommended that the SC assesses both options for providing guidance to the MoP.

79. The Workshop recommended that, if the aim is to define a commercial Portuguese dogfish fishery and to take measures to ensure it is sustainably managed, the SC should enhance biological data collection efforts and conduct CPUE and other relevant analyses towards conducting a stock assessment to determine the sustainable level of Portuguese dogfish catch. The outcomes of the EU project as presented in MoP9-Info-15 will help on the elaboration of scientific advice.

80. The Workshop noted that a number of studies have shown the effectiveness of using nylon traces as a shark bycatch mitigation measure, including for demersal longline fisheries, and recommended that the SC recommend that the MoP consider the use of nylon traces instead of wire traces or heavy braided traces as a mitigation measure.

81. The Workshop noted that the EU's preliminary analysis of the Spanish longline fishery suggested that fishing sets with higher bycatch of sharks had, on average, a higher number of hooks, and recommended that the SC recommend that the MoP develop a mitigation measure for reducing the number of longline hooks set. The Workshop requested the EU to provide more information to the SC regarding the number of hooks currently being used for further discussion.

82. The Workshop noted that the EU's tagging activities suggested that reduced soak times resulted in higher survival rates for deepwater sharks and recommended that the SC consider the development of measures for reducing the soak times of longlines.

83. The Workshop noted that the Spanish longline vessel operating in Subarea 2 has implemented a move-on rule as a voluntary measure. The Workshop noted that the move-on rule has been triggered very frequently, suggesting that it is ineffective in reducing shark bycatch, and recommended that the SC discuss potential ways to enhance its effectiveness, such as increasing the move-on distance.

84. The Workshop recommended that the SC conduct further research to better understand the habitats and behaviour of deepwater sharks in this area, such as nursery grounds, areas were females concentrate, hotspots, etc., towards informing measures such as the setting of spatial management measures and protection of large, especially pregnant females.

85. The Workshop recommended that the SC note the high and increasing level of Portuguese dogfish bycatch and recommend that the SC develop interim measures for reducing catch, such as catch limits and/or effort limits.

86. The Workshop reviewed the list of species at high risk and of concern in CMM 2022/12 (Sharks) and recommended that it be updated by incorporating the species found to be at high or extreme risk based on the chondrichthyan ERA update conducted by Australia (WSDWS-2023-03). The proposed updated list is attached as **Annex C**.

87. The Workshop noted that FAO's DSF Project can develop a more practical species identification guide for deepwater sharks and recommended that the SC review the guide when it is completed, and use it as a basis for developing deepwater shark species identification guides for each fishery in the SIOFA Area that interacts with deepwater sharks.

88. The Workshop recommended that the SC develop, as an identification assistance resource, a photographic archive of species that CCPs could use on a trial and voluntary basis. The method of species identification would need to be included in the archive, e.g. identified by a taxonomist, observer guide, etc. Each photo and the information associated with each photo should be linked to the logbook or observer record of the fishing event it originated from along with genetic subsample of species where possible for verification. The release of any data from the archive would need to be done in accordance with the relevant SIOFA CMMs and protocols.

89. The Workshop recommended that as a future step, the SC consider moving towards the development of an AI identification process and library.

Report adoption

The draft convener's report was circulated to participants on 21 March 2023 for comment and adoption via email. The draft was revised and finalized based on the comments received and the final report was adopted via email on 26 March 2023.

The workshop convener, Dr Rodríguez Alfaro, thanked all the participants for their positive contributions in progressing the work of the group. On behalf of the Workshop, Australia thanked Dr Rodríguez Alfaro for his leadership of the Workshop and for guiding the participants in producing an informative and useful report.

The workshop convener and the participants expressed their thanks to the Oceanographic Centre of the Canary Islands, Spanish Institute of Oceanography for hosting the workshop, the European Union for funding the Workshop organisation, the invited experts Dr Teresa Moura and Mr Paul Clerkin and the Secretariat staff for their high-quality work and organisation of the Workshop.

ANNEX A: List of participants

	First name	Last name	Title	Position	Organisation	Email	Attendance	
							In person	Virtual
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ANNEX B: Adopted Agenda for the Deepwater Sharks Workshop (WSDWS-2023)

1. Opening of the workshop on deepwater sharks in the SIOFA Area
2. Administrative arrangements
    2.1. Adoption of the workshop objectives and agenda
    2.2. Appointment of rapporteurs and facilitators
3. Assessment of the stock status of the deepwater shark species involved in SIOFA fisheries
    3.1. Review of available data
    3.2. Approaches to determine the stock status of deepwater sharks
    3.3. Development of a risk assessment framework (e.g., Productivity Susceptibility Analysis (PSA))
4. Potential Management options
    4.1. Deepwater shark bycatch mitigation measures, including potential gear modifications and other mitigation measures.
    4.2. Potential management measures
    4.3. Consideration of interim measures
5. Species of concern in CMM 2022/12 (Sharks)
    5.1. Review and update of the list of species of concern in CMM 2022/12 (Sharks)
6. Shark identification
    6.1. Deepwater shark identification guides and potential SIOFA identification guide
7. Recommendations to the Scientific Committee

ANNEX C: List of shark species at “high risk” and “of concern” CMM 2022/12 (Sharks)

The original list of species in CMM 2022/12 contained 20 species, while this list contains 29 species (i.e. 9 new species have been added to the list). Species have only been added to the list, no species in CMM 2022/12 was excluded.
The list of species considered at “high risk” in CMM 2022/12 contained 5 species, while this list contains 22 species (i.e. species “of concern” were recategorized as at "high risk").
The list of species considered at "of concern" in CMM 2022/12 contained 15 species, while this list contains 7 species (i.e. species “of concern” were recategorized as at "high risk").

FAO code	Scientific name	Common name	French name
APD	*Apristurus indicus*	Smallbelly catshark	Holbiche artouca
	Bathyraja tunae		
BZO	***Bythaelurus bachi***	Bach’s catshark	
BZL	*Bythaelurus tenuicephalus*	Narrowhead catshark	
GUP	***Centrophorus granulosus***	Gulper shark	Squale-chagrin commun
GUQ	***Centrophorus squamosus***	Leafscale gulper shark	Squale-chagrin de l'Atlantique
CPU	***Centrophorus uyato***	Little gulper shark	Petit squale-chagrin
CYO	*Centroscymnus coelolepis*	Portuguese dogfish	Pailona commun
CYP	***Centroselachus crepidater***	Longnose velvet dogfish	Pailona à long nez
ZZC	***Chimaera buccanigella***	Dark-mouth chimaera	
ZZD	***Chimaera didierae***	Falkor chimaera	
ZZE	***Chimaera willwatchi***	Seafarer’s ghost shark	
HXC	***Chlamydoselachus anguineus***	Frilled shark	Requin lézard
SCK	***Dalatias licha***	Kitefin shark	Squale liche
DCA	***Deania calceus***	Birdbeak dogfish	Squale savate
SDU	***Deania profundorum***	Arrowhead dogfish	Squale-savate lutin
SDQ	***Deania quadrispinosa***	Longsnout dogfish	Squale-savate à long nez
EZU	*Etmopterus alphus*	Whitecheek lanternshark	
ETB	***Etmopterus bigelowi***	Blurred smooth lantern shark	
ETP	*Etmopterus pusillus*	Smooth lanternshark	Sagre nain
EZT	***Etmopterus viator***	Blue-eye lanternshark	
HCR	*Harriotta raleighana*	Pacific longnose chimaera	Chimère à nez rigide
HXN	*Hexanchus nakamurai*	Bigeyed sixgill shark	Requin-vache
LMO	***Mitsukurina owstoni***	Goblin shark	Requin lutin
	Rhinochimaera africana	**Paddlenose chimaera**	
CYU	***Scymnodon plunketi***	Plunket's shark	Pailona austral
RZZ	***Somniosus antarcticus***	Southern sleeper shark	
QUK	***Squalus mitsukurii***	Shortspine spurdog	Aiguillat épinette
SSQ	***Zameus squamulosus***	Velvet dogfish	