First Meeting of the Southern Indian Ocean Fisheries Agreement (SIOFA)
Scientific Committee Stock Assessment and Ecological Risk Assessment Working Group (SERAWG)

20–22 March 2019, Yokohama, Japan

REPORT

of the

Stock Assessment and Ecological Risk Assessment Working Group

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Agenda item 1 – Opening

Agenda item 1.1 Opening statement from the Chair

1. The first meeting of the SIOFA SC Stock and Ecological Risk Assessment Working Group (SERAWG1) was opened by Dr Tsutomu Nishida, the Japanese Co-Chair of the SERAWG at 10:00 am on 20 March 2019.
2. The Co-Chair (Japan) welcomed the SERAWG participants to Yokohama. He explained that he would be co-chairing the meeting with Mr. Lee Georgeson of Australia. Dr Nishida explained that SIOFA's work on stock assessment and ecological risk assessment (ERA) was only in its second year and still at an early stage. As the SIOFA SC is tasked with providing advice on a large number of target and non-target species in the context of the tiered assessment framework, it was decided to combine both the stock assessment and ERA work streams into one working group. Lastly, Dr Nishida called for the constructive cooperation of all participants for contributing advice that will ensure the sustainable use of SIOFA fisheries resources.
3. On behalf of the SERAWG, the Co-Chair (Australia) thanked Japan for hosting the meeting and expressed his hope for the success of the meeting.

Agenda item 1.2 Introduction of participants

4. Participants introduced themselves and noted their affiliations. A list of participants in attendance is included at Annex A.

Agenda item 2 – Administrative arrangements

Agenda item 2.1 Adoption of the agenda

5. The agenda was adopted (Annex B).

Agenda item 2.2 Confirmation of meeting documents

6. The meeting documents (Annex C) were confirmed. The Chair explained that the following documents were confidential and were available to meeting participants on the restricted part of the SIOFA website and in a restricted document folder of the meeting server: SERAWG-01-11 (IOTC species list), SERAWG-01-12 (Patagonian toothfish scoping study), SERAWG–01-13 (alfonsino scoping study) and SERAWG-01-14 (ecological risk assessment for SIOFA teleosts).

Agenda item 2.3 Appointment of rapporteurs

7. Mr Alex Meyer, of Tokyo-based company Urban Connections, was appointed as rapporteur with assistance from participants.

Agenda item 2.4 Review of functions and terms of reference

8. The Co-Chair (Japan) reminded the SERAWG of its Terms of Reference, highlighting the task of the Scientific Committee and its subsidiary bodies to develop a research and review plan for the implementation of stock assessments and ecological risk assessments, to facilitate this by providing data in accordance with relevant confidentiality protocols and to consider assessments in the context of the SIOFA stock assessment framework.

Agenda item 3 – Alfonsino

Agenda item 3.1 Alfonsino workplan (SC3 Annex M)

9. The Co-Chair (Japan) presented the alfonsino workplan as described in Annex M of the SC3 meeting report. He explained that the SC has completed the scoping analysis work (including most components of the data inventory) according to schedule. He noted that there are a number of issues that need to be resolved before an integrated stock assessment could be attempted. These included investigation of the use of acoustic survey data and/or catch per unit effort (CPUE) data as potential biomass indices for use in an integrated stock assessment. Consequently it has not been possible for the SERAWG to conduct an alfonsino stock assessment before SC4 and it would not be possible for the SC to provide management advice to the Meeting of the Parties (MoP) in 2019. The Co-Chair (Japan) noted that the SERAWG must therefore update its workplan with a new schedule.

Agenda item 3.2 Report of the scoping study from the consultant (SERAWG-01-13).

Summary of paper

10. The Consultant (Dr Ross Shotton) presented a summary of the alfonsino scoping study. The scoping study documents the information that exists that could support stock assessment of alfonsino in the SIOFA area and reviews information that may support and inform future management.

SERAWG discussion

11. The SERAWG discussed confidentiality issues that may arise in conducting the stock assessment work. In line with the CMM 2018/03 on Data Confidentiality, the SERAWG noted that these should be managed by taking a similar approach to that taken for the orange roughy stock assessment undertaken in 2018. Namely, all relevant data were released to the stock assessment consultant with the approval of data owners under three conditions: (i) data attributable to a particular entity or vessel must not be included in any reports or presentations, (ii) codes should be used in the place of feature or fleet names, and (iii) all data received by the consultant must be deleted after completion of the stock assessment.

12. The SERAWG discussed possible parameters for inclusion in the stock assessment:

    - Stock structure and management units which could relate to major fishing grounds or features.
    - Catch in the SIOFA area, disaggregated by management unit or statistical area.
    - Abundance indices such as acoustic survey data-based estimates or CPUE-based estimates.
    - Biological parameters such as:
        i. Sex ratio
        ii. Life span
        iii. Natural mortality
        iv. Length/weight relationship
        v. Length frequency of catch composition
        vi. Age-length key
        vii. Growth

viii. Maturity-at-size

ix. Fecundity

13. Regarding catch and effort data, the Secretariat noted that not all Contracting Parties (CPs) have submitted catch and effort data at a sufficiently fine spatial scale to enable the disaggregation of data at the scale of potential management units or key fishing grounds. In response, the SERAWG **requested** the Secretariat to review the data it has received and request the necessary data at the required spatial scale from CPs.

14. The SERAWG **agreed** that selection of a stock assessment model should be based on data availability.

15. The SERAWG **requested** the Cook Islands to provide an inventory of available acoustic survey data for alfonsino to the SERAWG. It was agreed that this inventory would be considered intersessionally to inform whether to proceed with an expert review of the usefulness of the available acoustic data. The SERAWG **agreed** that if such data were deemed to be useful, an acoustics expert could be engaged to investigate whether these data could be used to inform abundance indices that could be used in a stock assessment.

16. The SERAWG noted that CPUE data may be used for estimating an abundance index for alfonsino. They **recommended** engaging a stock assessment consultant to standardise CPUE and evaluate whether they can be used as abundance indices in an alfonsino stock assessment.

17. The SERAWG recommended the commissioning of work to undertake a stock assessment using the best available data.

18. Dr Shotton presented possible factors to consider when designing a new acoustic survey, should such a survey be found to be necessary, including implementation concerns, requirements for achieving good results, and the interpretation of the survey results.

19. The SERAWG **agreed** that development of a new acoustics survey programme should be done after the review of the previous survey data.

20. The Executive Secretary, Mr Jon Lansley, advised the SERAWG that in order to engage a consultant, a budget needs to be approved and money available. Normally budgets approved at the MoP are not available until the next financial year starting 1 January. Should sufficient funds be available within the SC Activities budget the activity can commence sooner but new activities still require MoP approval. In response, the SERAWG noted that a budget of 23,000 euros has already been approved for stock assessment work.

21. SIODFA proposed, as an alternative to setting a limit on the allowed catch, that a freeze on fishing effort in the alfonsino fishery should also be considered as a potential management measure. They noted that fishing occurred essentially on well established tow lines whose positions were considered to be highly confidential and part of fishing operators' intellectual property. Their concern was that new operators could enter the fishery and without this knowledge could cause considerable damage to fragile sedentary benthos in defined existing fishing foot prints where the bottom was not in fact disturbed.

Agenda item 3.3 Resource analyses by member countries

22. No papers were provided for this agenda item.

Agenda item 3.4 Report on assessment to SC

23. No papers were provided for this agenda item.

Agenda item 3.5 Future work plan

24. The future work plan is attached at Annex D.

Agenda item 4 –Patagonian toothfish

Agenda item 4.1 Patagonian toothfish workplan (SC3 Report, Annex M)

25. The SERAWG reviewed the Patagonian toothfish workplan as described in Annex M of the third SC meeting report.

Agenda item 4.2 Report of the scoping study from the consultant (SERAWG-01-12)

Summary of papers

26. On behalf of the consultant (Dr Anne-Elise Nieblas (Company for Open Ocean Observations and Logging)), the Co-Chair (Japan) presented the scoping study for Patagonian toothfish (*Dissostichus eleginoides*). In preparation for the SC4 meeting, a scoping study was undertaken to source all relevant existing information in SIOFA and its adjacent areas of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), which may aid to evaluate its stock status in the SIOFA area and to inform the SERAWG and SC considerations. This work was completed in conjunction with the SIOFA Secretariat, SC Chairperson, Co-Chair of the SERAWG, the CCAMLR Secretariat and CPs. All attempts were made to find fisheries-related information that covered not only commercial fisheries but also surveys, research cruises and other relevant activities. Information is as detailed and at the finest spatial and temporal scale possible.

27. As defined in the Terms of Reference for this study, data were collected with the intention to include 1) fisheries information (e.g., description of the fisheries, catch, bycatch), 2) abundance related information (e.g., catch and effort, CPUE), including different types of effort), and 3) biological information (e.g., size, length, weight, sex, maturity, fecundity, age, stock structure) for the SIOFA area, and 4) stock assessment information in its adjacent areas of CCAMLR including biological information, stock structure, results of stock assessments, harvest control rules, reference points, management measure and data poor method.

SERAWG discussion

28. The SERAWG acknowledged the work done by Dr Nieblas as well as the assistance and cooperation provided by CCAMLR.

29. Based on the scoping study, the SERAWG noted that the most recent CASAL stock assessment results estimated the 2017 stock status of the TOP in CCAMLR divisions 58.5.1 and 58.5.2 and subarea 58.6 to be above the CCAMLR target biomass level of 50% SSB0.

Agenda item 4.3 Resource analyses by member countries

30. Australia presented paper SERAWG-01-8: Population structure of Patagonian toothfish on the Kerguelen Plateau and consequences for the fishery in SIOFA Statistical Area 7.

Summary of papers

31. Almost the entire Kerguelen Plateau is situated within the area managed by CCAMLR, with only a portion of the William's Ridge on the eastern side of the Plateau extending into SIOFA Statistical Area 7. Based on available genetic information, catch composition and tag-recapture data from the toothfish fisheries in

the French and Australian EEZs, Patagonian toothfish are continuously distributed on the northern part of the Kerguelen Plateau and populations are linked. Population linkages between the French and Australian EEZs are accounted for in the toothfish assessment for the Australian EEZ undertaken by CCAMLR. Based on CCAMLR decision rules, this assessment estimates the catch limit which is fully taken within CCAMLR waters.

32. Given continuous toothfish habitat across the northern part of the Kerguelen Plateau and the proximity of William's Ridge to the Australian EEZ, toothfish on William's Ridge are part of the same population as those in the Australian EEZ. Any additional fishing mortality of this population on William's Ridge is therefore likely to result in the total fishing mortality exceeding the catch limit set by CCAMLR.

SERAWG discussion

33. Australia expressed its strong concerns about large toothfish catches on Williams Ridge in 2018 by a fishing vessel from EU-Spain. This is the first time that fishing has occurred in this area since historical IUU fishing occurred in the early 2000s.

34. SERAWG **agreed** that:

- Based on genetic information, catch composition and tag-recapture data from the French and Australian toothfish fisheries, Patagonian toothfish on the northern part of the Kerguelen Plateau are continuously distributed and populations are linked;
- The population linkages between the Australian and French EEZ are accounted for in the CCAMLR assessments as well as the estimation of catch limits for toothfish in the Australian EEZ, and the yield is fully taken within CCAMLR waters;
- The CCAMLR stock assessments are subject to a rigorous review process;
- The movement of the five toothfish, released in the Australian or French EEZ and recaptured on William's Ridge in 2018, is consistent with the observed movement patterns of toothfish across the Kerguelen Plateau;
- Given continuous toothfish habitat across the northern part of the Kerguelen Plateau, the proximity of William's Ridge to the Australian EEZ, and the known fish movement patterns across the plateau, toothfish on William's Ridge are part of the same population as those in the Australian EEZ.
- This fish population is well studied, with a large amount of fishery-dependent and independent data being available.
- Toothfish catches on the SIOFA part of William's Ridge are likely to result in catch limits being exceeded and may undermine the CCAMLR management objectives for this toothfish population.

35. SERAWG **requested** that the SC urgently considers measures to regulate toothfish fishing on William's Ridge to ensure that catches from this population do not exceed the catch limit as determined by CCAMLR and undermine the CCAMLR management objectives.

SERAWG discussion on Toothfish on Del Cano Rise

36. SERAWG noted that:

- Patagonian toothfish catch in the SIOFA part of Del Cano Rise increased dramatically from 2016 to 2017.

- The Del Cano Rise is spread over SIOFA, CCAMLR waters, the French EEZ of Crozet and the South African EEZ of Marion and Prince Edward Islands. Most of the catches in the SIOFA area are taken adjacent to the CCAMLR area and the French EEZ of Crozet.

37. SERAWG **agreed** that:

    - Based on tag-recapture data from the French toothfish fisheries and biological knowledge of the reproduction of Patagonian toothfish, Patagonian toothfish populations of the Del Cano Rise and the Crozet plateau are linked.
    - Five toothfish released in the French EEZ (2 around Crozet Island, 3 around Kerguelen Islands) were recaptured on SIOFA part of the Del Cano Rise, which is consistent with movement patterns of toothfish in the region (Sarralde and Barreiro, 2019).
    - Patagonian toothfish show size and sex specific habitat preference. In particular, the juvenile phase relies on shallow waters (<600m depth) while large adult, mostly female, are distributed in deep-sea habitats (from 1200m up to 2300m+) (Peron et al., 2016). As there is only deep area in the Del Cano Rise, and based on the oceanography of the area (West to East) (Pollard et al., 2007), the population of the Del Cano Rise is likely to rely on Crozet and Marion-Prince Edwards plateau for its juvenile phase.
    - A CCAMLR assessment estimates the catch limits for the toothfish population in the French EEZ of Crozet-Del Cano, and the yield is fully taken within CCAMLR waters (Sinegre et al., 2017).
    - This CCAMLR stock assessment is subject to a rigorous review process.
    - Toothfish catches from the Del Cano Rise in the SIOFA area are likely to result in catch limits being exceeded for the Crozet-Del Cano toothfish population, which may undermine the CCAMLR management objectives for this population.
    - Catches from the Del Cano Rise in the SIOFA area are also likely to impact the recruitment of the population of Crozet-Del Cano. Since there are no observations of recruitment at Crozet through, for example, a trawl survey, any impact on recruitment would only be observed with a large delay which may put the sustainability of the population of Crozet-Del Cano at risk.

38. SERAWG **requested** that the SC urgently considers measures to regulate toothfish fishing on the Del Cano Rise in the SIOFA area to ensure that catches from the Crozet - Del Cano population do not exceed the catch limit and undermine the CCAMLR management objectives.

Agenda item 4.4 Report on assessment to SC

39. No papers were provided for this agenda item.

Agenda item 4.5 Future work plan

40. No papers were provided for this agenda item. The SERAWG has progressed work in relation to toothfish in SIOFA and **requests** that the SC considers the future toothfish workplan.

Agenda item 5 – Orange roughy

Agenda item 5.1 Resource analyses by member countries

SERAWG-01-INFO-03: Age distribution of orange roughy (*Hoplostethus atlanticus*) harvested from the Sleeping Beauty seamount in the Southern Indian Ocean

Summary of the document

41. This document is based on the results of analysis of orange roughy otoliths. Otoliths of orange roughy from the Sleeping Beauty seamount in the Southern Indian Ocean were prepared and read by one reader following the accepted National Institute of Water and Atmospheric Research (NIWA) ageing protocol. The goal was to identify their age composition for use in their stock assessment. A sample of 400 orange roughy otoliths collected in 2017 was analysed. The results showed a range in age from 21 to 140 years, with a mode from around 32 to 45 years.

SERAWG discussion

42. The SERAWG recognised the usefulness of paper SERAWG-01-INFO-03 in documenting the data source for modelling the age distribution of orange roughy in its stock assessment. However, they also noted that the paper lacked sufficient information regarding the sampling method in order to be able to determine whether or not the sample was representative of the broader orange roughy population.

SERAWG-01-INFO-05: Age frequency and recruitment – an insight into orange roughy recruitment success in the southern Indian Ocean

Summary of the document

43. The study suggested that there is little evidence that recruitment in the population of orange roughy aged for this study is episodic; rather the data appears 'normal' for exploited marine fish populations. Furthermore, after adjusting age class numbers for natural mortality an estimate of the fishing mortality for a range of age classes where there appears to be full recruitment to the fishery but still enough observations in the more recent, and thus more frequent age classes, gives an F = 0.011. This is less than one quarter of a commonly used value for M of orange roughy of 0.045. The estimated F of 0.011 indicates a low rate of exploitation, (F/(F+Z)) of 19.6%.

SERAWG discussion

44. The SERAWG welcomed the intent to investigate the nature of recruitment patterns, but cautioned against drawing any firm conclusions without taking into account ageing error.

Agenda item 5.2 Report on assessment to SC

45. In response to the MoP5 request to provide advice on the status of stocks in relation to MSY until specific reference points are adopted (MoP5 Report, para 51), the SERAWG recalled the SC3 advice to the meetings of the Parties (SC3 Report, para 234), in particular:

    - All three assessment approaches indicated that ss17 for the 7 sub-regions assessed was likely to be above 50%SSB0.
    - The median estimates for the Walters Shoal Region from the base model and eight sensitivities evaluated varied between 63%SSB0 and 85%SSB0. The median estimate of the Base model was 76%SSB0.

46. The SERAWG noted that the 2018 stock assessment for the Walters Shoal Region provided deterministic estimates of BMSY assuming a Beverton and Holt stock recruitment relationship, a combination of assumed steepness and natural mortality, and maturity parameters (SC-03-07.1.1(04)). The BMSY estimate using the base model parameters was 23.6% B0 (Table 3, 37 years, 12 years).

47. The SERAWG noted the advice in SC-03-07.1.1(04) that:

    - 'Deterministic BMSY has not been found to be a useful reference point for New Zealand orange roughy stocks. It is highly dependent on the stock recruitment relationship and is therefore very uncertain.'

48. The SERAWG **agreed** that deterministic estimates of BMSY were highly uncertain and therefore not suitable to be used as a reference point for management advice for this stock.

49. The SERAWG noted that there are no available estimates of BMSY or MSY for the other six assessed orange roughy stocks.

Agenda item 5.3 Future work plan

50. No papers were provided for this agenda item. The SERAWG has progressed work in relation to orange roughy in SIOFA and **requests** that the SC considers the future orange roughy workplan.

Agenda item 6 – Ecological risk assessment

Agenda item 6.1 Deepwater chondrichthyans (sharks, rays and chimaeras)

51. The Co-Chair (Australia) reminded the SERAWG of paragraph 6a of CMM 2018/01, which tasks the SC with developing and providing advice and recommendations to the MoP on the status of stocks of principal deep-sea fishery resources targeted, and, to the extent possible, taken as bycatch and caught incidentally in these deep-sea fisheries, including straddling fishery resources. He also drew attention to the responsibility of the SC to continue progress on the ecological risk assessment for deepwater chondrichthyans in the SIOFA area in accordance with its ERA workplan.

52. The Co-Chair (Australia) reminded the SERAWG of the decision of the MoP (CMM 2018/02 Data Standards, para 8) to implement FAO identification guides for deepwater chondrichthyans in the Indian Ocean on fishing vessels to improve the collection of sharks catch information and consider the use of the Smartforms when available. The Executive Secretary, Mr Jon Lansley, informed the SERAWG that hard copies of the identification guides have been sent by FAO to the relevant contact points of the CPs that requested copies..

53. Dr Tony Thompson (Food and Agriculture Organization of the United Nations (FAO)) presented an initiative by the ABNJ Deep Sea Project to encourage collaboration between R(F)MOs related to sharing experience with the application of ecological risk assessments to deepwater chondrichthyans. This initiative aligns with obligations of UNCLOS and other instruments to minimise bycatch and incidental mortality. The concept note considers ERAs for chondrichthyans undertaken by demersal RFMOs (including SIOFA) using ERA methods including Productivity Susceptibility Analysis (PSA) and Sustainability Assessment for Fishing Effects (SAFE). These and similar methods have been used by MSC, IATTC, IOTC, WCPFC, and others. The Deep Sea Project drafted and circulated to R(F)MOs proposal to consider the merits of harmonisation of ERA approaches applied to chondrichthyans and to report on methods they are currently using. A concept note

comparing and contrasting the various shark ERA methods has been drafted and upon request from FAO had been shared with relevant Chairpersons for comment by the SIOFA Secretariat.

54. The ABNJ Project is also working with CSIRO on ecosystem risk assessment to develop models and strengthen methods used to assess and monitor change in marine communities. This will be progressed through a workshop of experts in the field to be held around July 2019. Information on the workshop has been distributed to CPs via the SIOFA Secretariat.

Summary of paper

55. The Co-Chair (Australia) presented paper SERAWG-01-10. The paper provides a draft manuscript for an ecological risk assessment for the effects of bottom fishing gears on deepwater chondrichthyans in high seas areas of the Southern Indian and South Pacific Oceans. PSA and SAFE methods were adapted to assess the vulnerability of 174 deepwater chondrichthyans to demersal trawl, demersal longline and demersal gillnet fishing gears in the Southern Indian and South Pacific Oceans. A number of species were categorised as being at high or extreme vulnerability to all gears, including some in the Southern Indian Ocean that are mainly taken in association with commercial deepwater shark fisheries. Overall, there was good concurrence between PSA and SAFE results at the upper end of the vulnerability spectrum for Southern Indian Ocean fisheries. Despite a number of methodological limitations of this assessment, such methods can be used effectively to prioritise management action for those species considered to have the highest vulnerability to fishing.

SERAWG discussion

56. The SERAWG noted that there is missing data for certain gears in certain years, which may bias the results of the deepwater chondrichthyan ERA towards underestimating the vulnerability of certain species.

57. The SERAWG noted that results should be considered in the context of information on the annual levels of catch for each gear type. In accordance with CMM 2016/03 (data confidentiality), which provides for making available finer-scale data to the SC and any of its Working Groups to undertake its work, the SERAWG requested the Secretariat to provide the annual catch data for deepwater shark catches in SIOFA from 2012 to 2017 for review by the Working Group.

58. In accordance with the SIOFA Rules of Procedure these data were viewed and discussed within a closed session. Upon request observers and industry affiliates were absent while the SERAWG considered these fine-scale data, a subset of which were confidential as they related to total annual catches for individual species taken by EU-Spain.

59. After reviewing these data, the SERAWG noted that most of the catch of deepwater chondrichthyans recorded in the SIOFA database is being taken by the demersal longline fishery (although noting that this has replaced a demersal gillnet fishery since 2015) and confirmed that the majority of these catches were being taken by EU-Spain.

60. Based on its discussion of the risk assessment results and its analysis of catches, the SERAWG noted that the ‘key species of concern’ in the longline fishery include *Centroscymnus coelolepis* (Portuguese dogfish – SAFE risk low), *Centrophorus granulosus* (Gulper shark - SAFE risk extreme), *Deania calcea* (Brier shark - SAFE risk extreme), *Dalatias licha* (Black shark – SAFE risk extreme), *Zameus squamulosus* (Velvet shark – SAFE risk extreme), *Scymnodon plunketi* (Plunket’s dogfish – SAFE risk extreme) and *Centroselachus crepidater* (Golden dogfish – SAFE risk extreme). Three newly described species of chimaera were also

assessed to be at high risk in the SAFE assessment for longline gears (*Chimaera willwatchi*, *C. buccanigella* and *C. didierae*).

61. The SERAWG noted that annual catch information was available to inform its consideration of the risk assessment results for *C. coelolepis*, *C. granulosus*, *D. calcea*, *D. licha* and *Etmopterus granulosus* (*E. granulosus* - SAFE risk low). *E. granulosus* was included because it is reported as the fourth highest catch volume.

62. The SERAWG noted for 2013 – 2016 the annual catch data available indicates that these catches are from targeted fishing for Portuguese dogfish in the longline and gillnet fisheries. The SERAWG noted that for one year of catch data (2015) there were two gears in use (longline and gillnet). For one year (2017) the characteristics of longline fishing by this Contracting Party changed with the addition of catches of toothfish. In this context, it was noted that without additional analyses of the spatial distribution of catches, it was difficult to establish whether catches of the aforementioned 'key species of concern' for which catch data are available for 2017 were being taken in association with the main target species (which is thought to be Portuguese dogfish (*Centroscymnus coelolepis*), as it is the species being caught in the highest volumes) or whether these species of concern may be being taken as bycatch when targeting other species (e.g. toothfish).

63. The SERAWG also noted that it would be useful to analyse the spatial distribution of catches of the main target species and the species of concern in the longline fishery so that catch rate and catch trend information could be considered in the context of the results from the ecological risk assessment.

64. In summary, the SERAWG:

    - **Agreed** there is limited catch, effort and biological information for many species of deepwater chondrichthyans;
    - **Agreed** that this PSA and SAFE analysis have identified a number of species of deepwater chondrichthyans at high or extreme relative vulnerability to fishing using demersal trawl, demersal longline and demersal gillnet gears;
    - **Noted** that based on the results of the ERA and the understanding of the vulnerability of many deepwater chondrichthyans species to fishing, four 'key species of concern' for which catch data are available (*C. coelolepis*, *C. granulosus*, *D. calcea* and *D. licha)* are caught in relatively high volumes.

65. The SERAWG:

    - **Requests** the SC to consider the requirement for the collection and submission of more detailed observer data for species of concern (e.g. those at high or extreme vulnerability to fishing using certain gears) in accordance with CMM 2018/02, Annex B;
    - **Requests** the Secretariat, in preparation for SC4, to provide a spatial analysis of catches of key species of concern so that it can be established if these species are taken in association with the main target fishery; and
    - **Requests** the SC to urgently consider measures to mitigate the potential for overexploitation of 'key species of concern' that has been seen in similar fisheries globally.

Agenda item 6.2 Teleosts and others

66. The Co-Chair (Australia) reminded the SERAWG of the recommendation in the third SC meeting regarding the potential need to hire consultants to compile the biological

data to support the risk assessments of teleosts, particularly in relation to species caught on the Saya de Malha bank. He reported that much of the relevant data has since been found in the CSIRO database, potentially resulting in a saving in the SIOFA SC budget that was recommended for allocation to this task at SC3.

Summary of paper

67. The Co-Chair (Australia) presented paper SERAWG-01-14. The paper updates the SC on a preliminary ecological risk assessment for SIOFA teleosts. The preliminary species list was developed using catch records in the SIOFA databases and information from annual reports submitted by SIOFA Contracting Parties. The species list is incomplete due to the developmental nature of the SIOFA databases and associated issues, some of which are captured in the paper 'SIOFA species list' submitted to SERAWG1 and SC4.

68. The assessment applies PSA and SAFE methods to assess the relative vulnerability of teleosts to demersal trawl, midwater trawl, 'shallow trawl' (Saya de Malha bank fishery), demersal line and demersal gillnet gears in the SIOFA area. Fishing effort data were provided by most Contracting Parties for the 2012-2016 period; however, some effort data are missing. Species distribution data were sourced from aquamaps.org (80-100% probability of occurrence layer was used). Life history attribute data were sourced from the CSIRO database that underpins the CSIRO ERA online tool and was available for most species.

69. The results are preliminary and cannot currently be used for management advice on species status or fishing mortality. Once refined, the results could be used for prioritising assessment options (in line with the SIOFA stock assessment framework), or for informing requirements for additional data collection. The next step is to refine the SIOFA species list and the assumptions used in the assessment, and to encourage collaboration with other SIOFA Contracting Parties.

SERAWG discussion

70. The SERAWG noted that the same species list was used for different types of gear in the PSA, which may lead to misleading results. This should be further investigated.

71. The SERAWG noted that the assessment work could be improved by producing an explicit list of data gaps. This list should be included in the workplan for teleosts.

Agenda item 6.3 Report on assessment to SC

72. No papers were provided for this agenda item.

Agenda item 6.4 Future work plan

73. No papers were provided for this agenda item. The SERAWG noted that the workplan would be discussed further during SC4.

Agenda item 7 – Saya de Malha bank fisheries

Agenda item 7.1 Teleosts, resource analyses by parties (Mauritius and MRAG)

74. No papers were provided for this agenda item. The SERAWG noted that Mauritius and MRAG have conducted an assessment of the Saya de Malha bank fisheries. They **requested** the Secretariat to follow up with MRAG regarding submitting information on their assessment to the next SERAWG meeting, possibly as a paper.

75. The SERAWG asked Thailand if they have analysed catch and effort data relevant to the Saya de Malha bank fisheries. Thailand explained that they have analysed

catch composition and CPUE for the Saya de Malha bank fisheries. However, Thailand has not calculated maximum sustainable yield (MSY) as they only have two years of data. Thailand also explained that 62 Thai vessels fished in the SIOFA area in 2015 and 2016. However, Thailand recalled these vessels to Thailand while they developed new regulations for overseas fishing. Thailand is scheduled to resume their fisheries in the SIOFA area in mid-2019.

76. The SERAWG noted that the Saya de Malha longline fishery had been grouped together with other longline fisheries in the SIOFA area when conducting the ERA, even though they occur in different areas and target different species. This may lead to skewed results. The SERAWG requested that various longline fisheries should be treated separately in future ERAs.

Agenda item 7.2 Report of Ecosystem Approach to Fisheries – Dr Fridtjof Nansen cruise (Seychelles)

77. No papers were provided for this agenda item. The Executive Secretary explained that it was originally planned for the Seychelles to deliver an oral presentation for this agenda item but owing to travel delays they were unable to attend the SERAWG meeting and that it may be possible to receive a presentation later during SC4. The Co-Chair pointed out that an information paper on the Nansen Programme had been prepared and submitted to the upcoming SC meeting (SC-04-INFO-03).

78. The SERAWG discussed how to access data from the cruises and was informed that the data collected is owned by the country leading the cruise and that they should be approached to request access. More information can be found on the website http://www.fao.org/in-action/eaf-nansen/en/.

Agenda item 7.3 Report on assessment to SC

79. No papers were provided for this agenda item.

Agenda item 7.4 Future work plan

80. No papers were provided for this agenda item.

Agenda item 8 – SIOFA stock assessment framework – implementation, including species categorisation and data characterisation, including refining SIOFA species list

Summary of paper

81. The Co-Chair (Australia) presented paper SERAWG-01-07. The paper provides an update on development of a SIOFA species list, which is needed to categorise SIOFA species into the SIOFA stock assessment framework (paper SERAWG-01-09) and for the ecological risk assessment for SIOFA teleosts (paper SERAWG-01-14). The work has relevance to the SIOFA databases and, more broadly, to any future work that requires reliable species-specific information.

82. The species list (SERAWG-01-07 SIOFA_species_list.xlsx) was built using catch records held in the SIOFA database and checked against codes and species reported in annual national reports. Two-hundred-and-twelve species or group codes were identified. These were assumed to be the FAO 3-alpha species codes against which CNCPs are required to submit data to SIOFA in accordance with CMM 2018/02. Species distribution data were then checked to confirm if the species or species group corresponding to the code occurred in the SIOFA area.

83. The work uncovered a number of likely errors in the database coding arising from erroneous codes being used by CPs for data submission, including for some key target species. Uncertainty around whether a species or group occurred in the fishery was evident for around 12 percent of species and one species group. The analysis has also highlighted that a proportion of the data in the SIOFA database is currently associated with group codes, such that deriving species-specific information (such as catch volume) for applications such as stock assessment will be challenging.

SERAWG discussion

84. The SERAWG agreed that there were a number of errors and inconsistencies in the SIOFA database and species list that needed to be rectified to allow continuation of other work.

85. Regarding the issue of CPs using erroneous codes (i.e. not FAO 3-alpha species codes) when submitting data to SIOFA, the SERAWG recognised that each CP may not necessarily use the FAO codes domestically. However, when submitting data to SIOFA, the FAO codes shall be used.

86. Regarding the issue of data being submitted with group codes, the SERAWG encouraged CNCPs to submit catch and other data at a species level.

87. The SERAWG **requested** the Secretariat to resolve the species coding issues in collaboration with CNCPs before SC5 in 2020.

88. The SERAWG did not support requesting FAO to change its global species code at this time (SC3 Report, para 245).

Summary of paper

89. The Co-Chair (Australia) presented paper SERAWG-01-09. The paper describes a preliminary attempt to categorise SIOFA species within the adopted tiered stock assessment framework for bottom fisheries within the SIOFA Area (SC3 Report, Annex J). Progress on this task has been limited because the categorisation of species into this framework requires a characterisation of available data, which is difficult due to the developmental nature of the SIOFA database and the lack of a robust SIOFA species list. Ultimately, categorisation into the framework and associated data characterisation should help the SC to formulate assessment options for the large number of species with which SIOFA bottom fisheries interact. As well as the level of data availability, assessment should be informed by the risks posed by fishing to various stocks. The consideration of the current risks to stocks as well as the desired (future) harvest strategy objectives should be used to drive data collection to enable the appropriate assessments to be applied.

SERAWG discussion

90. The SERAWG acknowledged the value of the preliminary work done to categorise SIOFA species within the tiered stock assessment framework. They recognised that the SIOFA database and species need to be further refined in order to be able continue this work and categorise SIOFA species into tiers with more confidence.

    The SERAWG **agreed** that the ERA assessments could be used to categorize species into an appropriate tier of the stock assessment framework.

91. The SERAWG:

    - **Notes** that this work is ongoing and will be progressed as the SIOFA database and species list are refined and better data characterisation becomes possible; and
    - **Recommends** that this work is continued and supported as part of the SC workplan.

Agenda item 9 – Technical work to inform reference points and harvest strategy development

Agenda item 9.1 Technical work to inform advice on candidate target (TRP) and limit reference points (LRP) (orange roughy, alfonsino and toothfish)

92. No papers were provided for this agenda item. The Co-Chair (Japan) presented potential biomass-based or MSY-based TRPs and LRPs for the consideration of the SERAWG. The SERAWG agreed that more scientific work needed to be done before they could give advice on TRPs and LRPs. They agreed to form a group of key interested parties to work intersessionally to draft a technical working paper for submission to the next SERAWG meeting.

93. Noting, for example, that the orange roughy fishery is data-limited, the SERAWG agreed that candidate reference points should take into account the level of data uncertainty in stocks.

94. The SERAWG agreed to develop a generic approach for determining reference points for current and future stocks. The SERAWG agreed that for straddling stocks consistent reference points should be applied across the stock.

Agenda item 9.2 Framework and work plan for the establishment of harvest strategies (key species)

95. No papers were provided for this agenda item. The SERAWG discussed six potential key elements for harvest strategies: (i) operational objectives, (ii) reference points, (iii) an acceptable level of risk of breaching reference points, (iv) a monitoring strategy, (v) decision rules for achieving reference points, and (vi) a process for evaluating harvest strategies.

96. The SERAWG **recommended** that the SC considers including the six aforementioned elements when developing harvest strategies, beginning work to populate those elements, and developing a workplan for further populating those elements.

Agenda item 10 – Consideration of work plans and resource requirements

Agenda item 10.1 Target Strength (TS)–length relationship for alfonsino

97. No papers were provided for this agenda item. In relation to paragraphs 141 and 166 of the SAWG-1 meeting report, the SERAWG reaffirmed the need to analyse the TS–length relationship for alfonsino, if acoustic data are to be used.

Agenda item 10.2 Analysis and review of alfonsino acoustic surveys

98. No papers were provided for this agenda item. See paragraph 15.

Agenda item 10.3 Otolith preparation and reading for ageing for alfonsino, orange roughy or other species

99. No papers were provided for this agenda item. Towards developing age-length keys for alfonsino, the SERAWG **recommended** ageing and analysing 100-150 otoliths per year per area for three areas (Walter's Shoal, South Indian Ridge, 90 degrees east). Japan informed the SERAWG that they are progressing otolith ageing work for their alfonsino fishery. If the otoliths would be read by multiple readers, a protocol should be developed for cross-checking subsets of the otoliths read by each reader. The SERAWG also noted that there are no digitalized data for the otoliths collected

to date outside of the Japanese fishery so samples would need to be selected manually.

Agenda item 10.4 Genetics work for Single-Nucleotide Polymorphism (SNP) analysis (orange roughy)

100. No papers were provided for this agenda item. The SERAWG noted that the work of collecting genetic samples for the SNP analysis (SAWG-1 Report, paras 153-157) was not yet complete and agreed to continue this work intersessionally.

Agenda item 10.5 Investigation of 'new' fisheries

101. No papers were provided for this agenda item.

Agenda item 11 – Advice to the Scientific Committee

102. Advice is included in the text above.

Agenda item 12 – Future meeting arrangements

103. The SERAWG **requests** the SC to consider future meeting arrangements in conjunction with arrangements for SC5.

Agenda item 13 – Other business

104. No other business was raised.

Agenda item 14 – Adoption of the meeting report

105. The report of the 1st meeting of the SIOFA SERAWG was adopted at 5:50 pm, 22 March 2019.

Agenda item 15 – Close of meeting

106. The Chair closed the meeting at 5:50 pm, 22 March 2019.

Annex A List of Participants

Delegation	Title	Name	Function	Contact Email
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			Assistants	
Japan	Ms	Kanna Young	Assistant	
Japan	Ms	Narumi Saito	Assistant	
Japan	Mr	Alex Myer	Rapporteur	meyer@urbanconnections.jp

Annex B Agenda

Agenda

First Meeting of the SIOFA Stock and Ecological Risk Assessment Working Group (SERAWG1)

20-22 March 2019

National Research Institute of Fisheries Science, Yokohama,

Japan

Co-Chairs: Dr Tom Nishida (stock assessment) & tbc (ecological risk assessment)

Registration will be open from 09:30 on the 20th March and the meeting will run 10:00 to 18:00 each day

NOTE: Before and after this meeting the following two SIOFA SC meetings will convene;

- First Meeting of the Protected Areas and Ecosystems Working Group (PAEWG1), 18-19 March 2019
- Fourth Meeting of the Southern Indian Ocean Fisheries Agreement (SIOFA) Scientific Committee, 25-29 March

1. Opening
   1.2 Opening statement from the Co-Chairs
   1.2 Introduction of participants

2. Administrative arrangement
   2.1. Adoption of the agenda
   2.2. Confirmation of meeting documents
   2.3. Appointment of rapporteurs
   2.4. Review of functions and terms of reference

3. Alfonsino
   3.1. Alfonsino workplan (SC3 Annex M)
   3.2. Report of scoping study from the consultant
   3.3. Resource analyses by member countries
   3.4. Report on assessment to SC
   3.5. Future work plan

4. Patagonian toothfish
   4.1. Patagonian toothfish workplan (SC3 Annex M)
   4.2. Report of the scoping study from the consultant
   4.3. Resource analyses by member countries
   4.4. Report on assessment to SC

4.5. Future work plan

5. Orange roughy
   5.1 Resource analyses by member countries
   5.2 Report on assessment to SC
   5.3 Future work plan

6. Ecological risk assessment
   6.1. Deepwater chondrichthyans
   6.2. Teleosts and others
   6.3. Report on assessment to SC
   6.4. Future work plan

7. Saya de Malha bank fisheries
   7.1. Teleosts, resource analyses by parties (Mauritius and MRAG)
   7.2. Report of Ecosystem Approach to Fisheries - Dr Fridtjof Nansen cruise (Seychelles)
   7.3. Report on assessment to SC
   7.4. Future work plan

8. SIOFA stock assessment framework – implementation, including species categorisation and data characterisation, including refining SIOFA species list

9. Technical work to inform reference points and harvest strategy development
   9.1. Technical work to inform advice on candidate target (TRP) and limit reference points (LRP) (orange roughy, alfonsino and toothfish)
   9.2. Framework and work plan for the establishment of harvest strategies (key species)

10. Consideration of work plans and resource requirements
    10.1. TS length relationship for alfonsino
    10.2. Analysis and review of alfonsino acoustic surveys
    10.3. Otolith preparation and reading for ageing for alfonsino, orange roughy or other species
    10.4. Genetics work for Single-Nucleotide Polymorphism (SNP) analysis (orange roughy)
    10.5. Investigation of 'new' fisheries

11. Advice to the Scientific Committee

12. Future meeting arrangements

13. Other business

14. Adoption of the meeting report

Close of meeting

Annex C List of documents

List of Meeting Documents

Document Reference Nº	Document	Relevant agenda items
SC-04-01	Meeting notice – available on SC4 page of SIOFA website	
SERAWG-01-01 Rev1	Provisional agenda	2.1
SERAWG-01-02	Provisional agenda for Heads of Delegation meeting -tbc	
SERAWG-01-03	List of Meeting Documents	2.2
SERAWG-01-04	Table of agenda items and related papers	2.2
SERAWG-01-05	SERAWG Terms of Reference	2.2
SERAWG-01-06	List of Participants	2.2
SERAWG-01-07	SIOFA species list (with xls annex)	8
SERAWG-01-08	Population structure of Patagonian toothfish (Dissostichus eleginoides) on the Kerguelen Plateau and consequences for the fishery in SIOFA Statistical Area 7	4
SERAWG-01-09	Preliminary categorisation of species into the SIOFA stock assessment framework	8
SERAWG-01-10	Draft manuscript for an ecological risk assessment for the effects of bottom fishing gears on deepwater chondrichthyans in high seas areas of the Southern Indian and South Pacific oceans	6.1
SERAWG-01-11	IOTC catch records of non-IOTC species in the SIOFA area RESTRICTED DOCUMENT	8
SERAWG-01-12	Patagonian toothfish scoping study – Consultants Report RESTRICTED DOCUMENT	4.2
SERAWG-01-13	Alfonsino scoping study – Consultants Report RESTRICTED DOCUMENT	3.2
SERAWG-01-14	Preliminary ecological risk assessment for SIOFA teleosts RESTRICTED DOCUMENT (Submitted 04.03.2019)	6.2
SERAWG-01-INFO-01	SC3 Annex M-Operational-WP 2018-21	3.1, 4.1
SERAWG-01-INFO-02	Thoughts on the Management of Alfonsino in the Southern Indian Ocean	3.1
SERAWG-01-INFO-03	AGE DISTRIBUTION OF ORANGE ROUGHY HARVESTED FROM THE SLEEPING BEAUTY SEAMOUNT, SOUTHERN INDIAN OCEAN.	5
SERAWG-01-INFO-04	Patagonian toothfish population analysis with data from two Spanish vessels fishing in the South of the Indian Ocean (SIOFA CA) between 2017 and 2018	4.3
SERAWG-01-INFO-05	AGE FREQUENCY AND RECRUITMENT – AN INSIGHT INTO ORANGE ROUGHY RECRUITMENT SUCCESS IN THE SOUTHERN INDIAN OCEAN	5.1

Annex D Alfonsino work plan

Activities and time-line of alfonsino stock assessments (SA) (2019-2020) (SIOFA SERA-WG)

Topics	Activities	Responsibility				2019									2020		
		CP	Secretariat	SERA-WG (co-chair) (JPN) +SC Chair	Consultant	4	5	6	7	8	9	10	11	12	1	2	3
	Meetings							(a)	MoP 6				(b)				SERA-WG2+SC5
CPUE	fine scale data submission (catch+CPUE)																
Acoustic data	Inventory of acoustic data	Cook Islands															
	Evaluation of acoustic data				?												
	Appointment of consultant (acoustic data process) only if the data are useful for stock assessment									(c)							presentation
Biology	Study of biological parameters (d)					Results need to be submitted before SA Consultant is hired.											
stock assessment	Appointment of consultant (stock assessment)						1st stage Evaluation of CPUE							2nd stage: stock assessment			presentation
	Decision on assessment approach and budget proposal							(a)									

(a) Web discussion by SC HoD if CPUE and acoustic data are used for stock assessment based on results of evaluations.

(b) Web discussion by SC HoD on biological parameters (ageing by otolith, LW relation etc.) for stock assessments

(c) If the acoustic data are used, TS vs length relationship, acoustic data process and other relevant works are included.

(d) Voluntary works by national scientists. For other biological activities (otolith and genetic works), budgets will be allocated.