

# 7<sup>TH</sup> SCIENTIFIC COMMITTEE MEETING REPORT

*7-12 October 2019*

*Havana, Cuba*

SPRFMO SC7 Report 2019

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**In Memoriam: Alexander Gretchina**

It was with great sadness that SC Members received the news of the passing of Dr Alexandre Gretchina. SC Members would like to honour our colleague and friend Alex, acknowledging that his contributions in the discussions have been missed in this meeting together with his great character and his big heart. We would like to extend our most heartfelt condolences to his family.



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## SPRFMO SC7-REPORT EXECUTIVE SUMMARY

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The 7<sup>th</sup> Scientific Committee Meeting (SC7) of the South Pacific Regional Fisheries Management Organisation (SPRFMO) took place from 7-12 October 2019 in Havana, Cuba.

Over 70 participants (scientists from 13 SPRFMO Members, representatives from 3 NGOs, two external invited experts and the Secretariat) reviewed and assessed almost 90 working papers. The Scientific Committee (SC) provided recommendations (Annex 1) on a wide diversity of issues.

**Annual reports** were received from Australia, Chile, China, Cook Islands, Ecuador, European Union, Korea, New Zealand, Peru, Russian Federation, Chinese Taipei, United States of America and Vanuatu.

The **Jack mackerel** in the southeast Pacific shows a continued recovery since the time-series low in 2010. Updated data indicate that the 2016 year-class is well above average. Nevertheless, the uncertainty about the size of this year-class is large, and model estimates differed substantially from the 2018 estimates. Therefore, a precautionary estimate (lower 95<sup>th</sup> percentile of the confidence interval) was used for the size of the 2016 year-class to be taken forward in the forecast. Estimated biomass increased from 2018 to 2019 in all model configurations (including one-stock and two-stock hypotheses) and are now well above  $B_{MSY}$ . Therefore, the SC noted that the Jack mackerel has been rebuilt to the third tier of the Commission adopted harvest control rule.

The SC notes that within the third tier of the harvest control rule, catches should be limited to either a fishing mortality of  $F_{MSY}$  or a maximum change in the catch limit of 15% (described in COMM6, annex 3). Fishing at  $F_{MSY}$  would be expected to result in catches in 2020 between 1,072 and 1,164 thousand tonnes (t), depending on model configurations and assumptions. As such, a maximum change in the catch limit of 15%, which would be based off the 2019 TAC, should apply.

Therefore, in line with the accepted rebuilding plan ("Adjusted Annex K") and because the Jack mackerel biomass is estimated to be above  $B_{MSY}$ , the SC **recommended** a 15% increase in 2020 catches throughout the range of Jack mackerel resulting in a total catch limit at or below 680 thousand tonnes.

The SC also discussed the Management Strategy Evaluation approach and identified that there is a requirement for a task group of Members of the Commission to guide the development of the harvest control rules and long-term management plan. It was recommended that a Task Group be established by COMM8.

**Regarding deep water issues**, the SC discussed updates on Ecological Risk Assessments (ERA) in deepwater fisheries, particularly deepwater sharks, rays and chimaeras. The different methods used in assessing the vulnerability of deepwater chondrichthyans to various demersal fishing gears showed good concurrence results. They also noted that stock delineation studies would be useful in the short to medium-term for orange roughy and alfonso.

The SC discussed an update to the Louisville Ridge stock assessments for **orange roughy** and noted that although current stock status for each of the stocks is quite uncertain, the current stock status for **Louisville Central and North** is likely to be above 50% and 30%  $B_0$  respectively; and **Louisville South** is likely to be above 20%  $B_0$ ; and therefore **recommended** that the current catch limit of 1,140 t per year for Louisville Ridge be maintained for 2020-2022.

The SC also discussed a stock assessment model for the straddling stock of orange roughy that includes ORH 7A (New Zealand) and the Westpac Bank (SPRFMO) and noted that the stock assessment estimated the current biomass of the entire stock to be 47%  $B_0$ , and that a maximum annual yield of 2,448 t would maintain the biomass of the stock above 40%  $B_0$  for the next five years. Since the current Total Allowable Commercial Catch limit for the entire area applied by New Zealand is 2,058 t the SC **recommended** that a catch limit for Westpac Bank could sustainably be set at a level up to 306 t, but that a catch limit of 258 t would represent a suitably precautionary approach.

Noting the need for further details and discussion around the technical details of the orange roughy stock assessments, the SC requested the Commission to consider whether a Deepwater Workshop could provide the opportunity to do so, and include further topics in need of deliberation, such as developing appropriate biological reference points for deepwater stocks within SPRFMO.

With regard to **VME encounters and Spatial management** the SC noted that there is continuous improvement in the data available to inform the review of the management measures planned for 2020. The new data points seemed to indicate that the habitat suitability models performed well in some places but also not very well in others and may have higher uncertainty than previously thought. The uncertainty results might indicate that CMM 03-2019 may provide less protection than previously thought. Further work is required to establish whether current thresholds are consistent with the objectives of CMM 03-2019 to prevent significant adverse impacts on VMEs.

The SC also discussed a review of the SPRFMO list of VME indicator taxa and **recommended** that when the Commission reviews CMM 03-2019 (Bottom Fishing) in 2021, the list of VME indicator taxa should be revised with a number of taxa to be added and others to be removed.

The SC noted the considerable progress leading up to full review of CMM 03-2019 in 2021. It was **recommended** to the Commission that a revised Bottom Fishery Impact Assessment (BFIA) Standard that had been considered intersessionally be adopted for any relevant BFIA processes undertaken in accordance with CMM 03-2019 and CMM 13-2019 (Exploratory Fisheries).

With regard to **Squid** a workshop was held two days prior to the SC7 meeting where important steps forward were made with respect to stock assessment and genetic studies. The SC discussed basic biology, assessment data, squid connectivity, genetic structure and the progress made towards a stock assessment.

The management measure discussions focused on fishing effort limits, temporal and spatial restrictions to protect spawners and juveniles, and observer coverage. However, there was no agreement on common elements for an appropriate CMM. Furthermore, the SC could not agree on any precautionary management measure duly noting the uncertainty on stock status and exploitation rate.

There was a specific request from the Commission to provide estimates of appropriate levels of observer coverage for fisheries without a CMM. There was no unified view on the most appropriate observer coverage level and as such the SC made a **recommendation** that the minimum number of at-sea full-time observers is 5 per Member or that observer coverage in the range of 5-15% should be implemented, for a period of 3 years.

With regard to **Habitat monitoring** there was discussion about the work covered in the HMWG workshop and intersessional activities that had taken place prior to the SC7. Progress has been made on collecting, storing and standardised analyses on fishing vessel acoustic data identifying other platforms that could be used to collect data for habitat monitoring. The HMWG developed its work plan and the SC recommended to establish a Steering Committee to organise a Symposium on Habitat Monitoring prior to the 2022 meeting of the Commission.

Regarding the intersessional progress towards development of **a CMM to promote scientific research** in the SPRFMO Convention Area, including a proposal to establish procedures for the conduct of fishing for fishery resources for scientific purposes in the SPRFMO Convention Area, it was agreed that any CMM aiming to promote scientific research and manage fishing for fishery resources for scientific research purposes should not prevent or hinder research.

The SC **recommended** that in order to facilitate answering scientific related Commission requests while considering the Security and Confidentiality Requirements of CMM 06-2018 (Commission VMS), **the review of CMM 06-2018** should provide that VMS data for scientific purposes require the permission of the Member or CNCP. It was suggested that making fishing activity data available to the SC would suffice for the need for high precision spatial data required for scientific analyses.

The Observer programme accreditation process and progress was acknowledged, and no specific advice was developed in relation to the process or outcome.

Concerning **exploratory fisheries**, the **Cook Islands** delegates presented the key findings of the two-trip programme of exploratory trap fishing. The SC revised its Fisheries Operational Plan with more research suggestions. The SC discussed the allocation of fishing effort across seamounts and the preliminary stock assessment and **agreed** that the approach outlined in the revised Fisheries Operation Plan is likely to ensure that the exploratory fishery is developed consistently with its nature as an exploratory fishery. The SC **recommended** that the Commission extend the expiry date of CMM 14b-2019 (Exploratory Potting CK) to 2022, aligning the CMM to the start of fisheries operations.

**Chile's proposal for an exploratory toothfish fishery** was discussed, and it was agreed that the approach outlined in the revised Fisheries Operation Plan is likely to ensure that the exploratory fishery is developed consistently with its nature as an exploratory fishery.

**Other relevant topics** addressed include seabird / bycatch interaction monitoring, climate change impacts on deep ocean fisheries, SC capacity building requirements, and the potential for more SC and CTC collaboration. The SC also agreed on its multi-annual workplan for 2020.

The **dates for the 2020 SC** were determined to be 3 October to 8 October 2020, with potential days for workshops 1-2 October. The venue will be Napier, New Zealand.

The SC noted that the current Chairperson of the Jack Mackerel Working Group (Dr Ianelli) has indicated that he would be prepared to step down and the SC warmly accepted Martin Pastoors as the new JMWG Chairperson.





## SPRFMO SC7-REPORT

### Report of the 7<sup>th</sup> Meeting of the Scientific Committee

*Havana, Cuba, 7-12 October 2019  
Adopted 12 October 2019, 7:20 pm*

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#### 1. Welcome and Introduction

1. The acting Scientific Committee (SC) Chairperson, Mr Niels Hintzen, opened the meeting and proceedings. Participants (Annex 2) then introduced themselves.
2. Dr Elisa García from the Republic of Cuba provided an opening statement and was thanked by the SC Chairperson for their welcome and hospitality.
3. The SC observed a moment of silence for Dr Alexandre Gretchina (Chile), who passed away unexpectedly on 28 September 2019.

#### 2. Administrative Arrangements

##### *2.1. Adoption of Agenda*

4. The Chairperson sought proposed changes to the Provisional Agenda and related documents (SC7-Doc01\_rev2). A specific item for election of Chairpersons was added and the SC adopted the agenda as provided in Annex 3.

##### *2.2. Meeting Documents*

5. Meeting documentation, location and access was presented. The document list (SC7-Doc03\_rev1) and annotated agenda (SC7-Doc02) were made available and referred to throughout the meeting.
6. There were 6 late papers that were considered and all accepted.

##### *2.3. Nomination of Rapporteurs*

7. Rapporteurship was supported by Australia, the European Union, New Zealand, and Chile. Lee Georgeson and Martin Pastoors offered to cover plenary sessions (including Ecosystem and Habitat Monitoring), Ignacio Paya and Juan Carlos Quiroz covered squid, Dr Marta Soeffker and Tiffany Bock covered deepwater with Shane Geange, Gerry Geen and Martin Pastoors covering Jack Mackerel.

##### *2.4. Meeting programme and Schedule*

8. The Indicative meeting schedule (SC7-Doc04) was introduced and made available. After discussion, slight modifications were agreed upon regarding the schedule.

#### 3. Discussion of Annual Reports

9. Annual Reports were received from Australia, Chile, China, Ecuador, European Union, Korea, New Zealand, Peru, Russian Federation, Chinese Taipei, USA and Vanuatu. Summaries for those reports are in Annex 4. The annual reports were taken as read and time was made for clarification questions (only).

### *Australia*

10. The High Seas Fishing Group (HSFG) queried why Australia did not fish using trawl gears during 2018. Australia noted that its trawl effort had been generally low and sporadic over the last 5-10 years but the reasons for zero effort in 2018 were unclear.

### *China*

11. China's national report described two vessels being sampled with over 200 vessels being active in the area. The SC queried the low observer coverage in China's squid fishery and whether there was a possibility to increase this. China noted that this was the first year observers have been deployed on board in accordance with the new observer CMM, and noted that minimum observer coverage levels have not yet been determined for the squid fishery. China noted that based on what has been collected so far, data was similar between the observer data and vessel-based data. They intend to undertake an observer coverage simulation study to inform coverage level requirements.

### *Chile*

12. The SC queried why the number of fishing vessels fishing on jumbo flying squid is decreasing, while the catch is increasing. Chile responded that the fisheries are waiting for the squid to grow larger before targeting them.

### *Ecuador*

13. The SC noted that no catch statistics were provided for Ecuador's in-zone squid fishery and queried whether it was possible to provide these data to SPRFMO for 2018. In response, Ecuador noted that squid fishing in Ecuador is currently done at an artisanal level, it is caught as bait for the fishing of large pelagic (tuna, mahi mahi, billfishes), and target fishery is low. Ecuador undertakes to present catch data and biological aspects at future meetings.

### *New Zealand*

14. The HSFG queried whether New Zealand could confirm how many vessels fished in the 2018-19 year and whether this refers to the calendar year, or the New Zealand domestic high seas permit year. New Zealand responded that the number of vessels that fished was given in table 3 of their report and that calendar year was used. The HSFG also queried whether the report included catch and effort data for the two longline fishing vessels permitted to target toothfish as part of New Zealand's exploratory toothfish fishery. These were confirmed to be included.

### *Peru*

15. The SC queried why no information was given on squid catch and effort in in-zone waters for 2018. Peru noted that it did not agree that there was a requirement to provide data on the squid fishery in its domestic waters. As there is no agreed assessment of jumbo flying squid this information is not being provided but could be provided in future for stock assessment purposes if other Members also provided the detailed information of their in-zone catches.
16. There were no other questions in relation to the other Annual reports that were received by the SC.

### *General Comments Relevant to Annual Reports*

17. The SC **noted** variable compliance with the requirements of the guidelines for annual reports, specifically that many reports were missing information on interactions with marine mammals, seabirds, reptiles and other species of concern.
18. The Chairperson noted that information on abandoned, lost, discarded and retrieved gears were part of the new guidelines which will be reviewed by SC7.
19. The SC **requested** that all Members follow the updated guidelines for annual reports in 2020.

## 4. Commission Guidance and Other Inter-Sessional Activities

### 4.1. Commission SC Multi-annual Workplan

20. Work planned for 2019 (refer SC7-Doc05\_rev1) was generally on track and was discussed further under relevant agenda items at SC7.
21. Regarding the Jack mackerel assessment data, the Chairperson queried progress towards the Jack mackerel workplan. In relation to the evaluation of the impact on age-length keys due to any revisions in age determinations, Chile noted that it had attempted to produce a new growth model in 2018 but that this was a work in progress, and they are expected to have an update in 2020. Progress on other issues is being made and was discussed during SC7.
22. The work supporting the Jack mackerel assessment was considered to be on track. The Chairperson noted that Management Strategy Evaluation (MSE) development and exploration of alternative Harvest Control Rules (HCRs) had commenced in 2019.
23. The SC was pleased to see the various papers on Jack mackerel connectivity that would be discussed during this meeting.
24. Regarding orange roughy assessment the SC noted indications that the Lord Howe Rise (LHR) may not be able to be assessed with North West Challenger in 2020. Australia urged that LHR be included in the Tasman Sea assessments for 2020.
25. The work to review Vulnerable Marine Ecosystem (VME) bycatch species was dependent on developing a process for review of all benthic bycatch data. In general, other tasks specified in CMM 03-2019 were on track.
26. The SC noted that the squid workplan would be reviewed again during the meeting following pending recommendations from the squid workshop. The development of a plan for more detailed within-season fishery monitoring was ongoing and there were no planned presentations for this meeting. The Squid workshop held prior to SC7 discussed both the development of a template to support monitoring and assessment of the performance of size-based models.
27. The Habitat Monitoring Working Group (HMWG) Chairperson(s) considered that work to evaluate data collected from fishing vessels and the other longer term workplan objectives were on track.
28. Regarding the Observer programme, New Zealand noted that a number of papers had been presented previously and no updates were prepared for SC7.
29. Regarding Observer coverage the Chairperson noted that this is a significant question for the SC, and it may prove difficult to provide advice to the Commission. New Zealand noted its previous paper to SC6 about seabird interaction rates in domestic squid jig fisheries (which were extrapolated across SPRFMO) and suggested that it would be much more useful to have better estimates of interaction rates for the SPRFMO squid jig fisheries via increased observer coverage.
30. The Exploratory Fishing tasks were felt to be on track.
31. Regarding tasks related to seabird bycatch NZ noted there was regional progress towards Spatially Explicit Fisheries Risk Assessments, but that work completed so far was more relevant to pelagic/tuna fisheries.
32. In relation to Ecologically and Biologically Significant Areas (EBSAs), New Zealand noted the design of spatial management areas in the development of the Bottom Fishing CMM did consider possible impacts on all the EBSAs which had been identified (particularly on the Louisville Ridge). The Deep Sea Conservation Coalition (DSCC) noted that the southern part of the Convention Area had not been assessed for EBSAs.
33. Under the Marine pollution work item, the Secretariat noted the 2019 Commission's request was made only relatively recently and that it encouraged relevant research to meet this objective.

## 4.2. Secretariat SC-Related Activities

34. Paper SC7-Doc18 “Status of previous SC recommendations” was presented and discussed. The Secretariat also provided an update on SC7-Doc10 “Secretariat SC related activities” over the past 12 months and noted the relevant tasks undertaken by the Secretariat in support of SC activities, including its attendance at relevant external meetings, working with other regional projects, formalising the FIRMS partnership and processing data releases.
35. The SC also noted that summaries of its two intersessional pre-SC planning meetings were available in document SC7-Doc09 “July 2019 Summary of web meeting(s)”.

## 4.3. SPRFMO Performance Review

36. The Secretariat introduced SC7-Doc08 on the Performance Review Recommendations that were developed by the performance review panel. The Executive Secretary offered to coordinate a working group with representatives from all Members to discuss and identify areas that need to be prioritised and added to the SC workplan.
37. The SPRFMO Secretariat also provided an update on SC7-Doc15 on Capacity building needs and noted the relevance to the SPRFMO Performance Review, which assessed how SPRFMO was performing in relation to the requirements of the SPRFMO Convention. At its last meeting, in response to the Performance Review recommendation (number 202h), the Commission highlighted the importance of capacity building and requested the SC to provide advice on how capacity building needs relevant to the work of the SC might be better managed.
38. SC agreed to work during the week to provide responses to the recommendations from the review. These responses are included at Annex 10 and included specifically that:

The SC **recommends** the Commission to consider mechanisms to harmonise coordination of data collection in observer programmes within the Memorandums of Understanding with relevant regional and/or sub-regional bodies.

The SC noted that the workshop participants supported a future CMM including data gathering and reporting for the jumbo flying squid fishery with several possible management approaches including catch limits, fishing efforts limits and temporal and spatial closures being discussed, however, there was no agreement on common elements for an appropriate CMM to be developed at this stage and **recommends** the Commission to consider the current situation on CMM discussion from the squid working group and allow adequate time to develop the elements of the CMM for the Jumbo flying squid fishery.

40. The SC Chairperson requested Members to think about how they wanted to collaborate and identify capacity building needs and noted that this would be considered in the workplan.

## 5. Deepwater

### 5.1. Inter-Sessional Assessment/Research

41. There were no specific topics discussed under this agenda item.

## 5.2. Ecological Risk Assessment and Stock Structure delineation

42. Australia introduced Paper SC7-DW10\_rev1, “Ecological risk assessment for the effects of bottom fishing gears on deepwater chondrichthyans in the SPRFMO Area”. This paper provides an update on the Ecological Risk Assessment (ERA) for deepwater chondrichthyans (sharks, rays and chimaeras) in SPRFMO deepwater fisheries and includes a draft manuscript that has been submitted to a scientific journal. Risks to deepwater chondrichthyans from fishing are poorly understood, particularly in areas beyond national jurisdiction.
43. The assessment adapted both the Productivity-Susceptibility Analysis (PSA) and Sustainability Assessment for Fishing Effects (SAFE) to assess the vulnerability of 174 deepwater chondrichthyans to various demersal fishing gears in the Southern Indian and South Pacific oceans. Several species were categorised as being at high or extreme vulnerability, including some in the Southern Indian Ocean that are reported to be commercially targeted and some in SPRFMO that are retained as bycatch.
44. There was good concurrence between PSA and SAFE results for species categorised as being at high or extreme vulnerability by the SAFE, but as expected there was an overall greater number assessed to be at higher vulnerability using PSA due to its precautionary nature.
45. Results indicate that running PSA and SAFE assessments concurrently provides more useful information than single assessments as it allows for better identification of potential false positives and false negatives. The paper concludes that better catch, effort and biological information is needed to inform assessment and management of deepwater chondrichthyans.
46. The SC discussed the outputs of the paper and noted the benefits of running PSA and SAFE in parallel to help identify potential false positives and false negatives. The SC also discussed the importance of considering the results in the context of information on catches and the understanding of species’ biology and life history characteristics, and being clear on the limitations of both the data and the risk assessment methods, in particular the uncertainty in the distribution of species and the assumptions around fishing effort.
47. It was also identified that there were significant differences in the results for midwater trawl across the two methods. The authors noted the midwater results are very uncertain and the difference is likely because of the assumptions around the vertical overlap of the species with the fishing activity. It was noted that these types of methodological limitations will continue until the data and risk assessment methods have high precision and resolution and include information on the intensity of effort (or finer spatial distribution of effort) within that.
48. The SC discussed that the primary value of the results of these risk assessments is for relative rankings of vulnerability (as opposed to absolute estimates) for driving the prioritisation of future work.
49. After considering SC7-DW10, the SC:
  - **Noted** that the ERA for deepwater chondrichthyans in the Southern Indian and South Pacific oceans has been finalised and the draft manuscript has been submitted for publication in a scientific journal;
  - **Noted** that other RFMO/As, such as SIOFA, have implemented measures prohibiting targeted fishing for deepwater chondrichthyans, which could be similarly implemented by SPRFMO to discourage such practices in the absence of scientifically based assessment and management;
  - **Noted** that information on deepwater chondrichthyan catches is often collected at a coarse resolution (for example, species identification is often at a genus level or coarser) and that improvements to this data collection would assist with future analyses;
  - **Agreed** that reductions in shark bycatch, particularly for species assessed to be at high or extreme vulnerability, would assist in mitigating any potential risk of overexploitation;
  - **Agreed** that improved assessments and estimates of sustainable yields would be useful in informing the level of reductions in shark bycatch required to mitigate any potential risk for overexploitation, particularly for species assessed to be at high and extreme risk that may be retained as by-product;
  - **Agreed** that in the absence of this information, measures to reduce shark bycatch (if implemented) should be informed by the precautionary approach; and,

**Recommended** to the SPRFMO Commission that:

- identification guides and identification protocols for sharks and rays available from Members be collated and made available to fishers active in the SPRFMO Area;
- Where observers are on board, biological data, including length, sex, number of eggs/pups, and life status (i.e. condition) if discarded (e.g. alive-vigorous, alive-signs of life and dead) are collected for sharks through updates to CMM 02-2018; and
- Sharks should be identified to the lowest taxonomic level possible, preferably to the species level.

50. Australia presented paper SC7-DW11 which provides an update on the PSA and SAFE ecological risk assessment for SPRFMO demersal teleosts. It describes results and discusses the development of the SPRFMO demersal teleost species list and progress towards the categorization of SPRFMO demersal species into the tiered assessment framework adopted at SC5. The majority of species were categorised by the PSA and SAFE as being at low vulnerability to the three gears assessed.
51. The SAFE assessment for longline gears resulted in a larger number of at-risk species than the trawl gears. For trawl gears, no data robust species were assessed to be at high or extreme vulnerability in the SAFE assessment. For demersal longline gears, data-robust target species assessed to be at high or extreme vulnerability included *Polyprion oxygeneios* (SAFE - extreme), *Hyperoglyphe antarctica* (SAFE - extreme) and *Nemadactylus macropterus* (SAFE - high).
52. Overall, there was good concurrence between PSA and SAFE results at the upper end of the vulnerability spectrum, with most species assessed to be at high or extreme vulnerability in the SAFE also ranked high in the PSA. The results of the assessment should be considered in the context of existing information on catches and species biology, as well as objectives regarding the application of the precautionary and ecosystem approach to fisheries management within SPRFMO.
53. The results suggest that categorisation into Tier 3 of the SPRFMO assessment framework (no further assessment required) would be appropriate for the majority of species. Despite this proposed categorisation, management measures may still be required for a number of species being taken in relatively large volumes. For all tier 1 and tier 2 species, a precautionary approach should be taken to categorise and prioritise species for further assessment, research and/or management measures.
54. The authors noted that in these approaches, data deficient species often get assigned a higher risk, but when the actual catches are very low to non-existent, there is little reason for concern. However, where fishing activity is present or substantial, such as for *Polyprion* spp. for example, higher risks identified warrant closer inspection of the overall situation.
55. Based on the results of this ERA and knowledge of catches and species biology, the SC **noted** that species listed at Annex B in SC7-DW11 have been proposed for categorisation into Tier 3 of the SPRFMO assessment framework (i.e. no further assessment required).
56. The SC considered the next steps for this type of assessment, given the large scale of the undertaking and the uncertainties highlighted around it.
57. The SC **noted** that a clear next step would be to consider species and fisheries spatial and temporal overlap, and that several new methods have emerged in recent years that would be more powerful addressing the question of risk and vulnerability in the future. Further research into species biology, gear selectivity, or post-capture mortality would also contribute to reducing uncertainty in the outputs of future assessments.
58. In regard to the process of future review and updating of these risk assessments, the SC **noted** that a retrospective approach e.g. using information from 5 years previously would likely result in a similar outcome and considered whether limiting the review to times when the fisheries in SPRFMO changed substantially. However, given the large amount of species and the scale of the undertaking, a regular review period would be more feasible.

59. The SC **noted** that interpretation of results for particular species of concern may benefit from additional spatial analysis of species distribution and depth ranges in relation to fishing effort, and closer consideration of the other productivity and/or susceptibility attributes driving overall vulnerability rankings for these species.
60. Regarding the monitoring of bottom fisheries, the SC **agreed** that catches of all species caught in bottom fisheries should be monitored and the priority list should be re-assessed periodically and changed as necessary following any major developments in fishing patterns or knowledge.
61. The SC discussed the role of stock delineation as an additional layer of information that could affect the outcomes of these risk assessments and **noted** that considering the given uncertainties, understanding the boundaries of stocks could have a substantive effect on the outcomes of the risk assessments. It would therefore be a short-term priority to address this question for at least the main exploited species.
62. The SC further discussed the accuracy of historical data holdings at SPRFMO, as the assessment highlighted that there were FAO species codes included in the SPRFMO database which correspond to species that do not occur within the SPRFMO area. The SC recalled that accurate data collection underpins most of the work to understand stock statuses and the impacts of fishing activities, and thus reliable data are fundamental to the work of the SC.
63. DSCC queried whether the risk assessments presented consider the state of fish stocks in adjacent areas, for example within the New Zealand EEZ, as part of the risk assessment, and whether, given the UNGA resolution requirements to assess stocks, whether a data collection plan for each of the listed species would be useful. Australia clarified that in paper SC7-DW09 stock status in the adjacent jurisdictions were also characterised, however that there is no relationship to the risk assessment itself, and that it would be necessary to take a weight of evidence approach here.
64. Australia also presented paper SC7-DW09, which discusses the need for stock structure delineation for SPRFMO demersal teleost species and considers several potential candidate species for stock structure analysis. The biological structure of most demersal fish stocks in the SPRFMO Convention area is uncertain but there are relatively few species for which Australia believes stock structure analyses should be prioritised.
65. Importantly, it needs to be established whether there is a pressing need for stock structure delineation in order to manage species and stocks within sustainable limits. With the exception of *Hoplostethus atlanticus* (orange roughy), there are few demersal species for which current levels of catch and effort are likely to be having a measurable influence on stock depletion and where stock assessment and possible implementation of harvest strategies may be warranted.
66. Possible candidate species where this may be the case (based on simple analyses of spatial and temporal characteristics of catches and catch volumes, CPUE, targeting and/or species biology/life history) and where information on stock structuring may be important for their management include *Beryx* spp. (mostly *B. splendens*, (alfonsino)), *Hyperoglyphe antarctica* (blue-eye trevalla, bluenose), *Polyprion* spp. (hapuku, bass groper, wreckfish etc.), *Nemadactylus macropterus* (tarakihi, jackass morwong), *Seriola lalandi* (yellowtail kingfish, yellowtail amberjack) and Lethrinidae and Etelinae species (predominantly *Lethrinus miniatus* (redthroat emperor)). For most stocks, management using catch triggers in conjunction with adequate monitoring may be appropriate management responses in the interim.
67. After consideration of SC7-DW11, the SC:
  - **Agreed** that cost and effort for ERA should be commensurate with the management needs and that methodological refinements to the current analysis may not be necessary at this time, but acknowledges that interpretation of results for particular species of concern may benefit from additional spatial analysis of species distribution and depth ranges in relation to fishing effort, and closer consideration of the other productivity and/or susceptibility attributes driving overall vulnerability rankings for these species;
  - **Noted** that additional research into species biology, gear selectivity and/or post capture mortality may reduce uncertainty in the outputs of future assessments;



- **Requested** that the SPRFMO Secretariat work collaboratively with Members and CNCPs to resolve species coding issues in the SPRFMO database, which would provide additional certainty that all species potentially at risk are included in future assessments;
- **Agreed** that species listed at Annex A (in paper SC7-DW11) could be considered for additional management measures and/or research, which could include, *inter alia*, more quantitative assessment, enhanced data collection, precautionary catch triggers and monitoring, or stock structure delineation studies, and that attempts are continued to categorise these species into Tier 1 or Tier 2 of the SPRFMO assessment framework;

68. Based on the results of this ERA and knowledge of catches and species biology, the SC:

- **Noted** that species listed at Annex B (in paper SC7-DW11) have been proposed for categorisation into Tier 3 of the SPRFMO assessment framework (i.e. no further assessment required);
- **Requests** that SPRFMO participants aim to identify all species listed at Annex A (in paper SC7-DW11) to a species level (or the highest taxonomic resolution possible) in the collection and reporting of catch and other relevant data;

**Recommended** that ERA assessments be repeated at least every five years and/or if there are substantial changes in the characteristics of SPRFMO bottom fisheries, and that this is reflected in the SPRFMO SC workplan. Such assessments could be expanded to include all SPRFMO fisheries.

69. Following consideration of SC7-DW09, the SC:

- **Noted** that stock delineation studies would be useful in the short to medium-term for the following species:
  - *Hoplostethus atlanticus* (orange roughy);
  - *Beryx splendens* (splendid alfonsino);
 and **agrees** that a workplan to drive stock structure delineation efforts should be developed for each of these species and presented to SC8 in 2020.
- **Notes** that stock delineation studies could be useful in the medium to longer-term for the following species:
  - *Hyperoglyphe antarctica* (bluenose warehou, bluenose);
  - *Polyprion oxygeneios* and *P. americanus* (hapuku, wreckfish, bass, because these are increasingly targeted instead of bluenose warehou in the New Zealand line fishery);
  - *Nemadactylus macropterus* (tarakihi, jackass morwong);
  - *Seriola lalandi* (yellowtail amberjack, kingfish);
  - Lethrinidae and Etelinae spp. (because these are increasingly targeted in the Australian line fishery);
 and **agrees** that a workplan to drive stock structure delineation efforts for these species should be developed and presented to SC9 in 2021.
- **Agreed** that fish species not included in the above lists are caught in SPRFMO bottom fisheries in such low volumes that stock delineation studies are a very low priority;
- **Agreed** that catches of all species caught in bottom fisheries should be monitored and the priority list should be re-assessed periodically and changed as necessary following any major developments in fishing patterns or knowledge; and
- **Agreed** that the medium-term workplan be modified to reflect any decisions.



### 5.3. SPRFMO Orange Roughy Assessments

70. New Zealand presented SC7-DW05, which describes a Bayesian stock assessment model for the Louisville Central orange roughy stock using age and length compositions and constraints on maximum exploitation rates. The biological parameters and year class strengths for Louisville Central were then used to update catch-history based assessments for Louisville North and South (where composition data have not been worked up). No biomass indices were available, but the composition data were adequate to rule out very high exploitation rates for Louisville Central in 1995 (when there was a spike in catches) and eliminate low values of  $B_0$  and current stock status. The estimates of unfished and current biomass for the Louisville stocks remain uncertain but the new data have enabled more precise stock assessments. The new estimate of  $M$  (0.03) points to lower yields per unit of biomass for these stocks compared with New Zealand stocks (where  $M \sim 0.045$ ). Although stock status remains uncertain, the models suggest that Louisville Central is probably above 50%  $B_0$  and Louisville North is probably above 30%  $B_0$ . There is a possibility that Louisville South is below 20%  $B_0$  but it is likely well above this level.
71. The SC requested clarification on several technical details including the steepness, reason for high catches outside of spawning season in early years, recruitment assumptions for projections, estimated year class strengths, potential retrospective analyses, and where the estimates of long-term yield come from. New Zealand agreed to follow up on these topics with individuals but was able to clarify that the long-term yield calculations were made based on results from applying the New Zealand EEZ orange roughy management strategy evaluation for  $M = 0.03$  and  $h = 0.6$  and was a scalar on  $B_0$ .
72. The HSFG provided background on the high catches outside of spawning season, explaining that in the early years of the fishery it was possible to catch orange roughy all year round, so there was no need to limit fishing to the spawning season.
73. The SC welcomed that all input files for these orange roughy assessments had been provided as appendices to the papers, noting that this would allow the SC to get a more detailed understanding of the assessment itself, and to re-run the assessments during the meetings (if necessary), and encouraged this practice for future SC and WG meetings where possible.
74. Regarding how to consider advice for the three stocks in the Louisville Ridge, the SC recalled that it had arrived at a similar conclusion in yield for the three stocks two years ago at SC5, which was deemed to be based on a precautionary approach. The SC considered whether, given the new information available, individual catch limits for each stock would be possible to develop, but considered that in the current situation, as long as the stocks are closely monitored, there was no clear advantage of separate yields over a total yield.
75. DSCC queried why the assumed minimum/maximum exploitation rates were higher for Louisville Central at 10% than for the other two stocks, which were around 5%. New Zealand clarified that Louisville Central was the most heavily fished of the three stocks, and the catch-only models are guided by those maximum exploitation rate estimates. New Zealand noted that while there is still some uncertainty associated with the assessment, it is still more certain that the assessment made two years ago.
76. After considering SC7-DW05, the SC:
  - **Noted** that the Louisville Ridge stock assessments have been updated using age and length frequency data from Louisville Central;
  - **Agreed** that the current stock assessment is currently the best available information on which to base management advice for Louisville Ridge orange roughy stocks;
  - **Noted** that although current stock status for each of the stocks is quite uncertain, the current stock status for Louisville Central and North is likely above 30%  $B_0$ ; and that current stock status for Louisville South is likely above 20%  $B_0$ ;

- **Noted** that as the input data did not include any biomass estimates the results should be treated with some caution. The median estimates of stock status and long-term yield were driven by the maximum exploitation rate assumptions and were less reliable than, for example, the lower bounds of the 95% CIs on biomass estimates and the probability of being below 20%  $B_0$ , which could be a more precautionary estimate to consider in the setting of catch limits.

**Recommends** that the current catch limit of 1,140 t per year for Louisville Ridge is maintained for 2020-2022.

77. New Zealand presented SC7-DW06, which describes a Bayesian stock assessment model for the straddling biological stock of orange roughy that includes ORH 7A (New Zealand) and the Westpac Bank (SPRFMO). Catches peaked in 1987–88 at about 12,000 t but reduced rapidly until the fishery was closed in 2000. The fishery was re-opened in 2010–11 with a TACC of 500 t which was increased to 1,600 t following a stock assessment in 2014. SPRFMO's catch limit on Westpac Bank is currently 200 t. The 2019 assessment made greater use of acoustic spawning biomass estimates from the 2005 to 2018 series of trawl and acoustic surveys than previous assessments. Estimates of spawning biomass on Volcano (Westpac Bank) were used for the first time. Current stock status (B2019) was estimated to be 47%  $B_0$  (95% CI: 39–55%  $B_0$ ). The most pessimistic sensitivity run estimated current stock status to be 37%  $B_0$  (95% CI: 30–45%  $B_0$ ). Application of the in-zone New Zealand Harvest Control Rule (target biomass range 30–50%  $B_0$ ) used for the New Zealand fishery suggests a catch limit of 2,448 t and projections estimate a 93% probability of stock status remaining above 30%  $B_0$ .
78. The SC sought further clarification on several technical details of the presented assessment, regarding the differences in priors and posteriors of  $q$ , spawning assumptions of mature fish, and the lack of sensitivity of the assessment to the removal or correction of variation in the acoustic data. New Zealand agreed to follow up on these topics with individuals, but was able to clarify that the assumption regarding all mature fish spawning each year was the usual assumption within the New Zealand EEZ orange roughy stock assessment.
79. CALAMASUR provided further information, noting that as the biomass estimates drive the assessment, and the estimates are relative rather than absolute, when this question was examined internally the conclusion was that it did not make a difference if the assumption is 100% or less.
80. DSCC queried the different assumptions made in this assessment when compared to the Louisville assessment, such as the estimate of  $M$  which is lower when estimated within the model here rather than being fixed as in the Louisville assessment. New Zealand agreed to follow up on this question individually but noted that a fixed  $M$  of 0.045 was assumed. New Zealand further noted that the estimated biomass was currently substantially above 20%  $B_0$ , and that sensitivity analyses and an internal review processes have determined that this value was not badly misleading.
81. The SC queried the observed age frequencies for 2018 and the model fit to those, acknowledging the low sampling effort for this particular year, but noting that higher densities of young fish and lower densities of old fish predicted by the model, and that combined with 10-year projection periods this may give rise to the question whether the assessment relies on over-optimistic assumptions regarding recruitment. The SC further queried whether the poor fit to the age frequencies would warrant a different selectivity assumption, for example using a logistic approach rather than assuming constant selectivity.

82. The SC discussed the assumptions made around recruitment within the model in more detail. The SC and the Invited Expert (Dr Arkhipkin) noted that recruitment events from the start of this fishery (including during a period of overfishing and depletion) would only now begin reaching maturity due to the longevity of this species and asked whether an attempt had been made to study or estimate more recent recruitment events, e.g. through surveys. The SC further expressed some concern that any recruitment events entering the fishery now would be mostly coming from the virgin population, and thus it is still not clear what the actual impact of the fishery is on current recruitment. If there are no investigations focussing on understanding more recent recruitment events, it will be at least 25-30 years before impacts of today's activities would be recognised, but the stock has already been below 20% virgin biomass. The SC further noted that it took almost a decade in the 1990s to return the stock from below 20%  $B_0$  to just above 20%  $B_0$ , and that the 10-year projections assuming the proposed fishing pressure as constant showed some risk of the stock returning to below 30%  $B_0$  at the end of that time period, highlighting the need to understand longer-term impacts of fishing pressure through longer projection periods in the assessment. CALAMASUR noted that there are some examples of domestic stocks within New Zealand that were historically exploited and for which recruitment into the biomass from depleted populations has been monitored, and that based on evidence from those stocks, concerns about this were sometimes overstated.
83. New Zealand acknowledged that a varying selectivity might lead to a better fit, however that in this case, the sample was from a single tow which was unlikely to have been representative of the 2018 population, and as such it may not be advisable to adjust the whole model to fit the small sample size. The fit to the 2014 age data, which had a more representative sample size, was notably better. With regards to the assumptions and efforts around recruitment, New Zealand clarified that at present there were no surveys or other investigations into determining more recent recruitment events, but that the concern was a valid one and if there were several consecutive years of poor recruitment that would become apparent through a decline in biomass, in which case the Harvest Control Rule applied by New Zealand would lead to a reduction of fishing mortality, thus providing a mechanism to prevent depletion of the stock. The limitation to 5-year projection periods was due to the management needs within the New Zealand EEZ, which assumes that catch limits would be adjusted every 5 years so a longer period was not considered necessary internally. New Zealand clarified that the very steep decline at the beginning of the time series coincided with very high catches, which were an order of magnitude greater than catch limits now. It may also have come from year class strengths recruiting to the fishery during that period given variability in recruitment over time.
84. New Zealand presented SC7-DW07 on 'Stock assessment and catch limit proposals for Westpac Bank orange roughy', building on the Bayesian stock assessment model for the straddling biological stock of orange roughy that includes the Westpac Bank in paper DW06. New Zealand suggested options for possible advice to the Commission on the catch limit for the Westpac Bank. The catch limit for the part of this stock within New Zealand's EEZ will be increased from 1,600 to 2,058 t in 1 October 2019, although the Harvest Control Rule in use in that fishery would allow larger increases. The same proportional change on the Westpac Bank would imply an increase in the SPRFMO catch limit from 200 to 257 t.
85. The SC sought clarification on how the relationship between the catch limit suggested to apply to the 12.5% of the stock thought to be found within the SPRFMO Area relates to the catch limit set by New Zealand within its EEZ based on an assessment that encompasses the entire stock, and whether the longer-term intention was for this fishery to focus on certain spatial areas. New Zealand clarified that catch taken from the Westpac Bank Area by New Zealand vessels is from within the New Zealand Total Allowable Commercial Catch and is not additional to the catch limit set domestically, meaning that New Zealand vessels can, in total, take 2,058 t, but that no more of that than the catch limit set by SPRFMO may come from the Westpac Bank Area. Catch taken by other Members in the Westpac Bank Area is additional to that catch limit but is expected to be relatively small and to not have any significant impact on the stock projections over time. The separation of Westpac catch limits from EEZ catch limits was not an intentional catch spreading mechanism, but to consider the entire stock in the setting of TAC rather than without reference to the whole biological unit.

86. Recalling that SPRFMO has yet to develop biological reference points and harvest control rules for its deepwater stocks, the SC enquired whether in future, there was room to consider developing a two-area model as well as a two-fisheries model. New Zealand responded that a two-area model would definitely be a development to consider.
87. DSCC asked what the position of New Zealand was regarding setting the allocation of catch outside the EEZ to be consistent with the decision of the New Zealand Fisheries Minister implemented on 1 October 2019, and whether the proposed catch limits outside the EEZ would be additional to those agreed by the New Zealand Fisheries Minister, bearing in mind that there would also be an allocation to non-New Zealand parties.
88. New Zealand replied that any catch taken by other members would be additional to the 2,058 t agreed by the Fisheries Minister for the New Zealand fleet, but is not expected to change projected stock status. The limit proposed in Option 4 (306 t) is considered as the maximum limit still deemed sustainable for the entire stock based on the outcomes of the assessment, and in this case the domestic New Zealand catch limit was adjusted to reflect likely limits outside the EEZ. For the remaining options, the assumption was that any additional catches outside the EEZ would not exceed the maximum proposed under Option 4. The Harvest Control Rule in all cases was set to allow zero probability to drop below 20%  $B_0$  in the projections.
89. Following consideration and discussion of SC7-DW06 and SC7-DW07, the SC:
  - **Agreed** that the New Zealand 2019 stock assessment for the Southwest Challenger Plateau stock of orange roughy, which includes the Westpac Bank Area in the SPRFMO Convention Area is the best available information to support management decisions;
  - **Requested** that long-term projections be included for Westpac in future assessments;
  - **Noted** that there is no new information to suggest that the estimate of 12.5% of the stock biomass being in the Westpac Bank area is inappropriate;
  - **Noted** that the stock assessment estimated current biomass of the entire stock to be 47%  $B_0$ , and that a maximum annual yield of 2,448 t would maintain the biomass of the stock above 40%  $B_0$  for the next five years, and that the current Total Allowable Commercial Catch limit for the entire area applied by New Zealand is 2,058 t;

**Recommended** that a catch limit for Westpac Bank could sustainably be set at a level up to 306 t, but that a catch limit of 258 t would represent a suitably precautionary approach given uncertainties in the stock assessment, in particular with regards to potential recruitment, and would also be consistent with the assumption that 12.5% of the Southwest challenger stock biomass occurs in the Westpac Bank area and that the catch limit be proportional to the total catch limit for the stock in accordance with this assumption.

90. Noting the need for further details and discussion around the technical details of the orange roughy stock assessments, the SC requested the Commission to consider whether a Deepwater Workshop could provide the opportunity to do so, and include further topics in need of deliberation, such as developing appropriate biological reference points for deepwater stocks within SPRFMO.
91. New Zealand presented SC7-DW08, a summary of data and archived otoliths that might be used to update and improve the stock assessments for Tasman Sea stocks. Largely in line with the level of catch, the most data and otoliths appear to be available for the northwest Challenger Plateau stock, but sufficient are probably available for the Lord Howe Rise. Based on this assessment, the guidance in SC-05's report, and the SC's multi-year workplan, it was proposed that age-based stock assessment models be developed for the northwest Challenger Plateau as a priority and, as time and resources permit, for the Lord Howe Rise. These two stocks have supported about 86% of orange roughy landings from the Tasman Sea. In the year after the development of models for the key Tasman Sea stocks, it was proposed that further work be conducted on Louisville stocks, including the collection of acoustic indices following the generic design agreed by SC-06.

92. The SC enquired about the slight shift towards smaller fish over time. New Zealand clarified that the plots of Length Frequency distributions over time in the paper are unscaled, range the whole of the SPRFMO Area, and that it would not be appropriate to infer anything from them at this time.
93. The SC urged that assessments for both Tasman Sea stocks be undertaken concurrently and further noted that insufficient progress with data collection to inform the stock assessment for the Lord Howe Rise stock in 2020 may have implications for yields based on the advice from SC5 that if insufficient progress was made by 2020, significantly more precautionary yields should be considered.
94. The SC considered SC7-DW08 and:
  - **Agreed** that sufficient data appear to be available to develop age structured models for orange roughy on the Northwest Challenger Plateau and the Lord Howe Rise, the two largest Tasman Sea stocks; and

**Recommended** that, consistent with the multi-annual workplan, a stock assessment for the northwest Challenger Plateau be developed as a priority in 2020 for review by SC8 and, as time and resources permit, for the Lord Howe Rise.

95. New Zealand presented paper SC7-DW20, which provides a summary of age estimates from otoliths taken from samples of the commercial catch of orange roughy taken from the Louisville Central stock. Estimated age compositions from early in the fishery (1995) and recent catches (2013–15) were compared. Ignoring spatial patterns (which turned out to be significant, see paper DW05), the mean age of adult orange roughy was about 8 years lower in 2013–15 than in 1995. Based on transition zones, age at maturity was 31 years. Age estimates for individual fish ranged from 21 to 230 years and 0.5% of fish were estimated to be older than 200 years at the time of sampling. These age estimates were key inputs to the stock assessment of the Louisville Central stock (paper DW05).
96. Upon enquiry by the SC whether the otoliths from 1995 coincided with the start of the fishery, New Zealand clarified that 1995 was the first year that otoliths were available for ageing, not the first year of the fishery, but that it was relatively early in the history of the fishery in the Louisville area.
97. There were no specific recommendations from this paper.

#### *5.4. VME Encounters and Spatial management*

98. New Zealand and the EU presented SC7-DW18 summarising the approaches used by other regional organisations to prevent significant adverse impacts on VMEs. There is a notable emphasis by many RFMOs on encounter protocols as a key tool, although almost all also have closed areas and additional measures that protect VMEs. SPRFMO's current bottom fishing measure (CMM03-2019) restricts bottom fishing to tightly-defined areas within the historical footprint that were designed to minimise the impacts on VME key indicator taxa while providing access for fisheries. Like most other RFMOs, SPRFMO has a VME encounter protocol based on threshold weights, but this was envisaged as a "backstop" to complement the spatial management approach rather than a primary tool. Other key differences of SPRFMO's approach are that there are no designated VMEs and associated closures (all areas outside the defined fishing areas are essentially closed to protect VMEs), that the performance of the spatial management measures at protecting VME indicator taxa has been estimated, and that avoiding significant adverse impacts on VMEs is considered mostly at a broad, regional scale, rather than a local scale. The aspect of scale will be part of further discussions in SPRFMO as there was no united view on what constitutes prevention of Significant Adverse Impacts on VMEs.
99. The DSCC provided updates on NAFO, where they have recently closed the final seamount in their area to bottom fishing and provided additional detail on measures in CCAMLR that are also described in SC7-DW18.

100. The HSFG noted that Members should be aware of the ratio of open to closed areas and vessel effort for bottom fishing when considering the approaches taken in other RFMO/As and provided a CCAMLR example where, with the approval of an MPA, 65% of the Ross Sea area is closed (compared to over 99% in SPRFMO), they also reminded Members that as shown in the NZ /EU presentation the encounter protocols in SPRFMO should not be the primary management measure but complement the spatial management and should allow sustainable use.
101. It is **recommended** that the SC:
- **Notes** the variety of approaches used by other RFMOs and CCAMLR to avoid significant adverse impacts on VMEs;
  - **Evaluates** the relevance and utility of approaches used by other RFMOs and CCAMLR when reviewing the SPRFMO Bottom Fishery Impact Assessment Standard and the bottom fishing measure, CMM 03-2019, to prevent significant adverse impacts on VMEs.
102. Paper SC7-DW12 was introduced by New Zealand. It summarised work to determine the availability of new data for VME indicator taxa and consider the associated implications for the review of VME habitat suitability models for ten SPRFMO VME indicator taxa. There were 10s of new records for *Madrepora oculata* and *Enallopsammia rostrata*, 100s for *Solenosmilia variabilis*, *Goniocorella dumosa*, Antipatharia Stylasteridae, Pennatulacea, and >1,000 for Alyconacea, Demospongiae, and Hexactinellida. New records came from a variety of databases and, for some taxa (including *Solenosmilia variabilis*), many of the new data records came from the image datasets, a source of data not used for constructing the existing models. Some of the new data records came from areas where data were previously absent or scarce, and the spread of new data is across areas representing a range of habitat suitability predictions for all VME indicator taxa. Thus, the new data should provide for rigorous testing of at least some of the models.
103. The SC **noted** that there is continuous improvement in the data available to inform the review of the management measures in 2020. It noted that the new data points seem to indicate that the habitat suitability models perform well in some places but also not very well in others and may have higher uncertainty than previously thought.
104. The SC **agreed** that updated models should be used for the updated Bottom Fishing Impact Assessment Standard, but that these updates would also have implications for reviewing how the measure is performing against its objectives.
105. As a next step, the SC suggested that the observations be overlaid on the outputs from updated habitat models to verify that the new models are also being informed by new data, and to establish whether new data would change the outcomes and likely interpretation of the model. There also remains a level of concern that the old model did not predict the presence of some of those observations. New Zealand noted that due to the spatial aspects of the models, being at a 1 km<sup>2</sup> scale, a low prediction of presence from the habitat suitability model does not mean that organisms are not present in a particular cell, and noted that the model should be tested across its whole range, not on specific points. The new data spans a range of habitat suitability predictions which makes it powerful to test the model as described and should allow testing for consistent over/under predictions, but advised caution in drawing conclusions about there being significant issues based on some observed organisms in areas with low predicted habitat suitability.
106. Following consideration of SC7-DW12, the SC:
- **Agreed** that new records for VME indicator taxa should be obtained from all available data sources, and that all new data should be error-checked prior to being used to test the habitat suitability models of Georgian et al. (2019)<sup>1</sup>.

<sup>1</sup> Georgian, S.E.; Anderson, O.F.; Rowden, A.A. (2019). Ensemble habitat suitability modeling of vulnerable marine ecosystem indicator taxa to inform deep-sea fisheries management in the South Pacific Ocean. *Fisheries Research* 211:256274.



- **Agreed** that, should the testing of the models raise concerns about the levels of uncertainty of the habitat suitability predictions for any taxa, then the models for those taxa should be updated in 2020 to be used in the revised BFIA (refer paragraph 25 of CMM 03-2019).
107. New Zealand presented SC7-DW13 reviewing the SPRFMO list of VME indicator taxa relative to those used by other R(F)MOs in terms of their morphological, ecological, and life history characteristics within the SPRFMO Convention Area. Thirteen taxa were identified as suitable VME indicators within the SPRFMO Area, of which zoantharia, hydrozoa, and bryozoa are not currently included as VME indicators within CMM 03-2019.
108. The SC noted that some of the conclusions and recommendations from this paper related to a separate discussion in relation to setting threshold levels for move-on rules, which will be taken at a later time, and that therefore its discussions here would be limited to the review sections of the paper. The SC noted that the criteria were set out clearly, the results were consistent with definitions by the FAO of VMEs, and that this was an appropriate way to evaluate potential candidate VME species within the SPRFMO area.
109. DSCC queried whether rhodoliths had been considered during this work, noting that they were mentioned during the exploratory fishery presentation from the Cook Islands and are considered VMEs in other jurisdictions. New Zealand noted that they were not considered at this time, as the initial focus was on those indicators used by other RFMOs, but they could be considered in future.
110. Following consideration of SC7-DW13, the SC:
- **Agreed** that the approach to review the list of VME indicator taxa is appropriate;

**Recommended** that, when the Commission reviews CMM 03-2019 in 2021, the list of VME indicator taxa should be revised to include the following additional taxa, noting that specific threshold weights may need to be revised once additional work is done to establish whether current thresholds are consistent with the objectives of CMM 03-2019:

- Gorgonian Alcyonacea
- Zoantharia

**Recommended** to the Commission that, when it reviews CMM 03-2019 in 2021, the list of VME indicator taxa should be revised to remove the following taxon and associated weight thresholds:

- Alcyonacea

**Recommended** to the Commission that, when it reviews CMM 03-2019 in 2021, the list of VME indicator taxa used for the biodiversity component of the encounter protocol should be revised to include the following additional taxa:

- Zoantharia
- Hydrozoa (Hydroids)
- Bryozoa

- **Agreed** that a broader list of VME taxa for the SPRFMO Convention area should be developed.
111. As required by CMM 03-2019 and the SC workplan, New Zealand presented SC7-DW15, a summary of benthic bycatch by their vessels, including a review of all reported VME encounters. There were no reported encounters under CMM 03-2019 from 86 trawl tows conducted between 28 April 2019 and 4 August 2019. Consequently, assessments of the consistency of encounters with habitat suitability models were not undertaken.
112. The SC asked if there was any known reason why the frequency of the triggering events was double what was initially estimated. New Zealand clarified that it is likely the result of changing distribution in fishing effort over time.

113. The HSFG offered that the reason was most likely due to the very low effort in this fishery and the fact as recorded that the area available to bottom fishing has reduced by 50% from the previous CMM.
114. The DSCC raised several questions, primarily around the spatial distribution of the events that would have been encounters had CMM 03-2019 been in force in 2018, including whether the events were in areas that were previously closed, whether they were from the same feature, and if they were from the same trawl tracks. New Zealand noted that spatial analysis of these events had not been completed, but there is an intention in future to look at these questions and be able to report if there is any pattern amongst them and if they are in areas that were previously closed.
115. The DSCC also asked if there was an immediate management response to the events at the time. New Zealand clarified that the events took place in open areas that at the time had no move-on rule in place and therefore there was no immediate closure or management action taken.
116. After consideration of SC7-DW15, the SC:
  - **Noted** that little benthic bycatch had been recorded by observers on bottom trawl vessels operating in the SPRFMO Area since CMM 03-2019 became binding on 28 April 2019 and there had been no encounters with potential VMEs as defined in the measure;
  - **Noted** that, had the new encounter protocol been in force between 1 January 2018 and 28 April 2019, 13 unique move-on events would have been triggered, more than initially expected events based on previous analyses.
117. New Zealand presented SC7-DW14 as requested by SC6 to assess catchability of VME indicator taxa in both trawl and bottom-line fisheries to inform encounter thresholds. A detailed analysis of existing New Zealand trawl records and seabed imagery suggests that insufficient data exists from within the SPRFMO Area to develop meaningful estimates. Although estimates of catch efficiency were typically < 1%, these estimates should be interpreted with great caution because the records were not well matched, and uncertainty was very high. Several options exist to provide more meaningful quantitative estimates of catchability for VME indicator taxa, including using additional data from within and/or outside the Convention Area and collecting new data from headline and net cameras on commercial trawls.
118. The SC enquired about the wording of the recommendations given that the results appear to suggest an outcome of the research, rather than the current wording which suggests it is too uncertain to draw any quantitative conclusions. New Zealand responded that there is a high level of uncertainty in a number of inputs that propagates through the analysis.
119. The SC **noted** the high level of uncertainties, but expressed the view that quantitative values had previously not been available and even with very wide confidence intervals, which reflect the majority of uncertainties raised, these represent the best currently available knowledge specific to SPRFMO on catchability of VME organisms in benthic trawls.
120. The outcomes of this work were consistent with studies done elsewhere (including in SC7-DW21) and the SC asked whether addressing the highlighted uncertainties would change the conclusion that retention of VME indicator taxa in benthic trawl gear was very low. New Zealand noted that it was not likely to change the general conclusion, but that at present the results would not be suitable for the development of conversion factors. The SC suggested that the means and variances be calculated approximately weighted by the amount of data available from each area.
121. The SC agreed that deploying cameras on the headlines of trawl nets will help to better understand the actual impact and improve existing knowledge of benthic biodiversity.
122. A brief discussion around trawl gear followed, including whether the cumulative impact for each evaluated trawl track was considered in this analysis, and whether the analysis considered the specific width of contact of bottom trawl gear. New Zealand clarified that cumulative impact was not considered although that information would be available, and that the introductory figure was a broad approach that did not include details on specific gear width of contact although the actual analysis included details of specific gear width of contact.



123. The HSFG agreed that headline cameras will help resolve these outstanding questions and referenced video footage they have gathered as well as a voyage by a New Zealand research vessel on the Louisville where over 26,000 photos were taken at depth that show the variation in presence of benthic organisms. They also noted that this survey found a need to look deeper than expected to find benthic organisms.
124. The DSCC asked if the study had looked at how many trawls had occurred in the areas of analysis before the assessment and noted that the catch of benthos in one area suggested trawl paths are not as narrow as suggested. New Zealand responded that there is a table that provides information on the number of tows in each area, and noted that there is information that suggests trawl tracks are in well-defined portions of the features being analysed and not widespread.
125. The SC recognised that the spatial mismatch between the benthic survey data and trawl paths was likely to introduce a systematic bias into the analysis. While this analysis represented the best available information based on existing data, caution should be taken not to use the results in a quantitative sense as the numbers are likely systematically biased.
126. A Member raised a point that estimating impacted biomass at the scale of the current CMM 03-2019 is only relevant if there is knowledge of the total weight of a given species, providing context on the impacted biomass in relation to the total biomass. Other Members disagreed with the point and noted it is unlikely that there will ever be a reliable estimate of the total biomass of a given species. The Chairperson noted that the issue of scale is one that has been discussed before and will be discussed again at a later point.
127. After consideration of SC7-DW14, the SC:
- **Agreed** that there is high uncertainty and probable bias associated with this analysis of SPRFMO trawl bycatch data, but notes the results indicate low catch efficiency for benthic taxa in trawl gears that accords with other analyses undertaken elsewhere that indicate that small amounts of benthic bycatch brought up in nets can correspond to large weights of benthic taxa impacted on the seabed;
  - **Agreed** that a better approach to quantifying catchability of VME indicator taxa than using opportunistic samples would be to compare the biomass of VME indicator taxa landed on deck with estimates of seabed biomass from headline and net cameras, but acknowledges that, until this can be done, other methods such as using paired data to determine catchability are being investigated;
  - **Noted** that analysis using paired data (i.e. co-located data from waters adjacent to the SPRFMO Area) indicated that catch efficiency is very low and small amounts of benthic bycatch brought up in nets corresponded to large weights impacted on the seabed in that analysis;
  - **Noted** that estimates of catchability may, in the future, be useful in converting reported bycatch of VME indicator taxa into estimates of the extent of the impact of individual events on VME taxa on the seafloor which could help inform the review of VME indicator thresholds in SPRFMO CMM 03-2019.
128. Australia presented paper SC7-DW21\_Rev1 “Progress with investigating uncertainty in the habitat suitability model predictions and VME indicator taxa thresholds underpinning CMM 03-2019” which informs the SC on an analysis contributing to whether the CMM is meeting/will meet its objectives to prevent and/or manage significant adverse impacts (SAIs) on vulnerable marine ecosystems (VMEs). This work will also contribute towards a full review of CMM 03-2019 in 2021. The paper described progress on three tasks:
- 1) Better understand what actual VME taxa abundances on the seabed correspond to levels of predicted probability, by examining relationships between predicted probability of presence and observed abundances of VME taxa, using previous CSIRO empirical data and modelling outputs;
  - 2) Examine the potential over-prediction of the SPRFMO 1 km habitat suitability probability modelling, using observation data from south-eastern Australia; and
  - 3) Estimate VME catchability by analysing existing CSIRO research data, to contribute towards review of the encounter thresholds.

129. Results to date demonstrated that there is considerable uncertainty regarding the proportion of stony coral reef protected across the modelled region, and evidence within the paper suggested that CMM 03-2019 was likely to provide less protection than previously thought across SPRFMO, particularly within bioregions such as the Louisville Seamount Chain and the Lord Howe Rise. The work also demonstrated that the encounter thresholds for VME indicator taxa in CMM 03-2019 are very likely to correspond to very high covers and biomasses of VME taxa on the seabed. Therefore, the paper concluded that there was very high uncertainty regarding whether CMM 03-2019 will achieve the objective of preventing SAIs on VMEs at all spatial scales and recommended that until a full review of the measure is undertaken, and key uncertainties resolved, more precautionary VME bycatch trigger levels would help to mitigate and minimise risks of SAIs on VMEs.
130. The SC discussed the generality of the conclusions with regard to the relationship between predicted probability of occurrence and actual abundance of VME indicator taxa, and regarding over-prediction. Additional plots showing a different and much less steep relationship for Louisville features were presented by New Zealand in paper SC7-DW17\_rev1. These plots also showed that *Solenosmilia variabilis* was observed at some sites with low to medium predicted habitat suitability. The SC also discussed potential implications of the granularity of observation and sampling versus the predictions and also the physical differences in the locations in which the two different analyses were conducted.
131. The SC acknowledged that these relationships might be expected to be different in different models with different data and for regions with different characteristics and noted that the relationship found in DW21 was consistent with findings in some other studies (e.g. Gonzales-Mirelis et al. 2019<sup>2</sup>) but not with the new (unpublished) plots included in DW17-rev1. In response to questions around the power-of-8 approximation, Australia noted that the conclusions of DW21 were not predicated solely on this approximation *per se*, rather that summing a probability of presence profile gives larger totals than an abundance profile — and moreover, the power-of-8 adjustment used could not ‘correct’ for the empirical evidence of over-prediction, where there are predictions of medium and high probability in areas where observations show no corals present. The plots from Louisville features showed *S. variabilis* across a wide range of habitat suitability predictions. Australia suggested that these same uncertainties, for the same reasons, have been published previously for relatively data-rich features on the Louisville Seamount Chain demonstrating need for caution when applying such predictions in spatial planning (Anderson et al., 2016<sup>3</sup>).
132. The SC discussed the implications of potential over-prediction in the habitat suitability models (particularly in the extensive areas with sparse or no data, where pseudo-absences were the key input to the models) on the post-accounting of how much VME habitat is exposed to trawling under the spatial management measures and on the potential for underestimating VME protection. The results shown in DW21 suggest that there is increased uncertainty associated with the post-accounting process, particularly in regard to the majority area of the modelled domain with low to moderate predicted habitat suitability outside areas where most of the data occur.
133. New Zealand clarified that, although the outputs of the Georgian et al. (2019) models were used in the design of the open and closed areas, the open areas were also selected based on their estimated naturalness, their historical value to fishing and operational considerations (e.g. allowing for gear to be set on the ‘run-up’ to key areas). Fishing does not occur within the entire spatial extent of any given open area and it has been estimated that the actual footprint was (at most) 24% of the open areas. The SC discussed that if fishing remained within its past footprint then not all VME taxa within open areas would be trawled; however, the CMM includes open areas around seamounts, so there is no formalised limit to the future exposure to trawling and there are no rules to prevent currently un-impacted areas within management areas from being impacted in the future.

<sup>2</sup> Gonzales-Mirelis et al. (2019) *Frontiers of Marine Science* submitted.

<sup>3</sup> Anderson, O.F.; Guinotte, J.M.; Rowden, A.A.; Clark, M.R.; Mormede, S.; Davies, A.J.; Bowden, D.A. (2016) Field validation of habitat suitability models for vulnerable marine ecosystems in the South Pacific Ocean: Implications for the use of broad-scale models in fisheries management. *Ocean & Coastal Management* 120: 110-126.

134. The SC discussed the issue of scale in the context of the interpretation of significant adverse impacts on VMEs and whether this would affect CMM 03-2019 meeting its objectives. The SC noted that there are different interpretations of the scale at which VMEs are defined and at which significant adverse impacts on VMEs should be managed. There was agreement that guidance from the Commission would be extremely helpful in resolving the issue of the relevant spatial scale for considering SAIs on VMEs and it was noted that a relevant recommendation on this was formulated in discussions of paper SC7-DW17.
135. The SC discussed the work done to date on catchability and agreed that available information on the catch efficiency of trawl gears for VME indicator taxa is broadly consistent and indicates that these catchabilities are generally very low, meaning that only a small fraction of VME indicator taxa on the seafloor are caught and retained by demersal fish trawls and that the thresholds currently in place likely translate into much greater impacts at the seabed.
136. CALAMASUR noted that paper SC7-DW13 proposed including additional VME indicator taxa to the CMM, and that adding new taxa was estimated to increase the sensitivity of the move-on rule and the likelihood of triggering an encounter.
137. The SC queried whether re-opened areas that had formerly been closed had been fished before. It was clarified that the management areas close some previously fished areas but also re-opened some areas that had not been fished for up to 8 years. The DSCC queried whether recovery was provided for in the spatial management. It was clarified that papers to the Commission showed that about four times as much apparently suitable habitat was closed to fishing as was re-opened under CMM 03-2019 (which allows for potential recovery of corals and VME taxa, to which some recent studies provide evidence for).
138. In relation to the catchability analyses, HSFG queried the location of the study in the Great Barrier Reef (GBR) and at what depth those samples were taken. Australia confirmed that some of the catchability results were from sampling on the GBR shelf seabed, not on coral reefs, in depths of 30-80 m, noting that while the taxa on the GBR would vary from those expected to be seen in the SPRFMO area, the estimates of catchability presented in DW21 were consistent with those known from other studies.
139. The HSFG noted that there is an international obligation to protect VMEs, but also reminded the SC that they are required to consider sustainable use as well as VME protection. The SC acknowledged the economic ramifications of closures or more restrictive management measures for the fishing industry.
140. The DSCC enquired whether further work was planned to examine these uncertainties for taxa other than stony coral *S. variabilis* in the future. It was confirmed that this was intended through collaborative work planned by New Zealand and Australia.
141. The SC **agreed** that it would be useful to indicate to the Commission that the results show increased uncertainty about the predictions of the distribution of at least one important VME indicator taxon which may mean that the protection statistics of the measure might be lower than previously estimated.
142. The SC **agreed** that further work is needed to be more certain about the implications of the results presented in SC7-DW21, and that the Commission should also be advised that further work is underway to examine these issues.
143. The SC **agreed** that, if the Commission wanted to be more precautionary in the meantime, the management areas or thresholds could be adjusted to achieve this.
144. The SC **noted** that any adjustment to the management approach should consider a broad suite of scientific, management, regulatory and economic aspects and it was suggested that New Zealand and Australia could work together to develop a discussion paper to assist the next Commission meeting to make an informed decision.
145. After consideration of SC7-DW21, the SC:
  - **Noted** that considerable progress has been made on the work programme mandated by CMM 03-2019 on bottom fisheries and also that there is much work in progress leading up to full review of CMM 03-2019 in 2021, including a cumulative Australian and New Zealand bottom fishery impact assessment in 2020;

- **Agreed** that work in progress suggests that uncertainty in the predictions of the habitat suitability models for VME taxa may be higher than previously thought and this leads to increased uncertainty in estimates of the proportion of stony coral protected across the modelled region. Specifically, the new results might indicate that CMM 03-2019 may provide less protection than previously thought;
  - **Agreed** that presence of areas of high habitat suitability for VME indicator taxa within the current Bottom Trawl Management Areas contributes to the uncertainty in the estimates of the proportion of VME taxa protected under CMM 03-2019;
  - **Agreed** that the VME indicator taxa thresholds outlined in CMM 03-2019 are likely to correspond to high coverage and biomass of VME taxa on the seabed and further work is required to establish whether current thresholds are consistent with the objectives of CMM 03-2019 to prevent significant adverse impacts on VMEs, and that it is important to evaluate whether bycatch of VME indicator taxa that correspond to these thresholds would result in significant adverse impacts;
  - **Agreed** that given these increased uncertainties, lower encounter thresholds for VME indicator taxa would help to mitigate risks of significant adverse impacts on VMEs until key uncertainties with the performance of the spatial management measures can be resolved;
  - **Urged** all members to continue working collaboratively to reduce key uncertainties as part of the cumulative bottom fishery impact assessment.
146. New Zealand provided SC7-DW16 summarising the requirements of clause 32 to 36 (but especially 32 and 33) of CMM 03-2019 related to encounters with potential VMEs and the process by which SC should review any such encounters and advise the Commission. The paper was structured using the sequential components identified for such a process, with discussion points for SC under each. Under each component, there are several options for what might be done, and there is a need to balance what is required to ensure the measure works as expected and delivers on its objectives with what is feasible and reasonable for the Member, the Secretariat, and the SC to deliver.
147. The SC **noted** that SC7-DW16 provided a useful framework around what will be a complex process. This process will require level of confidence that the models will be informative to the review of any encounter events because of model uncertainty.
148. The SC **noted** that this process only deals with encounter events, and the measure requires a process for review of all benthic bycatch (not just benthic bycatch related to encounter events), so that will need to be developed to sit alongside this process.
149. New Zealand agreed and noted that the models are uncertain and that part of the value of this process is challenging models with data. Information on the benthic bycatch and new information to inform the models has also been produced.
150. The SC **agreed** that there is a separate process needed for the review of benthic bycatch that does not trigger an encounter and thought needs to be given to how this fits into annual benthic bycatch reporting.
151. The HSFG provided a short update on fishing activities in the last year which comprised 3-4 trips in the Tasman Sea area, and one trip out to the Louisville that was for five days. They noted that it would be unlikely to have seen any events that triggered the encounter protocol given the much-reduced fishing effort and reduced area available to fish. They also noted that they actively try to stay on well-known trawl tracks avoid possibly triggering a move-on event because closing an area constrains their ability to undertake fishing activities. Some of the open areas are very small and a single move on event with the 1-mile restriction would stop fishing in that open area.
152. The DSCC noted that CMM 03-2019, in particular paragraphs 32 and 33, provides for the SC to consider a wider range of factors other than just whether the encounter was unexpected. New Zealand agreed that the CMM provides for any other information the SC considers relevant to be considered and make recommendations to the Commission as it sees fit.
153. It was suggested that the details of this paper be discussed in a small working group that would take place intersessionally.

154. After consideration of SC7-DW16, the SC:

- **Noted** that up to 18 August 2019, there have been no encounters since CMM 03-2019 came into force, so no reviews of temporary closures are required this year;
- **Agrees** to the draft components of a review process identified in this paper for application and revision in future years and develops a protocol or terms of reference for the review process, using an intersessional working group;
- **Agreed** that a geodatabase of standardised and approved GIS layers should be developed including habitat suitability predictions for the 10 VME indicator species at a 1 km spatial resolution, including corresponding naturalness and uncertainty layers;
- **Agreed** that the geodatabase will be held by the Secretariat and can be provided to Members and CNCPs to aid in the evaluation of encounters each year;
- **Noted** that Members will work collaboratively on the suite of VME indicator taxa appropriate for SPRFMO, the thresholds for VME encounter protocols, habitat suitability models for VME indicator taxa, and estimating the performance of the spatial management regime to be completed before SC8 meets in 2020 to support advice to the Commission on the ongoing effectiveness of CMM 03-2019;

**Recommended** to the Commission that, with respect to individual temporary suspensions / closed areas following encounters, that the Commission:

- Notes that SC7 has reviewed information on benthic bycatch and all temporary suspensions to fishing that occurred since CMM 03-2019 was adopted; and,
- Notes that no encounter events occurred before the SC's annual meeting;

155. New Zealand presented SC7-DW17 describing work already completed, work underway, and future tasks that will collectively contribute to the various requirements of CMM 03-2019 to review the spatial management measures, VME indicator species, and encounter thresholds at SC8 in 2020. This is required so that SC8 will be able to advise the Commission on the ongoing appropriateness of the management measure to ensure it can achieve its objective and the objectives of the Convention.
156. The DSCC provided three comments on the presentation. The first suggested that the approach described in the paper is inconsistent with the CMM, the Convention, other RFMO approaches and would be better addressed by policy change in the UN General Assembly. Secondly, it was argued that the paper relies on a misconception of VMEs and there is no justification for using 'bioregional scale' when seeking to avoid Significant Adverse Impacts on VMEs. Thirdly, the paper is inconsistent with the functioning of the SC and does not apply a precautionary approach when considering identification, distribution and possible VME impacts.
157. New Zealand responded that the intervention is based on an interpretation that VMEs occur at a very small (site or local) scale. The FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas (FAO Deep-sea Guidelines) and UNGA resolutions, Convention text and CMM can be interpreted at a bioregional scale and are not necessarily at a site/local scale. The whole debate comes down to one of the scale at which VMEs are defined and the scale at which SAIs on VMEs should be considered. New Zealand noted that sites are mentioned in the FAO Deep-sea Guidelines, but that they interpreted this to be in a wider context. New Zealand suggested that the guidelines are not explicit enough to determine the appropriate scales that should be considered. The previous paper asks the SC to call on the Commission to work towards resolving the issue of scale.
158. The DSCC observed that the UNGA will be undertaking a review of the bottom fishing measures in August 2020 and that this was the appropriate route to request to review the UNGA resolutions and the FAO Deep-sea Guidelines.

159. The HSFG asked if work to look for recovery of benthic taxa on features that have been closed following fishing activity could be added to the work plan. New Zealand responded that it sounded like a good idea, but there are additional considerations that need to be taken into account, including the feasibility of such a study within current SPRFMO CMMs and requirements.
160. The SC **noted** that the undertaking of the joint BFIA cumulative impact assessment would benefit greatly from the updating of the habitat models using the new available data. New Zealand noted that it could be added in if it is not already there.
161. After consideration of SC7-DW17, the SC:
- **Noted** that considerable progress has been made on the work programme required by CMM 03-2019 on bottom fisheries;
  - **Agreed** that a review process for all new and historical benthic bycatch data (i.e. not just for events that trigger the encounter protocol) will be established inter-sessionally and included as part of a protocol based on that outlined in SC7-DW16, in line with the recommendation from paragraph 85 of the SC6 report<sup>4</sup> and implicit in paragraphs 35 and 37 of CMM 03-2019;
  - **Noted** that much work remains for Australia and New Zealand to conclude a cumulative bottom fishery impact assessment before SC8 as required by CMM 03-2019;
  - **Noted** that there are a number of unresolved issues, particularly regarding the definitions of SAIs and VMEs, and relevant questions of scale, and that SPRFMO in isolation is currently unable to resolve these issues;

**Recommended** that the SPRFMO Commission cooperate and coordinate with other RFMO/As and the FAO in refining or developing guidelines on the interpretation of appropriate scale of consideration and assessment of SAIs on VMEs, giving consideration to the FAO Deep-sea Guidelines and relevant UNGA resolutions, and taking into account efforts by RFMO/As to meet their obligations in this regard.

162. The High Seas Fishing Group (HSFG) presented a brief summary of their observer paper SC7-Obs1 which provides information on the spatial scale of the areas open to bottom fishing in the SPRFMO Area and stated that they believe that the current measures are hyper-precautionary.
163. The HSFG requested that members carefully review video footage of actual bottom fishing and recognise that camera work is on-going and will inform what is actually on the bottom in the small area open to bottom fishing. The HSFG made the point that if there is no VME / Benthos in an area then the trawl net will not catch anything. The SC asked about the possibility of video footage from headline cameras being provided and used for scientific analyses.
164. The HSFG concluded that the effect of the current CMM was to close areas to bottom trawling amounting to 99.81 % of the total SPRFMO area. They believe that the SC must give due consideration to the matters raised in their paper and ensure that a fair balance is struck between sustainable use of the marine environment and protection of the environment. In the HSFG's view the hyper-precautionary approach currently being adopted in this and other forums is out of step with what is required and what is mandated.
165. The DSCC presented paper SC7-Obs04 addressing the issue of thresholds and the encounter protocol for the bottom fishing measure CMM 03-2019. They conclude that the 99% threshold is arbitrary and extreme, and that the policy choice of a percentile threshold is ultimately one for the Commission, applying the precautionary approach and other provisions of the SPRFMO Convention and following the applicable United Nations General Assembly Resolutions and FAO Deep-Sea Guidelines. SC advice of a risk assessment and consequences of each choice would be welcome.

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<sup>4</sup> SC6 *inter alia* Recommended a mandatory review process for VME Indicator encounters (annual), benthic data (annual), and models underpinning spatial management approaches (roughly every 5 years or when evidence suggests those models are misleading), and to include the development of the review process in suggested SC work plans for consideration by the Commission;



### 5.5. Bottom Fishery Impact Assessment Standard (BFIAS)

166. Australia presented paper SC7-DW19 “Review of the SPRFMO Bottom Fishery Impact Assessment Standard” which provides background to the revision of the SPRFMO BFIAS and briefly summarises feedback received from the intersessional working group. It provides a draft revised SPRFMO BFIAS as an attachment for consideration by SC7.
167. Changes made to the revised BFIAS include that much of the procedural and supporting text has been reduced, simplified or moved to annexes. References to recent relevant science and links to SPRFMO measures have been updated. The scope has been expanded so that impact assessment will consider marine mammals, seabirds, marine reptiles and other species of concern—in line with an ecosystem approach as required by the SPRFMO Convention—as well as deepsea fish stocks and vulnerable marine ecosystems.
168. The revised BFIAS is structured around a framework for risk and impact assessment with the following components:
  - 1) Identification of objectives, assets, hazards and risks using a hierarchical risk assessment approach;
  - 2) Identification and assessment of impacts;
  - 3) Identification of mitigation, management and monitoring measures relevant to impacts and residual risks; and
  - 4) Iterative and adaptive review.
169. The intersessional process highlighted a number of conflicting perspectives on technical aspects, particularly regarding definitions of significant adverse impacts and vulnerable marine ecosystems and relevant questions of scale. A number of these issues remain unresolved.
170. The DSCC noted that this is a really useful way to move forward on the BFIAS development process and asked that additional possible new fishing methods be included in the future review given the likelihood of new methods encountering new VME taxa. Australia noted that the current draft BFIAS is aiming to include all gears, noting that not everything can be covered in detail, but agreed that it should be included and considered in the future review.
171. The SC suggested that a wider workshop including other RFMOs may be required to discuss the interpretation of the FAO Deep-sea Guidelines, and that the SC may have some funds for this.
172. Following consideration of SC7-DW19, the SC:
  - **Agreed** that a comprehensive and inclusive process of revising the BFIAS has been undertaken by the intersessional working group and that the draft revised BFIAS takes into account the varied feedback received from stakeholders;
  - **Agreed** that the revised BFIAS is used to inform the development of a cumulative BFIA to be undertaken jointly by Australia and New Zealand by 2020;
  - **Acknowledged** that the process of undertaking a best-practice BFIA in 2020 may result in knowledge that could be used to refine the BFIAS, and agrees that the BFIAS could be retrospectively updated once this BFIA is completed and has been reviewed by the SC;
  - **Requested** that an intersessional SC working group be formed to review the BFIAS with the knowledge gained from the development of the cumulative Australian and New Zealand BFIA in time for SC9 in 2021 and, taking into account any progress made towards clarifying or refining issues of scale and SAls on VMEs, to develop appropriate recommendations thereon for the Commission meeting in 2022;

**Recommended** to the Commission that the revised BFIAS at Annex A (of SC07-DW19) be adopted for any relevant BFIA processes undertaken in accordance with CMM 03-2019 and CMM 13-2019.

## 6. Jack Mackerel

### 6.1. Inter-Sessional Assessment/Research

173. Chile presented SC7-JM02 on “Space-time dynamics in CJM fishery from South-central Chile in 2019”, noting that catches in south central Chile between January and August 2019 are 32% up on the same period in 2017 and 12% up compared to this period in 2018. It was noted that the standardised CPUE has increased substantially in recent years because the fish has been caught closer inshore, so trip length has been much reduced. The fish concentrate on temperature fronts associated with upwelling that is close inshore at the beginning of the season. Catches are taken further offshore as the season progresses, this movement of the fish is associated with the movement toward the spawning areas on the high seas.
174. In 2019, there were fewer juveniles in the catch than in the previous two years, with the mode being around 34-36 cm which contrasts with the size structure of catches of the offshore fleet that caught predominantly larger fish of greater than 40 cm until late in the season when juveniles were caught in the northern area. It was noted that in the south central area there was an absence of juveniles in the catch, an increase in food resources for Jack mackerel, and an absence of jumbo flying squid.
175. An overview of the spatial distribution of catches in the fishery from the mid-1990s was provided that illustrated that the fishery was initially concentrated close to the coast near Concepcion. From 2003 to 2011 the fleet moved progressively further offshore. From 2012 onwards catches have again been close to the coast. The presentation also showed the distribution of catches of the international offshore fleet during the same period.
176. It was noted that the fishery in northern Chile is normally focused on fishing for anchovy with Jack mackerel bycatch and only opportunistic directed fishing for Jack mackerel. Chile also stated that their Jack mackerel fishery had attained MSC accreditation in 2019, noting that the industrial fleet routinely avoids juvenile fish and that the industry is currently preparing formal best practice protocols in this regard.
177. Chile noted that it has remote sensing data going back to the 1980s that could also be used in concert with the spatial catch data.
178. Chile noted that during warming events more juveniles are found in the south central fishery but because there is spatial separation with adult fish the fleet is able to target the adults. Smaller fish are normally taken in the northern Chilean fishery but not in 2019 when more adult fish were accessible to the fishery.
179. The SC appreciated the initiative to combine the spatial data for both the offshore and south central fleets and suggested that the next step should be to combine the data from all of the fleets to provide a visual presentation of the whole fishery.
180. Peru presented SC7-JM04 on the situation of the Peruvian stock of Jack mackerel (far-north stock) and the Peruvian fishery in national jurisdictional waters, period January 2018 - June 2019. It was advised that the marine environment off Peru is highly variable and that over the last five years it has been subject to more frequent warming periods than previously experienced and fewer normal periods. This has been associated with lower landings of Jack mackerel between 2014 and early 2018. Slightly warmer than neutral conditions associated with the weak 2018-2019 El Niño favoured the presence of denser concentrations, increased availability to the industrial purse seine fleet, much higher abundance indexes and consequently higher catches of Jack mackerel during the second half of 2018 and first half of 2019. Jack mackerel abundance indexes from acoustic surveys and from the fishery increased noticeably between January 2018 and August 2019, and composite yearly CPUE values of 2018 and 2019 were well above the CPUE values observed between 2002 and 2017.
181. Peru noted that the length frequency of catches in 2018 included a large number of juveniles whereas in 2019 catches were of significantly larger fish with a mode of 34-36 cm. An increasing trend in the availability of Jack mackerel in Peruvian waters was noted.



182. Survey results on jumbo flying squid and for Jack mackerel during April 2018, September 2018 and in June 2019 indicated the existence of an increasing trend in the abundance of Jack mackerel and an inverse relationship between the relative abundance of Jack mackerel and jumbo flying squid. Peru indicated that there is a spatial separation of these species in both latitudinal and longitudinal directions and also with respect to depth, with squid inhabiting deeper waters. It was noted that there is a strong relationship between areas of high salinity and the existence of squid concentrations, whereas high salinity is unfavourable for Jack mackerel. This leads to Jack mackerel being found mainly in the south of Peru while jumbo flying squid is found mainly in the north and further offshore.
183. Chile noted the similarities with the indications of the importance of the Humboldt current index in helping to explain squid landings in Chile.
184. The EU asked whether the Habitat Monitoring Group could analyse the habitat preferences of jumbo flying squid and Jack mackerel, noting the useful data and analyses provided by Peru and Chile.
185. The Russian Federation asked why there were no landings of Jack mackerel in June when there was a high biomass recorded in the June acoustic survey. Peru responded that the fleet targets anchovy at that time and that Jack mackerel landings are opportunistic when there is no anchovy fishing.
186. Vanuatu asked if there was a disconnect between the acoustic survey results that detected predominantly juvenile fish and the use of this data in the setting of TACs for adult fish. Peru responded that the acoustic results were only one component of their Jack mackerel assessment, and that the fleet were targeting large fish with a larger mesh size than that used for trial fishing in support of the acoustic survey.
187. Ecuador presented SC7-JM03 on the Jack mackerel fishery in Ecuador. The document explained the background and history of the catches of Jack mackerel in Ecuador, where reported catches reached 180,000 t in 1995 and averaged 52,000 t in the 1990s. There has usually been little catch since 2000, although there was a 70,000 t catch in 2011. The document indicated that there has been steady growth of the fishmeal industry since 2002 based on catches of a mixture of ten small pelagic species, including chub mackerel, sardines and Jack mackerel.
188. Peru asked if Ecuador has a fleet capable of fishing for Jack mackerel outside its EEZ. It was reported that there is no exclusive fleet at the coastal level dedicated to catch Jack mackerel, but it is a fleet dedicated to catch a variety of small pelagic fish species. It was noted that the fishing industry is very interested in developing Jack mackerel fishing activity, however, the current quota allocated is not sufficient for the Ecuadorian fishing sector to develop this fishery in the Convention Area. Additionally, Ecuador highlighted its commitment to the organization of collaborating with fisheries and biological data that give a greater knowledge of the dynamics of Jack mackerel in Ecuadorian waters. It was noted that the fleet has not found Jack mackerel in the EEZ in recent years, although there has been no particular exploration for this species. It was indicated that in previous meetings of the SC, biological fishery data have been presented, as well as the presence of Jack mackerel larvae in Ecuadorian waters.
189. The SC refrained from commenting on the quota allocation mentioned in the document. The Executive Secretary advised that the allocation of quota to different coastal states is not within the prerogative of the SC. Article 8b of the Convention states that the Commission will “determine the nature and extent of participation in fishing for fishery resources including, as appropriate, for particular fish stocks”.

190. The EU presented SC7-JM06 on CPUE standardization of the offshore fleet. Prior to 2018 two offshore CPUE series were used in the assessment of Jack mackerel: the standardised Chinese CPUE and the nominal offshore fleet CPUE (EU, Vanuatu, Korea, Russia). During the benchmark assessment of 2018, the nominal offshore CPUE was converted into a standardised CPUE series, following the same methods as used for the Chinese CPUE. The working document presented the results of a fully combined and standardised Offshore CPUE index that is based on the haul-by-haul data of China, EU, Korea, Vanuatu and Russia as contained in the SPRFMO database. The standardization procedure is identical to the procedure followed during the benchmark in 2018. The final GAM model consists of a number of discrete factors (year, vessel, month and El Niño Effect) and a smoothed interaction between latitude and longitude. The new standardised CPUE series starts in 2008 as this is the first year for which haul by haul information was available to carry out this analysis. CPUE for the offshore fleet has decreased between 2008 and 2012, has slowly increased between 2013 and 2017 and has decreased in 2018, indicating a lower availability of Jack mackerel in the offshore waters.
191. The SC **noted** that the new procedure with a combined standardised CPUE series is an improvement compared to the previous practice of using two separate CPUE series.
192. It was **noted** that it is important to maintain data availability of haul-by-haul data for future years, in order to be able to calculate the standardised CPUE as input to the assessment.
193. It was **noted** that a further improvement could be achieved by extending the time series further back in time (i.e. prior to 2008) and making that data available for the analysis.

The SC **recommends** that for future years, the haul-by-haul data will continue to be made available by the Members of the offshore fleet, via the SPRFMO Secretariat, for the analysis of standardised CPUE.

The SC **recommends** that Members work together on making historical (prior to 2008) haul-by-haul data available, via the SPRFMO Secretariat, for the analysis of standardised offshore CPUE.

## 6.2. Assessment Data Review and Evaluation

194. Chile presented an update of the Joint Jack Mackerel (JIM) single stock model, explaining that the process is to start from last year's model and then update sequentially with new data from 2018, including catches, length compositions, and CPUE indices. The model results from this 2018 data update (moving through model versions 01 to 06) were shown to be a substantial increase in recruitment and biomass and a reduction in fishing mortality.
195. The next stage was to include the 2019 data in a stepwise manner, generating model versions 07 to 16. An important factor affecting the model results was the Chile north acoustic survey that led to a substantial increase in estimated recruitment. This was moderated by the inclusion of the Peruvian length composition data.
196. An anomaly was seen in the 2015 weight-at-age data for the offshore and south-central Chilean fleet. In model version 16 the 2015 data were replaced by the average of the 2014 and 2016 weight at age data, and in model 17 the 2015 were downweighed. Neither model showed any significant changes in results although there was an improved fit to offshore CPUE.
197. This was followed by a presentation from Peru on the 2-stock model.
198. In discussion of the updates, the SC asked why the 2015 recruitment appeared to increase so much compared with the results from the previous assessment. This was advised to be the result of the change in 2015 weight at age data and the effect of the Chile north acoustic survey that showed a lot of older fish. It was noted by EU that 2019 data confirmed the stronger estimate of 2015 recruitment.
199. The SC **agreed** that the data updates were appropriate and that the data averaging of the 2015 and 2018 weight at age data represented an improvement in the model.

200. The SC **noted** that there is a need to carry out better quality control on the input data to the assessment, especially with regards to the catch data. This could be operationalised through specific quality control diagnostics.
201. The SC **accepted** the offer by the EU to develop r-tools for quality control of the catch data worksheets, to be presented to the next SC meeting in 2020.

### *6.3. Jack Mackerel Stock Assessment*

202. Chile presented the results of the base single stock model, renamed *1.00*. The key results in summary are that the stock looks healthy with the biomass being estimated to be above the level that generates MSY. Recent recruitments are estimated to have been high compared to the average level experienced over the previous 10 years. Landings are also higher while fishing mortality has decreased for all fleets except the far north fleet. The Kobe plot points to the 2019 stock condition being back in the green, healthy zone.
203. Chile stated that the biomass is estimated to be 10% above the level that generates MSY and that the model diagnostics appear to be reasonable.
204. The SC **agreed** that model version *1.00* would be the base single-stock model for 2019.
205. Peru presented the results of the two-stock model. The same process of updating and testing was followed as for the single-stock model.
206. The results for the southern stock showed very similar patterns to those seen in the single stock model. In the northern stock the recruitment, biomass and fishing mortality all increased for the most recent years. The spawning biomass increased after not having changed significantly over the past 5 years. The fishing mortality of the northern fleet increased, although to a level that was still lower than that of the southern fleet. This was said to be the result of the opportunistic nature of the Jack mackerel fishery in Peru. The stock recruitment curves for both stocks were presented. For the northern stock, two different regimes were identified; a higher regime from 1970-1996, and a lower regime from 2001-2016. It was suggested that the recent recruitments might possibly be indicating a shift back toward the more productive regime. The northern stock is also well inside the green, healthy zone of the Kobe plot.
207. EU indicated that the recruitment estimates for the northern stock in 2002, 2005 and 2010 were high compared to other years. Peru replied that large variations in recruitment were often seen in Peruvian waters for small pelagic species as a result of major fluctuations in environmental conditions.
208. Chile asked if the low Jack mackerel catches in Peru when the industrial fleet is targeting anchovy would result in the model interpreting this as low abundance in the northern stock. Peru replied that the industrial fleet is quick to switch to anchovy fishing whenever possible, but the artisanal fleet fishes all year round for a mix of inshore small pelagic species for human consumption including Jack mackerel. Peru reported that several years ago a new CPUE index was developed that used and standardised the data for the industrial and artisanal fleets, and that it found that the CPUEs for each fleet showed a close correspondence.
209. The SC Chairperson advised that the next step was to generate a set of projections. There was discussion around the interpretation of the most recent recruitment estimate and how it should be used in projections. It was advised that in previous years the lower bound of the confidence interval of the most recent recruitment estimate was used in the projections as this was a precautionary approach.
210. The SC **agreed** that the run *1.00* would be used as the final accepted assessment of Jack mackerel.
211. The SC **agreed** that the lower bound of the recruitment estimate (2016 year-class) should be used in projections
212. The SC **agreed** that the forecast will be run with both the single stock and two-stock model and the most precautionary result will be used to generate advice to the Commission.
213. The SC **agreed** to specify clearly the basis of advice development at its next SC meeting.

#### 6.4. Management Strategy Evaluation

214. The EU presented SC7-JM05 on the development of a Management Strategy Evaluation (MSE) of Jack mackerel. A rebuilding plan for Jack mackerel had been developed by SC2 and formed the basis of advice in SC3-SC6. The Commission has requested the SC to start working on a management approach to replace the rebuilding plan, given the developments in the Jack mackerel stocks. Different assumptions on the biology of Jack mackerel will be used in the MSE. Wageningen Marine Research (Netherlands) has offered to do the practical work of the MSE, but there is a requirement for a task group of Members of the Commission to guide the development of the harvest control rules and long-term management plan. This group would also need to address the output diagnostics that are required by the Commission.
215. It was suggested that to enable progress to be made prior to the 2020 Commission meeting a Working Group under the SC should be established. The planning is to finalise the operating model in the summer of 2020 with the possibility of supplying preliminary recommendations and findings to the Commission in 2021. It was noted that the current Jack mackerel assessment model is very complex, and EU asked whether there would be scope to look at a simpler model as part of the benchmark assessment. A discussion ensued about a possible link between an MSE and the benchmark assessment of Jack mackerel. It was agreed that the two should not be mixed and that the MSE should utilise the currently accepted assessment model, but the operating model developed under the MSE could also be considered in the context of a benchmark assessment of Jack mackerel.
216. A question was raised on the issues of quota allocation and whether that would need to be included in the MSE. The Chairperson responded that this would require an instruction from the Commission. Peru remarked that the task of the SC is to recommend a number for the whole TAC. Allocation has already been agreed until 2021 inclusive.

The SC **recommends** that an MSE Working Group be set up to progress the project prior to COMM 8.

The SC **recommends** that a Task Group be established by COMM 8 which includes Members of the SC and the Commission to progress the MSE for Jack Mackerel in 2020.

#### 6.5. Other Jack Mackerel Topics

217. There were no other Jack mackerel topics discussed.

#### 6.6. Advice to The Commission on Jack mackerel

218. The SC was tasked with giving advice on the status of Jack mackerel. Advice on Jack mackerel stock status at this meeting was based on stock assessments conducted using the Joint Jack Mackerel (JJM) statistical catch-at-age model as developed collaboratively by participants since 2010. The Jack mackerel stock(s) in the southeast Pacific shows a continued recovery since the time-series low in 2010.
219. CPUE and survey estimates from the Chilean and Peruvian waters show upward trends while the Offshore fleet shows a slightly decreasing trend in the past years, indicating lower availability of Jack mackerel in the offshore waters.
220. A comparison was made between the 1-stock and 2-stocks model configurations. Both models showed similar trends with an increasing overall biomass, high recruitments in recent years, and low fishing mortality. Under the two-stock hypothesis model, the northern stock is estimated to have stable and low biomass levels over the past decade with an increase in the last couple of years. The combined single-stock model resulted in slightly lower recruitment and biomass estimates than the summed 2-stock model. Updated data indicate that the 2016 year-class is well above average and this was consistent with some surveys, CPUE series and catch observations. Nevertheless, the uncertainty of this year-class (1-year-old in 2017) was still large, and model estimates differed substantially from the 2018 estimates. Therefore, and in line with previous practices, a precautionary estimate (lower 95<sup>th</sup> percentile of the confidence interval) was used for the size of the 2016 year-class to be taken forward in the forecast.

221. Estimated biomass increased from 2018 to 2019 in all model configurations (including one-stock and two-stock hypotheses) and are now well above  $B_{MSY}$ .
222. Therefore, the SC **noted** that the Jack mackerel has been rebuilt to the third tier of the proposed harvest control rule (COMM2 annex K).
223. Within the third tier of the harvest control rule, catches should be limited to a fishing mortality of  $F_{MSY}$  rather than the lower status quo fishing mortality applied under the previous tier of the Jack mackerel rebuilding plan. Fishing at  $F_{MSY}$  would be expected to result in catches in 2020 between 1,072 and 1,164 thousand tonnes, depending on model configurations and assumptions. However, according to the directive of the Commission to the SC (described in COMM6, Annex 3) to use the “adjusted Annex K”; a maximum change in the catch limit of 15%, which would be based off the 2019 TAC, should apply.

Therefore, the SC **recommends** a catch limit of 680,000 t for 2020.

224. Except for some differences in the estimated age structure in recent years, results of the 2019 assessment are consistent with the estimates provided by the 2018 assessment.
225. Short term projections were carried out using the updated 2019 assessment outcomes, evaluating, among others, a status-quo fishing mortality scenario for 2020 as well as a 15% increase in TAC. Both show a high probability of remaining above  $B_{MSY}$  by 2021.

In line with the accepted rebuilding plan (“Adjusted Annex K”) and because the Jack mackerel biomass is estimated to be above  $B_{MSY}$ , the SC **recommended** a 15% increase in 2020 catches throughout the range of Jack mackerel resulting in a total catch limit at or below 680 thousand tonnes.

226. Following the decision from the SPRFMO Commission in 2019 (COMM7), the SC has initiated a process for the revision of the Harvest Control Rule. It is anticipated that preliminary results of an evaluation of an updated management strategy will be available at the 2021 Commission meeting.

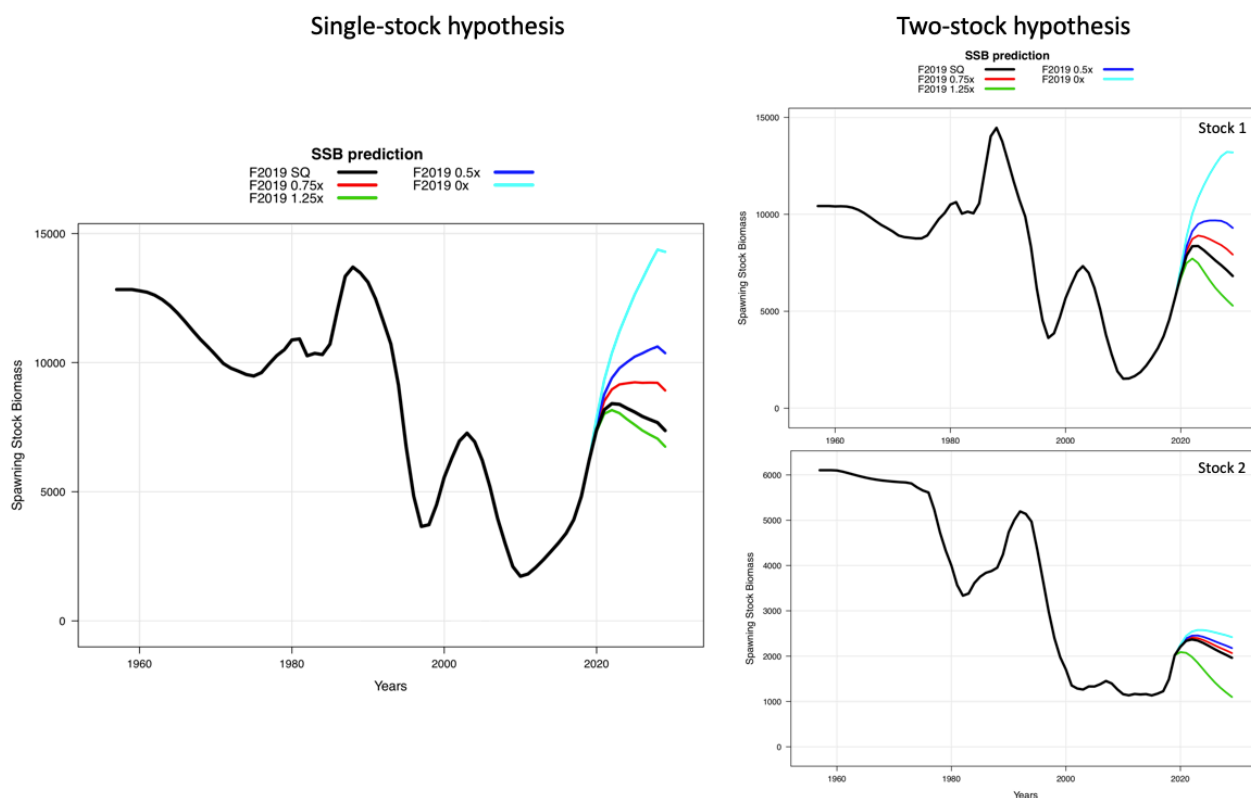


Figure 1. Spawning biomass projections for Model 1.00. The panel on the left shows the results from the single-stock hypothesis, while the panel on the right shows the results from the two-stock hypothesis. The top right plot shows the results from Stock 1, and the bottom right for Stock 2.

Table 1. Summary results for the short-term predictions for the single-stock model. Note that “B” in all cases represents thousands of tonnes of spawning stock biomass and  $B_{MSY}$  is taken to be 5.5 million tonnes of spawning biomass in all cases.

Model 1.00, steepness=0.65, recruitment from 2000-2015				
Multiplier of $F_{2019}$	$B_{2021}$	$P(B_{2021} > B_{MSY})$	Catch 2020 (kt)	Catch 2021 (kt)
0.00	8 549	98%	0	0
0.50	8 033	96%	360	445
0.75	7 790	94%	535	648
1.00	7 556	92%	706	840
$F_{MSY}$	7 074	88%	1 072	1 225

Table 2. Summary results for the short-term predictions for the two-stock model. Note that “B” in all cases represents thousands of t of spawning stock biomass and  $B_{MSY}$  is dynamically estimated within the model under the two-stock hypothesis.

Model 1.00_2stk: Stock 1, steepness=0.65, recruitment from 2000-2015				
Multiplier of $F_{2019}$	$B_{2021}$	$P(B_{2021} > B_{MSY})$	Catch 2020 (kt)	Catch 2021 (kt)
0.00	8 850	100%	0	0
0.50	8 343	100%	316	405
0.75	8 106	100%	469	588
1.00	7 880	100%	617	758
$F_{MSY}$	7 485	100%	885	1 046

Model 1.00_2stk: Stock 2, steepness=0.65, recruitment from 2000-2015				
Multiplier of $F_{2019}$	$B_{2021}$	$P(B_{2021} > B_{MSY})$	Catch 2020 (kt)	Catch 2021 (kt)
0.00	2 447	99%	0	0
0.50	2 390	98%	39	30
0.75	2 363	98%	58	44
1.00	2 337	98%	76	57
$F_{MSY}$	2 074	95%	279	166

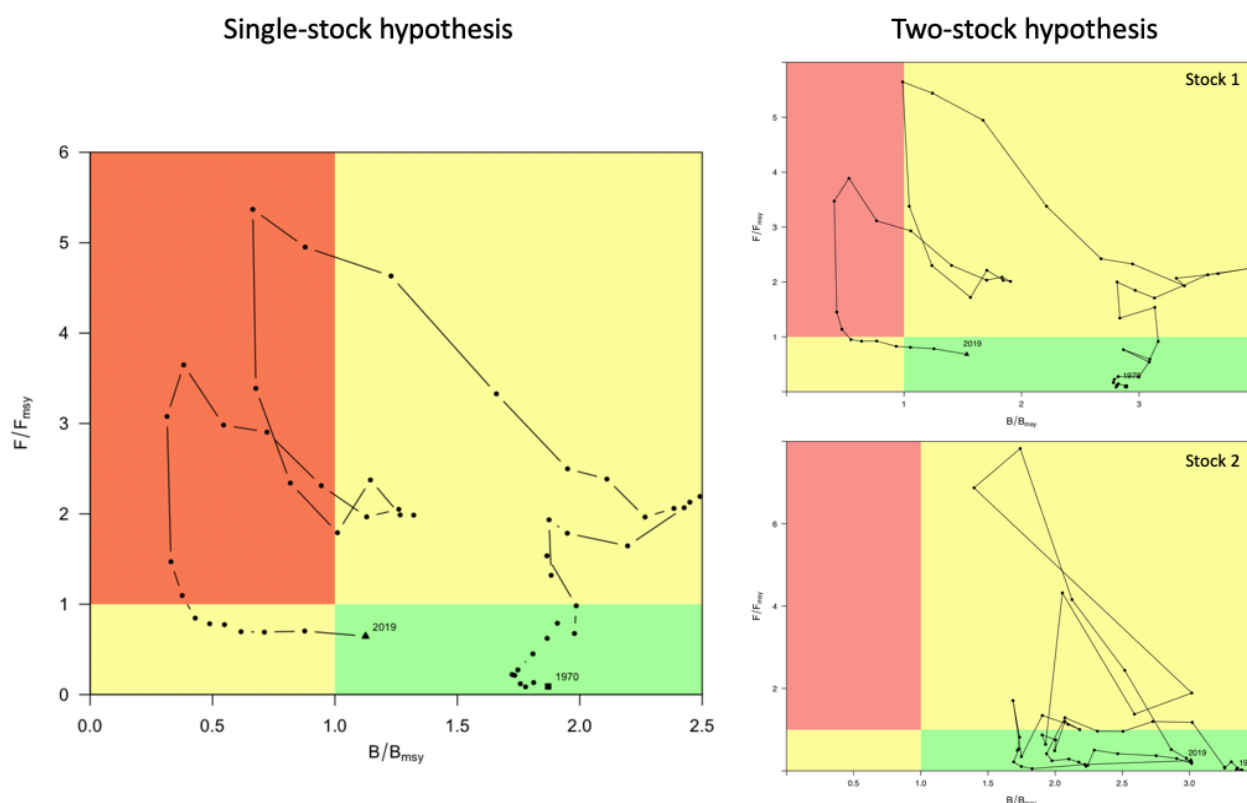


Figure 2. Phase plane (or “Kobe”) plot of the estimated trajectory for jack mackerel under Model 1.00 with steepness = 0.65. The panel on the left shows the results from the single-stock hypothesis, with  $B_{MSY}$  set to 5.5 million t. The panel on the right shows the results from the two-stock hypothesis, with  $B_{MSY}$  dynamically estimated within the model. The top right plot shows the results from Stock 1 (South), and the bottom right for Stock 2 (North).

227. Finally, on the topic of the Jack mackerel Working Group Chairperson the SC noted that the current Chairperson of this group (Dr Ianelli) has indicated that he would be prepared to step down if there was a suitable replacement and Martin Pastoors (EU) has signalled that he was prepared to take over the Chairing duties for this Working Group. The SC was very supportive of this offer and warmly accepted Martin Pastoors as the new JMWG Chairperson. The SC also gratefully acknowledged the excellent work of the previous WG Chairperson who was unfortunately unable to attend this meeting.

## 7. Squid

228. The Chairperson of the squid working group gave a short summary of the workshop that took place two days prior to the SC meeting. Fourteen papers as well as one observer paper and several presentations from the invited expert, A. Arkhipkin, were presented and discussed. The workshop also discussed and updated the work plan with respect to squid, and new research items were added, e.g. developing a template to support the stock assessment and monitor the fishery, holding a workshop on fishing effort estimation. The management measure discussions focused on fishing effort limits, temporal and spatial restrictions to protect spawners and juveniles, and observer coverage. However, there was no agreement on common elements for an appropriate CMM. The squid working group acknowledged and recommended that more information and studies would support development of more comprehensive management measures. The SC endorsed the report and adopted its recommendations.



### 7.1. Inter-Sessional Activities

229. Intersessional activities are documented within the Squid workshop report.

### 7.2. Basic Biology

230. Protocols for biological sampling were discussed and the workshop recommended that the development of a biological sampling protocol should be added to the SC squid workplan for the future.
231. The invited expert Dr Arkhipkin presented a talk on temperature effects on duration of life cycle of the eastern Pacific jumbo flying squid *Dosidicus gigas*.
232. The preliminary genetic results based on small sample sizes did not find differences between different phenotypes, suggesting one big metapopulation in the SPRFMO Area and EEZs.
233. Changes in squid phenotypes dominance in the recent 3 years in Chile and Peru EEZ were analyzed. Large squid were almost not present or available in EEZ while medium size squid increased in availability. Phenotype changes were related with the El Niño 2015-2016 event and low productivity produced after this event. Changes in temperature could also explain the change of phenotypes' predominance.
234. Korea presented the results of scientific observations conducted on board jigging vessels that collected information on bycatch and biological parameters and mentioned that they intended to continue their biological sampling plan for future studies.

#### SC discussion:

235. The change in phenotype (from large to medium squid) in Chile and Peru was considered important to understand the decreases in squid size, abundance and landings, and must be taken into account in the development of any stock assessment method and design of management measures in the SPRFMO Area. The changes in phenotype were correlated with positive temperature anomalies and low productivity (chlorophyll) produced after the El Niño event and the changes in temperature during the paralarvae stage as well.
236. Dr Arkhipkin presented information that showed that the change in phenotype dominance from large to medium squid related to a 7-10 fold reduction in reproductive output.

### 7.3. Assessment Data

237. The Secretariat presented SC7-SQ01 "Jumbo flying squid datasets held by the Secretariat". It was requested that the tables of catch currently available on the SPRFMO website are made available as downloadable excel files. The Secretariat agreed to follow up with affected delegations offline to resolve outstanding issues.
238. Chile presented paper SC7-SQ08 on "Direct evaluation of jumbo squid in Chile". Some participants considered that it did not accurately reflect all of the benefits of possible methods, in particular for hydro-acoustic methods. The workshop agreed that using hydro-acoustics would require some critical assumptions. It was noted that acoustic methods can provide an index and possibly estimate biomass where information on target strength and size frequency distribution is available.
239. Chile agreed that every method has pros and cons dependent on the particular area and objectives you are aiming to achieve. It was considered that there is too much uncertainty in target strength estimates to use hydro-acoustics for that purpose at this point in time. There was a general discussion that the particular area, fishery, and intended use need to be considered at length when determining approaches to monitoring and surveying squid stocks.
240. The monitoring system for the jumbo flying squid fishery in Peru was introduced in the squid workshop to assist in the consideration and discussions by the SPRFMO S of possible monitoring and sampling methodologies of jumbo flying squid used or to be used in the area of application of the SPRFMO Convention Area.

SC discussion:

- 241. The importance of sharing data and information was discussed. However, coastal States have more intensive and developed sampling programmes in their EEZs compared to the SPRFMO Area. It seems difficult to share data at this stage.
- 242. The invited expert recommended that depletion models and escapement biomass strategies be applied for jumbo flying squid in the SPRFMO Area. The stock assessment procedure needs a proper collection of data, not only from catch but also from observers.
- 243. It was recognised that squid fishery may require a more intensive sampling programme than a finfish fishery (e.g. Jack mackerel). Biological information requirements by sex are mantle length, weight and maturity stage. Statoliths should be collected in order to identify phenotypes and migrations. The sampling should be very intense in time and area, and representative of the fishery, considering at least monthly, and ideally weekly based.
- 244. Implementation of a real-time (weekly) electronic logbook system for detailed analyses of fishing fleet dynamics was discussed. This system could be based on, for example, Vessel Monitoring System, Satellite Information, or Global Fishing Watch<sup>5</sup>. This would allow spatial-temporal changes in squid movements and localization and local depletion events to be studied. Falkland Islands (Islas Malvinas) Fisheries Department could kindly provide its e-logbooks system to be adapted to SPRFMO requirements. CCAMLR could also provide help in this topic under the umbrella of the just signed MoU with SPRFMO.
- 245. The invited expert recommended consideration of information about commercial size categories, to complement the fishery and biological data currently collected.

7.4. Squid Connectivity

- 246. Several presentations were made on sampling design for genetic analysis and different genetic techniques. Protocol for the collection of jumbo flying squid *Dosidicus gigas* muscle tissue for molecular analysis were presented and discussed. RAD sequencing technology for the evaluation of the population genome variability was presented. Genetic diversity and population structure of *Dosidicus gigas* based on genome-wide SNPs by genotyping-by-sequencing was presented and discussed.
- 247. To have a more accurate population genetic structure of jumbo flying squid, it is necessary to expand the sampling area and increase the number of samples as the next step.
- 248. Dr Arkhipkin clarified the importance of separating genetic variability and diversity from the separation of genetic populations. If the results show genetic diversity is large, but all intermixed, we are dealing with a single, highly diverse, population, but if the results show statistically that the groups are separated, it means they are genetically distinct and therefore do not represent a wider metapopulation. The workshop noted that the purpose here is not to identify a separate species, but it is to look at possible population subunits that might be of interest for stock assessment and fisheries management purposes, so the genetic differentiation may not need to be as clear.

SC discussion:

- 249. The SC **noted** that connectivity and stock assessment were crucial to develop comprehensive management measures.

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<sup>5</sup> <https://globalfishingwatch.org>

### 7.5. SPRFMO Squid Assessment

250. A stock assessment for jumbo flying squid in the equatorial waters of the Convention Area was presented by China. The assumptions of the model were discussed in the squid workshop, including the effects of cannibalistic behaviour and squid movements on the estimates of proportion spawning and natural mortality. There was further discussion about the assumption of independent stocks and time intervals of the assessment model.
251. The workshop noted the need to consider the particular characteristics of the SPRFMO jumbo flying squid stock when considering the most appropriate monitoring approach. It was noted that with more information available, the current model could be improved to better capture the biological characteristics of the species.
252. The workshop also noted that should the stock assessment model be finalised, an MSE could be completed to evaluate the effects on the outputs of the assumptions.

#### SC discussion:

253. The SC **noted** that compared with last year's stock assessment modelling, some progress was made in terms of using real data and modelling the natural mortality related to semelparity. The model has several assumptions that were questioned.
254. Peru conducted acoustic surveys and developed a technique to improve the acoustic identification of squid. However, uncertainty still persists in the target strength (TS) relationship to transform the acoustic data into biomass estimation. Chile does not conduct acoustic surveys for squid because of the high uncertainty in the TS relationship, which strongly affects the biomass estimation in a logarithmic scale.
255. The SC **noted** the need to develop stock wide approaches to assessment.

### 7.6. Squid CMM Discussions

256. Different management measures were discussed including catch or fishing effort limits, temporal and/or area restrictions to protect spawners and juveniles, as well as observer coverage.
257. Chile is concerned about squid catches before and after the feeding period in Chilean EEZs. Squid migrate into the Chilean EEZ to feed and then migrate outside the Chilean EEZ to spawn. Therefore, Chile proposed temporal and/or spatial restrictions of fishing effort to protect nursery and spawning areas before and after squid passing through the Chilean EEZ.

#### SC discussion:

258. Fishing effort units for fishery regulation were discussed at length including number of vessels, vessel tonnage, vessel length, etc. The estimation of fishing power per vessel was also discussed to prevent the increase of fishing power of the fishing vessels. The importance of studying the fishing effort dynamics and the estimations was largely discussed. A workshop on this topic was put in the work plan.
259. SC7 **endorsed** the following squid workshop recommendations and:
  - **Noted** that important steps forward have been made with respect to stock assessment and genetic studies for jumbo flying squid but there is still much work to do including understanding the phenotype dynamics, improving the quantity and quality of fishery data and biological sample collection;
  - **Noted** that the size-structured model describes the population dynamics of jumbo flying squid in equatorial waters, but the current model should be improved to better capture the biological characteristics of the species;
  - **Agreed** to develop data templates to support stock assessment and monitor the fishery of jumbo flying squid;
  - **Agreed** to coordinate standardised approaches for genetic sampling;
  - **Agreed** to coordinate the use of standardised approaches for genetic analysis based on high throughput techniques and sharing of the sequencing data;

- **Agreed** to do alternative studies on fine population structure of jumbo flying squid using microchemistry of their statoliths;
- **Agreed** to make a workshop on the study of fishing effort dynamics and fishing power estimates;
- **Noted** that there are other stocks of jumbo flying squid in other parts of the north-eastern Pacific, and recommends getting some samples for comparison with the South Pacific stocks to help support the investigation and validation of stock structure by using samples taken from known, separate stocks;
- **Noted** that in order to address Review Panel Recommendations 108(a) and 178(c), the workshop participants supported a future CMM including data gathering and reporting for the jumbo flying squid fishery with several possible management approaches including catch limits, fishing efforts limits and temporal and spatial closures being discussed.

### *7.7. Advice to the Commission on Squid*

260. There was a robust discussion at the SC on the recommendations to be provided to the Commission, discussions were primarily focused on what an appropriate minimum level of observer coverage would be to support the work of the SC, and on potential precautionary management measures that could be implemented for the squid fishery.
261. The SC Chairperson highlighted that the Commission had requested that the SC produce a recommendation on observer coverage levels to the Commission. There was a specific request from the Commission to provide estimates of appropriate levels of observer coverage for fisheries without a CMM. A substantial discussion followed.
262. Some Members expressed their preference to include a requirement for a number of at-sea observers rather than a percentage observer coverage. Preliminary analyses showed that observer coverage as low as 5% or lower could be appropriate for biological sampling. Experiences in the Falkland Islands (Islas Malvinas) squid fishery demonstrated that observer coverage rates as high as 10-15% were necessary to provide representative sampling of the catches in a much simpler fishery. Bird interaction rate with squid jigging is considered to be very low which statistically may require higher observer coverage rates to retrieve appropriate absolute estimates of bycatch.
263. There was no unified view on the most appropriate observer coverage level and as such the SC:

**Recommends** that the minimum number of at-sea full-time observers is 5 per Member or implement observer coverage in the range of 5-15% for a period of 3 years.

264. The SC discussed possible appropriate management approaches that could be included in a CMM on squid. Discussions focused on implementation of a limit on fishing effort.
265. CALAMASUR noted that the apparent changes in the fishery to more smaller fish may result in lower biomass available and noted that the last time the small squid dominated, the fishing fleets were smaller than they are now.
266. Peru clarified that the proposed measure will apply to the Convention Area, noting that there are management measures in the EEZs of coastal states, and nothing at present in the Convention Area.
267. Chile indicated to consider the draft measures as a management issue rather than a science one but given the movement of the fish from within an EEZ to the Convention Area, it is difficult to agree to a limit that will apply to what is an appearing fishery for Chile.

268. The Chairperson noted that providing advice noting the uncertainty in stock status and exploitation rate is a matter for the SC. Peru suggested that management measures, and the impacts on coastal states and developing fisheries are something to be discussed by the Commission, but that the SC should still provide advice on possible management measures. CALAMASUR noted that limiting the number of vessels could be contrary to the precautionary approach as smaller vessels could be phased out and replaced with larger vessels.
269. A discussion followed on the most appropriate effort measure, suggesting number of vessels, gross tonnage and fishing days. Chile suggested considering that spatial and temporal closures are options supported by science and that there is no rationale to be limiting effort, as there are no signs of overexploitation of the stock.
270. Peru noted that there is no conclusive information on where spawning actually takes place, there is not enough coverage of the Convention Area through sampling to determine what is a spawning area or not. Also, it is considered unlikely that stable spawning areas exist in the open ocean. Chile noted that there is a fishery in the Convention Area that may impact spawners prior to them reaching any spawning area. CALAMASUR suggested to explore options for spatial/temporal closures, but this should be dealt with outside the current draft recommendation on effort limits.
271. The SC could not agree on any precautionary management measure, while it duly notes the uncertainty on stock status and exploitation rate.

## 8. Habitat Monitoring

### *8.1. Inter-Sessional Activities*

272. The co-Chairpersons of the habitat monitoring working group provided a summary overview of the workshop and intersessional activities that had taken place prior to the SC.
273. Members of the HMWG participated in a special SPRFMO session during the annual (2019) meeting of ICES Fisheries Acoustics Science and Technology Working group, also in an ICES Workshop on Mesopelagic fish as well as the SNP 7<sup>th</sup> habitat conditions workshop of Jack Mackerel of the Peruvian Current in the Humboldt System.
274. A discussion followed on the definition of habitat used in the HMWG, whether it would relate to 2D-3D-4D concepts of space and time. It was suggested that habitat is defined in at least 3D space and recognising changes therein over time. The interaction between habitat of different species was brought up as an interesting avenue of research for the HMWG. This may ultimately lead to definitions of niche for several species. In relation to data collection on habitat, it was mentioned that a close collaboration with the industry is considered to be important to retrieve relevant information on ocean conditions and changes. Remote sensing data on these conditions has now been available since the early 1990s but needs to be matched with fisheries data to advance science related to defining species habitat preference.

### *8.2. Applicability of Fishing Vessel Acoustic Data*

275. The Chairpersons presented progress made on collecting fishing vessel acoustic data, storage and standardised analyses. It was demonstrated that echo-sounder calibration of fishing vessels is fully developed and could help provide more data for science, especially when acoustic backscatter is related to biological samples taken from the catch. The ambition is to obtain more data (automated) from fishing vessels, apply quality control and use data for scientific analyses.

### *8.3. Developments in Characterising and Modelling Habitat*

276. The Chairpersons presented an overview of work that had been undertaken to characterise the Jack mackerel habitat including the overlap with top-predators. The acoustic biomass and distribution of the Jack mackerel was measured in the central-south Chile. It is recommended to test such a new series first in a benchmark.

#### 8.4. Future Habitat Monitoring Workplan

277. The HMWG developed its work plan which contains the six components for the period 2020-2024:

##### 8.4.1. Jack Mackerel habitat concept (ontogeny approach)

278. It was **agreed** that the HMWG will establish groups of specialists to develop an interdisciplinary ontogeny approach to the definition of Jack mackerel and other species' habitat for:

1. Every species of interest, not necessarily species under management
2. Every life stage
3. Every region

279. The three criteria when possible might be linked to the identification of spawning, nursery and recruitment and the interactions with other species. When consistent the findings should conduce to the definition of a stock structure for every species or the review of the existing ones for the benefit of fishery management under an ecosystem approach.

##### 8.4.2. Retrospective analysis (databases)

280. There is a large amount of data and analysis existing in different institutions linked to SPRFMO that could be shared for the benefit of the scientific community including:

1. Catches
2. Latitudinal-longitudinal distribution, abundance
3. Acoustic properties (TS) of species of interest
4. Environmental information (depth of oxycline, O<sub>2</sub> saturation (%), zpk)
5. VMS records
6. Trends of abundance before the fishery (paleoichthyology)
7. Scientific and grey literature

281. It was **noted** that the retrospective analyses require access or integration of databases held by different members of the HMWG and other working groups of the SC.

##### 8.4.3. Training, sharing and capacity building

282. It was **agreed** to develop an inventory of technologies available aboard fishing vessels in order to identify the potential to collect data using the technologies currently being deployed.

283. It is **agreed** to develop an inventory of research programmes currently being developed by the industry and the scientific institutions regarding data collection from different sources in order to promote cooperation, information exchange and progress toward the drafting of needed protocols.

##### 8.4.4. Development and application of tools

284. It was **noted** that the main tools to be developed are:

1. Protocols (for data collection, storage, analysis etc.)
2. Indexes useful for fisheries management
3. GAM, GLM, INLA, ROMS, Biogeochemical
4. Geostatistics
5. Big data and machine learning (e.g. for acoustic classification of targets)

##### 8.4.5. Utilization of different platforms

285. It was **noted** that the following platforms could be used to collect data for habitat monitoring:

1. Scientific surveys
2. Fishing vessels (based on an inventory of technologies and research programmes)
3. Satellite oceanography
4. Gliders, buoys, AUV

#### *8.4.6. Organization of a symposium on habitat monitoring*

286. The HMMWG recommended that a Symposium on Habitat Monitoring is organised prior to the 2022 meeting of the Commission ideally during the first half of 2021 in South America. The SC accepted this recommendation and added it to the multi-annual work plan. To support this aim the SC considered that it would be beneficial to establish a Steering Committee for organising the Symposium.

## 9. Advice on CMM Development

### *9.1. Developments Regarding Scientific Research*

287. New Zealand presented SC7-Doc24 which provided an update on the intersessional progress towards development of a Conservation and Management Measure to promote scientific research in the SPRFMO Convention Area, including a proposal to establish procedures for the conduct of fishing for fishery resources for scientific purposes in the SPRFMO Convention Area. Some hypothetical examples are provided in Appendix I to illustrate possible application of the proposed framework.
288. After consideration of SC7-Doc24, the SC:
289. **Noted** that there is a large amount of scientific research occurring across fisheries in the SPRFMO Convention Area, and any CMM aiming to promote scientific research and manage fishing for fishery resources for scientific research purposes should not prevent or hinder research;
290. **Agreed** that there may be situations regarding scientific research and the conduct of fishing for fishery resources for scientific purposes that may benefit from a CMM setting out a framework for such activity.
291. **Agreed** that a review of approaches and relevant definitions used by other RFMO/As should be considered by the SC at its annual meeting in 2020.

### *9.2. Developments Regarding Squid*

292. Section 7 above contains all the results of the SC discussions on this topic.

### *9.3. CMM 06-2019 (VMS), Data Access*

293. The Executive Secretary presented SC7-Doc14 “Secretariat VMS summary and SC access to data”. The SC formed a sub-group to further consider this paper.

The SC **agrees** that access to VMS data for scientific purposes is extremely valuable (habitat, changes on fishing fleets distribution, availability of fleets to resources, benthic impact assessment, bycatch overlap...) therefore in order to facilitate answering scientific related Commission requests and considering the Security and Confidentiality Requirements of CMM 06-2018, the SC **recommends** that VMS data for scientific purposes should require the Permission of the Member or CNCP.

294. The SC **agrees** that the current provisions for security and confidentiality in annex 2 of CMM 06-2018 are acceptable for scientific purposes. These security provisions are not going to facilitate this work from an operational point of view.



295. The SC **agrees** that the current process for the release of VMS data is adequate for scientific purposes. However, if in response to a request for VMS data a Member or CNCP withholds data, e.g., for individual vessels or areas, the Member or CNCP shall indicate what has been withheld to the requestor and the reasons behind this decision.
296. The SC **notes** that the process for requesting the release of VMS data should be considered within the protocol for submission of SC papers.
297. The SC **requests** the Secretariat to draft a template to request access to VMS data. This template should contain the annex 5 requirements and the following items: Clear objectives based on Commission requested advice, fishery to which the advice will be relevant, reasons for using the VMS data, type of data and type of associated analysis, what the output would be and for how long the data will be used.

The SC **recommends** that the review of CMM 06-2018 (Commission VMS) considers the input of SC7 so VMS data may also be used by the SC for analysis to support specific scientific advice requested by the Commission.

298. The SC **agrees** on providing feedback to the Commission regarding the operational aspects of the use and release of VMS Data.

#### *9.4. CMM 16-2019 (Observer Programme), coverage*

299. The Executive Secretary presented SC7-Doc12 “Observer programme accreditation process and progress”. The paper describes the current state of the process that has been used to select an Observer programme accreditor. The SC thanked the Executive Secretary for the presentation and no specific advice was developed in relation to the process.
300. The Data Manager presented SC7-Doc11 “Coarse summary of Observer coverage in SPRFMO”. This paper is a first attempt at providing an overview of achieved observer coverage for fisheries with less than 10% observer coverage. Coarse trends in observer coverage were identified including the consistency of coverage in the Jack mackerel fishery since 2012 and the overall sporadic coverage in the Bottom Longline fishery (mainly due to the limited amount of fishing/number of vessels and the irregular nature of the activities).
301. The Data Manager highlighted that lack of observer coverage was indicative either of:
- a) no observer coverage being achieved, or
  - b) the submitted data being unsuitable for uploading into the SPRFMO database.
302. In response to the Data Manager’s comments the Russian Federation provided its observer data for 2015. New Zealand committed to re-submitting its 5x5 degree summarised information and Australia committed to providing an update for its observer submissions that had failed validation. New Zealand also identified a possible East/West issue in the bottom longline data that seemed to indicate that longlining had occurred on the Louisville Ridge.
303. The SC thanked the Data Manager for the presentation and requested that it become a standing paper and also suggested that spatial plots for the most recent year of information would also be a useful addition.

## 10. Exploratory Fisheries

### *10.1. Cook Islands; potting report on progress*

304. The Cook Islands presented CS7-DW02, “Cook Islands exploratory lobster trap fishing in the SPRFMO Area - Trips 1 and 2”. The two-trip programme of exploratory trap fishing provided for by CMM 14b-2019, has successfully completed its first fishing year in 2019.

305. New biological information has been collected on *Jasus caveorum* and *Chaceon* sp. The key findings are that the fishery caught primarily lobster, *J. caveorum*, most of which were male (about 60%), and that most females were not carrying eggs (in berry). This trip provided information on Lobster and Crab presence, target stocks and marine ecosystems.
306. The collected data will be used to evaluate the effectiveness of existing mitigation measures, to ensure that the bottom trap fishery is developed through a precautionary and gradual process, and in accordance with the best available scientific information. Over the coming months, the Cook Islands will screen material and analyse all data collected in more detail than the timing of the trips has allowed so far. In addition, to maximise the value of future data collection for both the SPRFMO, we need to gain an understanding of the distribution, dynamics and status of stocks of *J. caveorum* and *Chaceon* sp.
307. The SC noted that there were some patterns in the CPUE that suggest it might not be a stable index of abundance and might be hyper stable or affected by factors unknown. Caution was therefore suggested in the interpretation of CPUE, particularly if it was going to be used as a limit on fishing. The Cook Islands agreed and noted their intention to take a modelling approach (e.g. a GLM) which might allow for the use of CPUE to monitor the fishery if the model is reasonable. The Cook Islands also noted that given the decline in CPUE during operations, it might not be hyper stable, and identified that the depth profile of the lobsters suggests they are unlikely to be moving between seamounts in large numbers, but that depth and size analyses, and understanding more about complex biology (e.g. mating season behaviour) might help answer these questions.
308. The SC suggested running some experimental sets to help understand effective fishing area of a pot, this could be done by setting strings with pots set at different distances apart. It was noted that effective fishing area has been a topic of discussion through the development of this proposal. The Cook Islands identified that they had done some thinking on this, noting that early estimates were made based on other species, but agreed that it would be good to plan an experimental approach, noting that consideration would need to be given to the interpretation of outputs of any experiments given the physical characteristics of the area and the possibility of outputs not truly reflecting effective fishing area (evenly spread animals across wide flat seamount).
309. The DSCC commented that it would be good to see the video footage taken during the trip, to better understand possible VMEs in the area, and asked whether there was more information available about the site identified in the report as a possible VME. The Cook Islands noted that most VME taxa were caught in the southwestern corner of the feature, and that permission would be required before footage could be made available. The Cook Islands also clarified that the video footage is quite dark and that still shots might be more useful in future.
310. The CALAMASUR suggested setting up a depletion experiment to focus effort into a small area which might provide additional information on whether the CPUE is hyperstable. The Cook Islands noted that this approach was considered earlier, but given the patterns seen in the first trip, they will focus on understanding those patterns rather than prioritising a depletion experiment at this point.
311. The Chairperson asked about the apparent large decline in the CPUE for crabs in the report. The Cook Islands clarified that the data for crabs is difficult to interpret because it is sparse but noted that it is more likely to be influenced by the location of fishing and depth of effort.
312. The DSCC identified that it was good to see documentation of lost gear in the fishery and raised concerns with the high amount of gear lost and asked if there were particular reasons for this, and if there are long-term implications of the lost gear. The Cook Islands noted that gear loss has been discussed, and may have been increased as a result of the pressure on the vessel to be profitable which leads to crew setting gear in inclement weather that is not conducive to recovering gear. They are working on solutions to minimise the loss of fishing gear in future.

## 10.2. Amended Cook Islands proposal

313. The Cook Islands presented SC7-DW01\_Rev1, "Cook Islands Fisheries Operation Plan for an Exploratory Potting Fishery in the SPRFMO Area".

314. The SC noted the ongoing concern since the inception of this proposal about the catch limit, and signalled that there are views that the proposal is essentially going from an exploratory fishery to a full commercial fishery in two years which is inconsistent with the mandate to develop fisheries in a precautionary manner. It was suggested that additional work could be done to support the catch limit proposals, including using literature values of effective fishing areas for similar species.
315. There was also a level of confusion about the proposed catch limits for the 2019/20 year and whether it was a total of 300 or 600 t and how this compared to the information provided in the Fishery Operation Plan.
316. The SC enquired about details regarding the proposed tagging programme, noting the logistic question of returning tagged lobsters to their depth and seamount of origin. The Cook Islands outlined that lobsters may need to be kept in holding tanks to allow returning to the correct release location. A tagging project would provide additional information to get a better estimate of the fished population; at present, there is a large amount of uncertainty around the actual fished area, which affects the population estimate. The authors noted that there are several considerations going forward with this project, including tagging and consequent biomass estimates by depth stratum in a structured way. The Cook Islands noted that a final decision on whether to undertake a tagging programme or not would be made once fishing experiments to assess area fished by the gear and subsequent biomass estimation work was completed.
317. The SC **encouraged** the exploratory fishery proponent to implement such a structured approach to tagging.
318. The DSCC positively noted the suggestions in the proposal for year 3 for protecting VMEs and doing more work to understand VMEs, and clarification was requested on what the decision point would be for when an area would be avoided, or additional measures taken. The DSCC also asked about the plan to reduce gear loss in year 3 of the exploratory fishery. The Cook Islands noted a need to continue mapping the area to identify the slope areas and developing protocols in regard to possible VME indicator species encounters. Similarly, on the loss of gear, the mapping will help identify areas where the seafloor is not appropriate for setting pots and allow them to avoid those and set in flat areas.
319. The SC discussed the allocation of fishing effort across seamounts. The Cook Islands noted that there were originally 13 seamounts proposed, which was reduced to 8 through the development of the Fisheries Operation Plan (FOP). These were explored and only 2-3 were found to have viable quantities of lobsters, which results in effort being allocated heavily to these seamounts in the forward proposal. They noted that this also is the rationale for the proposal to open more seamounts to the fishery in year 3.
320. The SC discussed the indications from the preliminary stock assessment of a virgin biomass of about 11,000 t and the estimate that the first two trips would have resulted in an exploitation rate of around 6%, and queried what sustainable exploitation rates were estimated to be in other fisheries for similar species. The Cook Islands responded that they would need to follow that up, noting that there is likely to be information from fisheries in a number of other areas on *Jasus* species but also noted that before calculating an appropriate exploitation rate it would be helpful to have a more solid estimate of initial biomass.
321. The fishing company involved in the exploratory fishery provided some clarification on the additional information provided to support the proposal, a paper on the biology of *Jasus caveorum* (SC7-DW22), and the draft stock assessment (SC7-Obs03). On the catch limits, they noted some disconnect with the FOP and the numbers in the presentation, which is primarily the result of some general confusion on the timing for the applicability of the catch limits in the current exploratory fishery (CMM 14b-2019). At this point, the expectation is for 600 t for year two, but because of the uncertainty, there was a preliminary allocation of 150 t per trip for two trips planned prior to the 2020 Commission. On the stock assessment, they identified that there may be more than one stock, and the unit of assessment will need to be considered. They also noted that other similar fisheries rely on long time series of information, but it would be good to start developing more rigorous stock assessments and better understanding of the drivers for catch rate changes. They also clarified that the original proposal was to explore 13 seamounts, which was reduced to 8, and now there are only 3 which are thought to have viable lobster populations. They also noted the need to continue to sample for VMEs and to analyse the data that is available thus far.

322. The SC **noted** that the catch limits are being set without a lot of strong evidence and suggested that an experiment to estimate the density of lobster and directly estimate the biomass and estimate exploitation rate could provide evidence to support the setting of the catch limits.
323. The SC raised a question about the proposal in the FOP to stop fishing if the CPUE gets to 40%, noting that 40% of unfished biomass is a common target reference point, but wasn't sure how 40% CPUE would compare to that. The Cook Islands clarified that the 40% is not intended to be a target or limit reference point, but that it would provide a backstop point to make sure that the initial fishery does not fish the stock down too far or too quickly. They noted a need to 'push' the stock to see any response, but it is important to ensure that pushing doesn't happen too fast or reduce the stock by too much. The specific number (i.e. the 40%) was open for discussion.
324. The SC formed a subgroup to further consider the Cook Islands amended proposal alongside the Chilean proposal for a new exploratory fishery. The SC completed the exploratory fisheries checklist which is contained in Annex 11 and provided a number of recommendations to the Cook Islands regarding its FOP.
325. Subsequently the Cook Islands revised its FOP (SC7-DW01\_Rev2) and the SC **agreed** that the approach outlined in the revised Fisheries Operation Plan is likely to ensure that the exploratory fishery is developed consistently with its nature as an exploratory fishery, and consistently with the objectives of Article 2 of the Convention. The SC **recommends** (Annex 11) that the SPRFMO Commission extend the expiry date of CMM 14b-2019 to 2022, aligning the CMM to the start of fisheries operations.
326. The Cook Islands thanked the SC for its assistance with revising its proposal and the SC expressed its immense satisfaction with the quality of science presented in the papers and discussions held this year in contrast to previous years.

### *10.3. EU toothfish; report on progress*

327. The EU provided an update that no fishing has happened to date so there is no information to provide to this meeting.
328. There was no further discussion on the EU exploratory toothfish fishery.

### *10.4. New Zealand toothfish; report on progress*

329. New Zealand presented a brief update of the exploratory fishery for toothfish being conducted by the vessel *San Aspiring*. The first voyage was still underway but preliminary results were presented for fishing undertaken between 16 September and 5 October 2019. At that time, 1,153 fish (36 t) of toothfish had been retained, 460 (173 females and 287 males) had been sampled for detailed biological information, 110 otolith pairs had been taken, and 112 had been tagged and released. All toothfish caught were Antarctic toothfish other than one Patagonian toothfish. Fish bycatch, mostly rattails and morid cods, was similar to the 2016 and 2017 voyages, and was about 7% of the catch by number. There was little benthic bycatch and no interactions with protected species. Only two deepwater dogfish had been caught so the move-on provisions had not been triggered and no sustainability concerns raised.
330. It was noted that the research planned in CCAMLR to the south of this area did not take place. There was a question about whether the reported tag recovery was of a fish tagged this year or in previous years. New Zealand clarified that they did not yet have that information given how recent the capture occurred. In response to a question, New Zealand clarified that they do not yet know the number of *Macrourid* spp. caught during the research voyage.
331. The SC asked if there were any plans to do satellite tagging on fish caught during the exploratory fishery. New Zealand responded that there are no plans to do so at this point, but it could be considered in future.
332. The SC was informed that there is a research fishing trip currently underway in the CCAMLR area which has been successful to date at adding to improve understanding of toothfish biology and population dynamics.

333. Following consideration of SC7-DW04, and the update provided by New Zealand, the SC:

- **Noted** New Zealand's exploratory demersal longline fishery for toothfish (limited at 140 tonnes greenweight retained annually) had only just started at the time SC7 met.

#### *10.5. Chile Exploratory toothfish proposal*

334. Chile presented paper SC7-DW03 on a Proposal for an Exploratory Toothfish Fishery in the SPRFMO Area.
335. The SC clarified that the proponents didn't need to fill in the checklist, noting that it is a very useful way to consider and review proposals. In relation to the risk assessment and potential for overexploitation of target species, in this case, that would relate to where the fish caught are thought to come from. It was requested to investigate where toothfish caught in the exploratory fishery may be coming from. It was furthermore suggested to expand the detail under the risk assessment.
336. Chile indicated that providing a risk assessment is complex when there is little information available for the area where the fishery is planned to take place. The assumption in the proposal is that conditions in the South Pacific would be similar to those found in Chile but it is a very broad assumption, and therefore it is unclear where the fish might be coming from.
337. The SC expressed concern on the potential low probability of toothfish occurring, and the possibility for there to be significant bycatch of other species, in particular deepwater sharks, if toothfish were not present. It was proposed that mitigation measures / bycatch limits and move-on rules as described in the South Tasman Rise EU exploratory toothfish fishery and the NZ toothfish fishery were included for consistency.
338. The SC asked how attempts would be made to have fish in good condition to be tagged to maximise survival after they are released. Chile indicated to not have identified issues with fish quality using this gear, the net doesn't squish the fish. The SC suggested a minimum distance between lines be incorporated to prevent within trip recaptures. Furthermore, research into stock delineation shows that the stock at South Georgia is very different to the stock in the Falkland Islands (Islas Malvinas). A reference made to South Georgia being a long over-exploited area was deemed incorrect.
339. The SC requested to include maps of research blocks and asked for the total anticipated catch of the exploratory fishery. Chile indicated to only propose four specific fishing spots for year one, because it is unknown what to expect in terms of catch. There are plans to propose four areas in each of the two following years to gather a wider range of information. The other proposed areas are closer to CCAMLR and the stocks are likely to straddle.
340. The DSCC wondered if Chile had looked at the research proposal in 88.3 which is in the CCAMLR waters south of this proposed area. In addition, it was questioned how possible impacts on VMEs would be addressed. It was suggested that a reference be included to identification of VME features and indicator species. Chile noted the importance of considering these points. It notes that there is a move-on rule in place to apply in cases where VME indicator taxa are caught. Chile doesn't have a specific regulation, but to date there have been no interactions reported. The rationale behind the 54 t catch limit was explained, working from the assumption that daily catch would be similar to that in Chile, multiplied by the number of days that each area will be fished.
341. The Chairperson asked the SC about how to frame the advice, and how it wants to deal with any work that needs to be completed by the proposal before it would be considered acceptable to recommend to the Commission. The SC agreed with the need to avoid the confusion that arose at the Commission meeting in 2019 where expectations differed based on SC recommendations that were agreed at the 6<sup>th</sup> SC meeting. The Chairperson agreed with the need to be clear about follow up process, for example if small tweaks are needed but otherwise fine to proceed to Commission, versus if there are more substantive changes and it needs agreement by the SC in some way prior to the Commission, etc. The key concern is to avoid having loose ends at the conclusion of this SC meeting.

342. The DSCC noted that no benthic fisheries impact assessment was included in the Chilean proposal. Chile indicated that given the lack of knowledge on the area, it would be nearly impossible to include such a risk assessment. The SC suggested that the extent of the evaluation of bottom impacts should be commensurate with the expected risk from the fishing gear planned to be used. Lining gear doesn't have as much impact as some other gears, but it does still have some impact so should be at least considered qualitatively. The SC noted that it is a requirement of CMM 13, if the proposed fishing activity is bottom fishing, then an assessment of the possible impact needs to be done.
343. A revised FOP was presented to the SC and circulated. The SC discussed the revised FOP and:
- **Agreed** that the approach outlined in the revised Fisheries Operation Plan is likely to ensure that the exploratory fishery is developed consistently with its nature as an exploratory fishery, and consistently with the objectives of Article 2 of the Convention.

## 11. Ecosystem Considerations

### 11.1. *Seabird / bycatch interaction monitoring*

344. The SPRFMO Secretariat presented paper SC7-DW13 on SPRFMO bycatch records.
345. The DSCC noted that it would be good in future to note information about whether Members have National Plans of Action (NPOAs) and queried whether Members would be willing to provide information on mitigation measures being used. In response, the Secretariat noted that information on NPOAs could be included in Members' annual reports, and that information on mitigation use is often provided through the implementation reports supplied to the Compliance and Technical Committee.
346. The SC also noted that the encounter rate for bycatch species of concern may be low but in order to get appropriate estimates of mortality (as well as considering cryptic mortality) then observer coverage is required. It was noted that there are specific concerns about some ocean-going seabird species, e.g. Antipodean albatross, whose populations are low and may be impacted by a low number of mortalities.
347. The SC **noted** that the reported interactions with seabirds may not represent total mortality of seabirds from fishing activities due to possible cryptic mortality of seabirds.
348. The SC **noted** that observer coverage is required to get better estimates of overall seabird interactions and possible mortalities.

### 11.2. *EBSAs/Marine pollution research*

349. No papers were received on these topics and no specific discussions were held.

### 11.3. *Climate change impacts on deep ocean fisheries*

350. NZ presented paper SC7-Doc25 which was the recent FAO report on "Deep-ocean climate change impacts on habitat, fish and fisheries". The paper presents the outcome of a meeting between the FAO/UNEP ABNJ Deep-seas and Biodiversity project and the Deep Ocean Stewardship Initiative. It focuses on the impacts of climatic changes on demersal fisheries, and the interactions of these fisheries with other species and vulnerable marine ecosystems. Regional fisheries management organizations rely on scientific information to develop advice to managers. In recent decades, climate change has been a focus largely as a unidirectional forcing over decadal timescales. However, changes can occur abruptly when critical thresholds are crossed. Moreover, distribution changes are expected as populations shift from existing to new areas. Hence, there is a need for new monitoring programmes to help scientists understand how these changes affect productivity and biodiversity.



351. The report notes that the principal cause of climate change is rising greenhouse gases and other compounds in the atmosphere that trap heat causing global warming, leading to deoxygenation and acidification in the oceans. Three-dimensional fully coupled earth system models are used to predict the extent of these changes in the deep oceans at 200–2500 m depth. Trends in changes are identified in many variables, including temperature, pH, oxygen and supply of particulate organic carbon (POC). Regional differences are identified, indicating the complexity of the predictions.
352. The response of various fish and invertebrate species to these changes in the physical environment are analysed using hazard and suitability modelling. Predictions are made to changes in distributions of commercial species, though in practice the processes governing population abundance are poorly understood in the deep-sea environment, and predicted distributional changes are not always as expected and may be manifested as simple disappearance of species or ecosystems.
353. The publication underscores the fact that adaptive monitoring and management mechanisms must be in place to ensure that fisheries are sustainable and the environment remains healthy and productive. Suggestions are provided as to the actions necessary.
354. The DSCC noted the similarities with the findings on the recent Intergovernmental Panel on Climate Change (IPCC) Special Report on the Ocean and Cryosphere in a Changing Climate and suggested that SC review these reports periodically to consider how it is responding to the messages and recommendations contained in those reports.
355. The SC **noted** that the time of emergence and magnitude of impacts is estimated to be less severe in the South Pacific than for other areas but that this did not mean attention to these effects of climate change and the impact on marine resources should not be considered.
356. There were no recommendations from this paper although the SC did add a watching brief for climate change into its workplan.

## 12. Other Matters

357. The SC **noted** that several photographs of draft text and recommendations had been taken during difficult and potentially sensitive discussions in plenary by both observers and Members. In response, the Chairperson reminded the meeting participants of their obligations in this regard. The SC also **noted** that observers could be excluded from further meetings as per the SPRFMO Rules of Procedure Section 9(2).

### *12.1. Level and Use of the Commission's Scientific Support Budget*

358. The SPRFMO Secretariat provided an update on SC7-Doc16\_rev1.
359. The Chairperson noted that more ambitious approach in requesting funds required to complete its workplan tasks may be appropriate and urged Members to think about these science funding requirements.
360. Considering the work plan tasks for 2020-21 the SC has budgeted \$93,000 in order to deliver on Commission requests.

### *12.2. SC capacity building requirements*

361. The SPRFMO Secretariat provided an update on SC7-Doc15 and noted the relevance to the SPRFMO Performance Review, which assessed how SPRFMO was performing in relation to the requirements of the SPRFMO Convention. At its last meeting, in response to the Performance Review recommendation (number 202h), the Commission highlighted the importance of capacity building and requested the SC to provide advice on how capacity building needs relevant to the work of the SC might be better managed.
362. The SC Chairperson requested Members to think about how they wanted to collaborate and identify capacity building needs and noted that this would need to be considered in the workplan.



363. The SC held a discussion on capacity building needs and identified the following important aspects:

- Scientific capacity development: external experts participating in workshops and assessments.
- External review of SC activities.
- Exchange of practice on identification of seabirds, mammals, sharks.
- Advancement of geospatial analysis while taking into account that VMS data will not be shared without prior agreement.

### *12.3. SC and CTC Collaboration*

364. The Secretariat presented some communications from the Chairperson of the CTC looking at opportunities to collaborate with the SC including:

- Improved data collection (e.g. port state inspections can compare monitored unload of product versus what has been declared to SPRFMO);
- Improved monitoring of areas where there is a scientific focus where compliance tools could assist (e.g. aerial surveillance, high seas boarding and inspection etc...);
- New methodologies in assessing catch (e.g. cutting-edge scientific tools such as genetic sampling kits which could be deployed to the front line);
- Satellite-based monitoring of pattern of fishing behaviour (i.e. ground testing of algorithms).

365. The Secretariat suggested that the SC Chairperson could contribute to a paper to the next CTC meeting to highlight potential areas for collaboration.

### *12.4. Planned Inter-session activities*

366. The SC **agreed** on its multi-annual workplan as shown in Annex 5.

367. The CALAMASUR made a statement concerning the next Squid workshop. The full Statement is attached as Annex 14.

The SC **recommend** considering the offer made by CALAMASUR to co-host a workshop on Squid.

### *12.5. Status of SC Recommendations*

368. The Secretariat presented paper SC7-Doc18 on the status of previous SC Recommendations. It identified that most recommendations have been progressed.

369. The Secretariat clarified that these are the recommendations from the SC and that this work was done in response to the review panel identifying that SC recommendations should be taken up by the Commission and Members as appropriate.

### *12.6. Next Meeting venue and timing*

370. The dates for the 2020 SC were determined to be 3 October to 8 October, with potential days for workshops 1-2 October. The venue will be Napier, New Zealand.

371. It was noted that this overlaps with Chinese and Korean National holidays, however the 30<sup>th</sup> of September is the day that Annual catch data is due, so moving the meeting earlier will require progression of Jack mackerel stock assessment without final data.

372. There were no expressions of interest in hosting future meetings (2021 and beyond).

373. Some participants remarked that the current practice of holding SC workshop(s) immediately prior to the main SC meeting presented difficulties including: loss of weekends, extended periods of work as well as reduced time to prepare workshop reports. The SC **agreed** to examine the possibility of a rest day between workshops and main SC meeting.

### 13. Adoption of the Report and Meeting Closure

374. The report was adopted at 7:20pm on 12 October 2019.
375. The Chairperson thanked the Participants and the Secretariat for their hard work throughout the week. The SC participants thanked the Chairperson for his contribution and leadership with a round of applause and the meeting was closed at 7:25pm.



## SPRFMO SC7-Report

### Annex 1. Collated Advice from the Scientific Committee

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#### Performance Review Recommendations

- The SC recommends (SC7-Report Section 4.3) the Commission to consider mechanisms to harmonise coordination of data collection in observer programmes within the Memorandums of Understanding with relevant regional and/or sub-regional bodies.
- The SC noted that the workshop participants supported a future CMM including data gathering and reporting for the jumbo flying squid fishery with several possible management approaches including catch limits, fishing efforts limits and temporal and spatial closures being discussed, however, there was no agreement on common elements for an appropriate CMM to be developed at this stage and recommends (SC7-Report Section 4.3) the Commission to consider the current situation on CMM discussion from the squid working group and allow adequate time to develop the elements of the CMM for the Jumbo flying squid fishery.

#### Ecological Risk Assessment and Stock Structure delineation in Deep water

The SC recommended to the SPRFMO Commission (SC7-Report Section 5.2) that:

- identification guides and identification protocols for sharks and rays available from Members be collated and made available to fishers active in the SPRFMO Area;
- Where observers are on board, biological data, including length, sex, number of eggs/pups, and life status (i.e. condition) if discarded (e.g. alive-vigorous, alive-signs of life and dead) are collected for sharks through updates to CMM 02-2018; and
- Sharks should be identified to the lowest taxonomic level possible, preferably to the species level.
- that ERA assessments be repeated at least every five years and/or if there are substantial changes in the characteristics of SPRFMO bottom fisheries, and that this is reflected in the SPRFMO SC workplan. Such assessments could be expanded to include all SPRFMO fisheries.

#### SPRFMO Orange Roughy Assessments

The SC recommended to the SPRFMO Commission (SC7-Report Section 5.3) that:

- the current catch limit of 1,140 t per year for Louisville Ridge is maintained for 2020-2022.
- a catch limit for Westpac Bank could sustainably be set at a level up to 306 t, but that a catch limit of 258 t would represent a suitably precautionary approach given uncertainties in the stock assessment, in particular with regards to potential recruitment, and would also be consistent with the assumption that 12.5% of the Southwest challenger stock biomass occurs in the Westpac Bank area and that the catch limit be proportional to the total catch limit for the stock in accordance with this assumption.
- consistent with the multi-annual workplan, a stock assessment for the northwest Challenger Plateau be developed as a priority in 2020 for review by SC8 and, as time and resources permit, for the Lord Howe Rise.

#### VME Encounters and Spatial management

The SC recommended (SC7-Report Section 5.4) that, when the Commission reviews CMM 03-2019 in 2021, the list of VME indicator taxa should be revised to include the following additional taxa, noting that specific threshold weights may need to be revised once additional work is done to establish whether current thresholds are consistent with the objectives of CMM 03-2019:

- Gorgonian Alcyonacea
- Zoantharia

and that, the list of VME indicator taxa should be revised to remove the following taxon and associated weight thresholds:

- Alcyonacea

and that the list of VME indicator taxa used for the biodiversity component of the encounter protocol should be revised to include the following additional taxa:

- Zoantharia
- Hydrozoa (Hydroids)
- Bryozoa

And, with respect to individual temporary suspensions / closed areas following encounters, recommended that the Commission:

- Notes that SC7 has reviewed information on benthic bycatch and all temporary suspensions to fishing that occurred since CMM 03-2019 was adopted; and,
- Notes that no encounter events occurred before the SC's annual meeting.

And that the SPRFMO Commission cooperate and coordinate with other RFMO/As and the FAO in refining or developing guidelines on the interpretation of appropriate scale of consideration and assessment of SAls on VMEs, giving consideration to the FAO Deep-sea Guidelines and relevant UNGA resolutions, and taking into account efforts by RFMO/As to meet their obligations in this regard.

### Bottom Fishery Impact Assessment Standard (BFIAS)

The SC recommended (SC7-Report Section 5.5) to the Commission that the revised BFIAS at annex A of SC07-DW19 be adopted for any relevant BFIA processes undertaken in accordance with CMM 03-2019 and CMM 13-2019.

### Jack Mackerel

The SC recommended (SC7-Report, Section 6.1) that for future years, the haul-by-haul data will continue to be made available by the Members of the offshore fleet, via the SPRFMO Secretariat, for the analysis of standardised CPUE and that Members work together on making historical (prior to 2008) haul-by-haul data available, via the SPRFMO Secretariat, for the analysis of standardised offshore CPUE.

### Management Strategy Evaluation

The SC recommended (SC7-Report, Section 6.4) that an MSE Working Group be set up to progress the project prior to COMM 8 and that a Task Group be established by COMM 8 which includes Members of the SC and the Commission to progress the MSE for Jack Mackerel in 2020.

### Advice to The Commission on Jack mackerel

In line with the accepted rebuilding plan ("Adjusted Annex K") and because the Jack mackerel biomass is estimated to be above  $B_{MSY}$ , the SC recommended (SC7-Report Section 6.6) a 15% increase in 2020 catches throughout the range of Jack mackerel resulting in a total catch limit at or below 680 thousand tonnes.

### Advice to the Commission on Squid

The SC recommended (SC7-Report, Section 7.7) that the minimum number of at-sea full-time observers is 5 per Member or implement observer coverage in the range of 5-15% for a period of 3 years.

## **CMM 06-2019 (VMS), Data Access**

The SC agrees that access to VMS data for scientific purposes is extremely valuable (habitat, changes on fishing fleets distribution, availability of fleets to resources, benthic impact assessment, bycatch overlap...) therefore in order to facilitate answering scientific related Commission requests and considering the Security and Confidentiality Requirements of CMM 06-2018, the SC recommended (SC7-Report, Section 9.3) that VMS data for scientific purposes should require the Permission of the Member or CNCP and that the review of CMM 06-2018 (Commission VMS) considers the input of SC7 so VMS data may also be used by the SC for analysis to support specific scientific advice requested by the Commission.

## **Amended Cook Islands proposal**

The SC recommends (SC7-Report Section 10.2) that the SPRFMO Commission extend the expiry date of CMM 14b-2019 to 2022, aligning the CMM to the start of fisheries operations.

## **Planned Inter-sessional activities**

The SC recommended (SC7-Report, Section 12.4) considering the offer made by CALAMASUR to co-host a workshop on Squid.



## SPRFMO SC7-Report

### Annex 2. List of Participants

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#### SCIENTIFIC COMMITTEE CHAIRPERSON

NAME: Niels HINTZEN  
AFFILIATION: Wageningen Marine Research  
ADDRESS: Haringkade 1, IJmuiden  
EMAIL: [niels.hintzen@wur.nl](mailto:niels.hintzen@wur.nl)

#### MEMBERS

##### AUSTRALIA

NAME: Lee GEORGESON  
AFFILIATION: Department of Agriculture  
ADDRESS: 7 London Circuit Canberra 2601 ACT  
EMAIL: [lee.georgeson@agriculture.gov.au](mailto:lee.georgeson@agriculture.gov.au)

NAME: Roland PITCHER  
AFFILIATION: CSIRO Oceans & Atmosphere  
ADDRESS: 306 Carmody Road, ST. LUCIA QLD 4067  
EMAIL: [roland.pitcher@csiro.au](mailto:roland.pitcher@csiro.au)

##### CHILE

NAME: Mauro URBINA  
AFFILIATION: Subsecretaria de Pesca y Acuicultura  
ADDRESS: Bellavista 168, Valparaíso  
EMAIL: [murbina@subpesca.cl](mailto:murbina@subpesca.cl)

NAME: Mario ACEVEDO  
AFFILIATION: Subsecretaria de Pesca y Acuicultura  
ADDRESS: Bellavista 168, Valparaíso  
EMAIL: [macevedo@subpesca.cl](mailto:macevedo@subpesca.cl)

NAME: Marcos TRONCOSO  
AFFILIATION: Subsecretaria de Pesca y Acuicultura  
ADDRESS: Bellavista 168, Valparaíso  
EMAIL: [mtroncoso@subpesca.cl](mailto:mtroncoso@subpesca.cl)

NAME: Juan Carlos QUIROZ  
AFFILIATION: Instituto de Fomento Pesquero  
ADDRESS: Av. Blanco Encalada 839, Valparaíso  
EMAIL: [juancarlos.quiroz@ifop.cl](mailto:juancarlos.quiroz@ifop.cl)

NAME: Ignacio PAYA  
AFFILIATION: Instituto de Fomento Pesquero  
ADDRESS: Av. Blanco Encalada 839, Valparaíso  
EMAIL: [ignacio.paya@ifop.cl](mailto:ignacio.paya@ifop.cl)

NAME: Aquiles SEPÚLVEDA  
AFFILIATION: Instituto de Investigación Pesquera  
ADDRESS: Av. Cristóbal Colón 2780, Talcahuano  
EMAIL: [asepulveda@inpesca.cl](mailto:asepulveda@inpesca.cl)

NAME: Andres COUVE  
AFFILIATION: Sociedad Nacional de Pesca  
ADDRESS: Barros Errazuriz 1954, Of. 206, Providencia, Santiago  
EMAIL: [andrescouve@entelchile.net](mailto:andrescouve@entelchile.net)

NAME: Albert ARIAS  
AFFILIATION: ANAPESCA/Lota Protein  
ADDRESS:  
EMAIL: [albarthur@gmail.com](mailto:albarthur@gmail.com)

NAME: Eduardo INFANTE DE T.P.  
AFFILIATION: AOBAC  
ADDRESS: Av. Del Parque 5339; Huechuraba, Santiago  
EMAIL: [einfante@globalpesca.cl](mailto:einfante@globalpesca.cl)

**CHINA**

NAME: Gang LI  
 AFFILIATION: Shanghai Ocean University  
 ADDRESS: 999 Huchengring Rd, Shanghai, 201306  
 EMAIL: [g-li@shou.edu.cn](mailto:g-li@shou.edu.cn)

NAME: Bilin LIU  
 AFFILIATION: Shanghai Ocean University  
 ADDRESS: 999 Huchengring Rd, Shanghai, 201306  
 EMAIL: [bl-liu@shou.edu.cn](mailto:bl-liu@shou.edu.cn)

NAME: Luoliang XU  
 AFFILIATION: Shanghai Ocean University  
 ADDRESS: 999 Huchengring Rd, Shanghai, 201306  
 EMAIL: [xllxxlxy@yeah.net](mailto:xllxxlxy@yeah.net)

NAME: Cong Cong WANG  
 AFFILIATION: Shanghai Ocean University  
 ADDRESS: 999 Huchengring Rd, Shanghai, 201306  
 EMAIL: [ccwang@shou.edu.cn](mailto:ccwang@shou.edu.cn)

**COOK ISLANDS**

NAME: Marino WICHMAN  
 AFFILIATION: Ministry of Marine Resources  
 ADDRESS: PO BOX 86, Rarotonga  
 EMAIL: [m.wichman@mmr.gov.ck](mailto:m.wichman@mmr.gov.ck)

NAME: Stephen BROUWER  
 AFFILIATION: Pacific Community  
 ADDRESS: 95 Promenade Roger Laroque BP D5 98848 Noumea  
 EMAIL: [stephenb@spc.int](mailto:stephenb@spc.int)

**CUBA**

NAME: Raidel BARROTO  
 AFFILIATION: Center for Fishery Research  
 ADDRESS: 246 y 5ta. Av. Barlovento, La Habana  
 EMAIL: [raidel.borroto@cip.alinet.cu](mailto:raidel.borroto@cip.alinet.cu)

NAME: Rafael PUGA  
 AFFILIATION: Center for Fishery Research  
 ADDRESS: 246 y 5ta. Av. Barlovento, La Habana  
 EMAIL: [rpuga@cip.alinet.cu](mailto:rpuga@cip.alinet.cu)

NAME: Servando VALLE  
 AFFILIATION: Center for Fishery Research  
 ADDRESS: 246 y 5ta. Av. Barlovento, La Habana  
 EMAIL: [servando@cip.alinet.cu](mailto:servando@cip.alinet.cu)

NAME: Elisa GARCÍA  
 AFFILIATION: Food Industry Ministry  
 ADDRESS:  
 EMAIL:

**ECUADOR**

NAME: Manuel PERALTA  
 AFFILIATION: Instituto Nacional de Pesca  
 ADDRESS: Letamendi 102 y La Ría, Guayaquil  
 EMAIL: [mperalta@institutopesca.gob.ec](mailto:mperalta@institutopesca.gob.ec)

NAME: Jose PACHECO  
 AFFILIATION: Instituto Nacional de Pesca  
 ADDRESS: Letamendi 102 y La Ría, Guayaquil  
 EMAIL: [jpacheco@institutopesca.gob.ec](mailto:jpacheco@institutopesca.gob.ec)

NAME: Jorge COSTAIN  
 AFFILIATION: TRANSMARINA  
 ADDRESS: E15, Manta 130218  
 EMAIL: [jcostain@transmarina.com](mailto:jcostain@transmarina.com)

NAME: Guillermo MORÁN  
 AFFILIATION: TRANSMARINA  
 ADDRESS: E15, Manta 130218  
 EMAIL: [gamv6731@gmail.com](mailto:gamv6731@gmail.com)

NAME: Jimmy VILLAVICENCIO  
 AFFILIATION:  
 ADDRESS:  
 EMAIL: [jvillavicencio@v-a.com.ec](mailto:jvillavicencio@v-a.com.ec)

NAME: Marco HERRERA  
 AFFILIATION: Instituto Nacional de Pesca  
 ADDRESS: Letamendi 102 y la Ría  
 EMAIL: [mherrera@institutopesca.gob.ec](mailto:mherrera@institutopesca.gob.ec)

**EUROPEAN UNION**

NAME: Marta SOEFFKER  
 AFFILIATION: Centre for Environment, Fisheries & Aquaculture Science  
 ADDRESS: Pakefield Rd, NR33 0HT  
 EMAIL: [marta.soffker@cefas.co.uk](mailto:marta.soffker@cefas.co.uk)



NAME: Martin PASTOORS  
 AFFILIATION: Pelagic Freezer-trawler Association  
 ADDRESS: Louis Braillelaan 80, 2719 EK Zoetermeer  
 EMAIL: [mpastoor@pelagicfish.eu](mailto:mpastoor@pelagicfish.eu)

NAME: Vladimir LAPTIKHOVSKY  
 AFFILIATION: Centre for Environment, Fisheries & Aquaculture Science  
 ADDRESS: Pakefield Rd, NR33 OHT  
 EMAIL: [vladimir.laptikhovsky@cefasc.co.uk](mailto:vladimir.laptikhovsky@cefasc.co.uk)

## KOREA

NAME: Kyum Joon PARK  
 AFFILIATION: National Institute of Fisheries Science  
 ADDRESS: 216, Gijanghaean-ro, Gijang-eup, Gijang-gun, Busan 46083  
 EMAIL: [mogas@korea.kr](mailto:mogas@korea.kr)

NAME: Jung-Hyun LIM  
 AFFILIATION: National Institute of Fisheries Science  
 ADDRESS: 216, Gijanghaean-ro, Gijang-eup, Gijang-gun, Busan 46083  
 EMAIL: [jhl1@korea.kr](mailto:jhl1@korea.kr)

NAME: Seong-Ju CHO  
 AFFILIATION: Korea Overseas Fisheries Association  
 ADDRESS: Nonhyeon-ro 83, Seocho-gu, Seoul  
 EMAIL: [csj@kosfa.org](mailto:csj@kosfa.org)

NAME: Kang-Hwi PARK  
 AFFILIATION: Jeongil Corp.  
 ADDRESS: 27 Dokseodang-ro, Yongsan-gu, Seoul  
 EMAIL: [leopark@insungnet.co.kr](mailto:leopark@insungnet.co.kr)

## NEW ZEALAND

NAME: Martin CRYER  
 AFFILIATION: Ministry for Primary Industries  
 ADDRESS: 118 Vickerman Street, Port Nelson  
 EMAIL: [martin.cryer@mpi.govt.nz](mailto:martin.cryer@mpi.govt.nz)

NAME: Tiffany BOCK  
 AFFILIATION: Ministry for Primary Industries  
 ADDRESS: 34-38 Bowen Street, Wellington  
 EMAIL: [tiffany.bock@mpi.govt.nz](mailto:tiffany.bock@mpi.govt.nz)

NAME: Shane GEANGE  
 AFFILIATION: Department of Conservation  
 ADDRESS: 18-32 Manners Street, Wellington  
 EMAIL: [sgeange@doc.govt.nz](mailto:sgeange@doc.govt.nz)

NAME: Kim DRUMMOND  
 AFFILIATION: Te Ohu Kaimoana  
 ADDRESS: PO Box 3277, Wellington  
 EMAIL: [kim.drummond@teohu.maori.nz](mailto:kim.drummond@teohu.maori.nz)

## PERU

NAME: Omar RÍOS  
 AFFILIATION: Ministerio de la Producción  
 ADDRESS: Calle Uno Oeste Nº 060, San Isidro  
 EMAIL: [orios@produce.gob.pe](mailto:orios@produce.gob.pe)

NAME: Miguel ÑIQUEN  
 AFFILIATION: Instituto del Mar del Perú - IMARPE  
 ADDRESS: Esq. Gamarra y Valle s/n – Callao  
 EMAIL: [mniquen@imarpe.gob.pe](mailto:mniquen@imarpe.gob.pe)

NAME: Jorge CSIRKE  
 AFFILIATION: Instituto del Mar del Perú - IMARPE  
 ADDRESS: Esq. Gamarra y Valle s/n – Callao  
 EMAIL: [jorge.csirke@gmail.com](mailto:jorge.csirke@gmail.com)

NAME: Luis MARIATEGUI  
 AFFILIATION: Instituto del Mar del Perú - IMARPE  
 ADDRESS: Esq. Gamarra y Valle s/n – Callao  
 EMAIL: [lmariategui@imarpe.gob.pe](mailto:lmariategui@imarpe.gob.pe)

NAME: Enrique RAMOS  
 AFFILIATION: Instituto del Mar del Perú - IMARPE  
 ADDRESS: Esq. Gamarra y Valle s/n – Callao  
 EMAIL: [enramos@imarpe.gob.pe](mailto:enramos@imarpe.gob.pe)

NAME: Giovanna SOTIL  
 AFFILIATION: Instituto del Mar del Perú - IMARPE  
 ADDRESS: Esq. Gamarra y Valle s/n – Callao  
 EMAIL: [gsotil@imarpe.gob.pe](mailto:gsotil@imarpe.gob.pe)

NAME: Ulises MUNAYLLA  
 AFFILIATION: Sociedad Nacional de Pesquerías  
 ADDRESS: Av. República de Panamá 3591, piso 9, San Isidro, Lima  
 EMAIL: [umunaylla@snp.org.pe](mailto:umunaylla@snp.org.pe)

NAME: Mariano GUTIERREZ  
 AFFILIATION: Humboldt Institute  
 ADDRESS: Av. República de Panamá 3591  
 EMAIL: [msgutierrez@gmail.com](mailto:msgutierrez@gmail.com)

NAME: Anibal ALIAGA  
 AFFILIATION: Sociedad Nacional de Pesquerías  
 ADDRESS: Av. República de Panamá 3591,  
 piso 9, San Isidro, Lima  
 EMAIL: [snpnet@snp.org.pe](mailto:snpnet@snp.org.pe)

NAME: Carlos MARIN  
 AFFILIATION: Sociedad Nacional de Pesquerías  
 ADDRESS: Av. República de Panamá 3591,  
 piso 9, San Isidro, Lima  
 EMAIL: [snpnet@snp.org.pe](mailto:snpnet@snp.org.pe)

NAME: John ROBLES  
 AFFILIATION: Sociedad Nacional de Pesquerías  
 ADDRESS: Av. República de Panamá 3591,  
 piso 9, San Isidro, Lima  
 EMAIL: [snpnet@snp.org.pe](mailto:snpnet@snp.org.pe)

NAME: Claudia BETALLELUZ  
 AFFILIATION: Embassy of Peru (Cuba)  
 ADDRESS: Calle 8 No 307 e/3ey5, Havana  
 EMAIL: [cbetallez@embaperu.org](mailto:cbetallez@embaperu.org)

## RUSSIAN FEDERATION

NAME: Alexander GLUBOKOV  
 AFFILIATION: VNIRO  
 ADDRESS: Moscow, Russia  
 EMAIL: [glubokov@vniro.ru](mailto:glubokov@vniro.ru)

## CHINESE TAIPEI

NAME: Ren-Fen WU  
 AFFILIATION: OFDC  
 ADDRESS: 3f, No 14, Wenzhou St  
 EMAIL: [fan@ofdc.org.tw](mailto:fan@ofdc.org.tw)

## VANUATU

NAME: Gerry GEEN  
 AFFILIATION: Vanuatu Department of Fisheries  
 ADDRESS: Mail bag 9045, Port Vila  
 EMAIL: [ggeen@bigpond.net.au](mailto:ggeen@bigpond.net.au)

## OBSERVERS – NGO

### CALAMASUR

NAME: Alfonso MIRANDA  
 AFFILIATION: CALAMASUR  
 ADDRESS:  
 EMAIL: [alfonso.miranda@pezex.pe](mailto:alfonso.miranda@pezex.pe)

NAME: Geoff TINGLEY  
 AFFILIATION: Sustainable Fisheries Partnership  
 ADDRESS: 4348 Waialae Ave.#692, Honolulu,  
 HI 96816  
 EMAIL: [geoff.tingley@sustainablefish.org](mailto:geoff.tingley@sustainablefish.org)

NAME: Pascual AGUILERA  
 AFFILIATION: CALAMASUR  
 ADDRESS:  
 EMAIL: [pascual.aguilera.sarmiento@gmail.com](mailto:pascual.aguilera.sarmiento@gmail.com)

NAME: Renato GOZZER  
 AFFILIATION: Sustainable Fisheries Partnership  
 ADDRESS: 4348 Waialae Ave.#692, Honolulu,  
 HI 96816  
 EMAIL: [renato.gozzer@sustainablefish.org](mailto:renato.gozzer@sustainablefish.org)

NAME: Rubén Rojas GALLARDO  
 AFFILIATION: Asesor  
 ADDRESS: Coordinadora Nacional de Jibieros  
 de Chile  
 EMAIL: [gerencia@almarspa.cl](mailto:gerencia@almarspa.cl)

## DEEP SEA CONSERVATION COALITION (DSCC)

NAME: Duncan CURRIE  
 AFFILIATION: Deep Sea Conservation Coalition  
 ADDRESS:  
 EMAIL: [duncanc@globelaw.com](mailto:duncanc@globelaw.com)

NAME: Barry WEEBER  
 AFFILIATION: Deep Sea Conservation Coalition  
 ADDRESS:  
 EMAIL: [baz.weeber@gmail.com](mailto:baz.weeber@gmail.com)

## HIGH SEAS FISHERIES GROUP (HSFG)

NAME: Andy SMITH  
 AFFILIATION: HSFG  
 ADDRESS: Maitai Wharf Port Nelson  
 EMAIL: [andy.smith@talleys.co.nz](mailto:andy.smith@talleys.co.nz)

NAME: Dean JURASOVICH  
 AFFILIATION: HSFG  
 ADDRESS: Hall Street, North Mole, Timaru  
 EMAIL: [djurasovich@sanford.co.nz](mailto:djurasovich@sanford.co.nz)

NAME: Alex EPSTEIN  
 AFFILIATION: HSFG  
 ADDRESS: BCI House, First Floor, Avarua  
 EMAIL: [alex.epstein@osf.pe](mailto:alex.epstein@osf.pe)

NAME: David JAPP  
 AFFILIATION: HSFG  
 ADDRESS: Unit 15 Foregate Square, Cape Town  
 EMAIL: [dave@capfish.co.za](mailto:dave@capfish.co.za)

## OBSERVER STATES

### JAPAN

NAME: Shin-Ichiro NAKAYAMA  
 AFFILIATION: National Research Institute of Fisheries Science  
 ADDRESS: 2-12-4 Fukuura, Kanazawa, Yokohama, Kanagawa 236-8648  
 EMAIL: [shin.ichiro.nak@gmail.com](mailto:shin.ichiro.nak@gmail.com)

NAME: Taiki FUJI  
 AFFILIATION: Japan Fisheries Research and Education  
 ADDRESS: 2-12-4 Fukuura, Kanazawa, Yokohama, 236-8648  
 EMAIL: [tfuji114@affrc.go.jp](mailto:tfuji114@affrc.go.jp)

## INVITED EXPERTS

NAME: Alexander ARKHIPKIN  
 AFFILIATION: Fisheries Department  
 ADDRESS: Bypass Road, Stanley  
 EMAIL: [aarkhipkin@fisheries.gov.fk](mailto:aarkhipkin@fisheries.gov.fk)

NAME: Lee QI  
 AFFILIATION: University of Washington  
 ADDRESS: 1122 NE Boat St, Seattle, WA 98195  
 EMAIL: [leeqi@uw.edu](mailto:leeqi@uw.edu)

## SPRFMO SECRETARIAT

NAME: Sebastián RODRIGUEZ ALFARO  
 AFFILIATION: SPRFMO Secretariat  
 ADDRESS: PO BOX 3797, Wellington 6140  
 EMAIL: [srodriguez@sprfmo.int](mailto:srodriguez@sprfmo.int)

NAME: Craig LOVERIDGE  
 AFFILIATION: SPRFMO Secretariat  
 ADDRESS: PO BOX 3797, Wellington 6140  
 EMAIL: [cloveridge@sprfmo.int](mailto:cloveridge@sprfmo.int)



## SPRFMO SC7-Report Annex 3. SC7 Agenda

1) OPENING OF THE MEETING a. Adoption of Agenda b. Meeting Documents c. Nomination of Rapporteurs d. Meeting program and timetable	Documents SC7-Doc01/02 SC7-Doc03  SC7-Doc04
2) ANNUAL REPORTS DISCUSSION	SC7-Doc19/20 SC7-Doc21 SC7-Doc22 SC7-Doc23 SC7-Doc26 SC7-Doc27 SC7-Doc28 SC7-Doc29/30 SC7-Doc31/32 SC7-Doc33/34 SC7-Doc35 SC7-Doc36
3) COMMISSION GUIDANCE AND INTER-SESSIONAL ACTIVITIES a) “Expanded” SC multi-annual workplan b) Secretariat SC related activities c) SPRFMO Performance review	SC7-Doc05/18 SC7-Doc09/10 SC7-Doc08/15
4) DEEPWATER a) Review of inter-sessional activities b) Deepwater stock structure(s) (priorities/planning) c) SPRFMO Orange roughy assessment d) Other assessments (including ecological risk assessments) e) VME encounters and Spatial management f) Bottom Fishery Impact Assessment Standard (BFIAS) g) Advice to the Commission on Deepwater	SC7-DW09 SC7-DW05/06/07/08/20 SC7-DW10/11 DW12/13/14/15/16/17/18 SC7-DW19
5) JACK MACKEREL a) Inter-sessional activities including stock structure and growth b) Assessment data review and evaluation c) SPRFMO Jack mackerel assessment d) Management Strategy Evaluation e) Advice to the Commission on Jack mackerel	SC7-JM01/02   SC7-JM03
6) SQUID a) Review of inter-sessional activities b) Basic biology c) Assessment data and modelling approaches d) Connectivity e) SPRFMO Squid Assessment	SC7-SQ02/03 SC7-SQ04/14 SC7-SQ01/08/09 SC7-SQ10/11/12 SC7-SQ07

f) Advice to the Commission on Squid	SC7-SQ05/06
<b>7) HABITAT MONITORING</b> a) Review of inter-sessional activities b) Applicability of fishing vessel acoustic data c) Developments in characterising and modelling CJM Habitat d) Future habitat monitoring workplan	SC7-HM01 SC7-HM02 SC7-HM03
<b>8) ADVICE ON CMM DEVELOPMENT</b> a) Developments regarding Scientific Research b) Developments regarding Squid c) CMM 06-2019 (VMS), data access d) CMM 16-2019 (Observer Programme), coverage	SC7-Doc24  SC7-Doc14 SC7-Doc11/12 SC7-SQ06
<b>9) EXPLORATORY FISHERIES</b> a) Cook Islands potting report on progress b) Amended Cook Islands proposal c) European Union toothfish report on progress d) New Zealand toothfish report on progress e) Chile Exploratory toothfish proposal	SC7-DW02/22 SC7-DW01  SC7-DW04 SC7-DW03
<b>10) ECOSYSTEM CONSIDERATIONS</b> a) Seabird/bycatch interaction monitoring b) Ecologically or Biologically Significant marine Areas (EBSAs) c) Marine pollution research d) Climate change impacts on deep ocean fisheries	SC7-Doc13   SC7-Doc25
<b>11) OTHER MATTERS</b> a) Level and use of the Commissions Scientific Support budget b) SC capacity building requirements c) SC and CTC collaboration d) Annual Report guidelines and SC Submission protocol e) Planned Inter-sessional activities f) Next meeting venue and timing	SC7-Doc16 SC7-Doc15  SC7-Doc06/07  SC7-Doc17
<b>12) REPORT ADOPTION AND MEETING CLOSURE</b>	



## SPRFMO SC7-Report

### Annex 4. Annual Reports

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#### Australia

Paper SC7-Doc22 provides an update on fishing activity by Australian-flagged vessels in the SPRFMO Convention Area. Two Australian-flagged vessels fished in the SPRFMO area in 2018 using demersal longline gears. There was no trawl effort or catch made by Australian-flagged vessels in 2018. The total retained catch reported in logbooks was 116 t in 2018 and effort was 753,000 hooks. *Seriola lalandi* accounted for 21% (24 t) of the 2018 longline catch; the remainder comprised *Nemadactylus macropterus* (15%; 18 t), *Lethrinus rubrioperculatus* (12%; 14 t), *Dentex spariformis* (12%; 14 t), *Etelis coruscans* (11%; 13 t) and other species (28%; 32 t). Logbook reported discards in 2018 in the longline fishery were 15 t. During 2018, observer coverage levels met or exceeded the levels specified in CMM 03-2018 (superseded by CMM 03-2019 in April 2019). Observers did not report any bycatch of marine mammals, seabirds or marine reptiles during 2018. For benthic bycatch, full 2018 observer data were not available at the time of writing the report, but benthic bycatch is expected to have been negligible as there was no trawl fishing. In the trawl fishery in 2017, observers reported bycatch of 13kg of Echinodermata, 6kg of Scleractinia and <1kg of Crinoidea and Pennatulacea. In the non-trawl fishery in 2017, observers reported 9kg of Crinoidea, 2kg of Hydrozoa and <1kg of Spongiidae.

#### Chile

The industrial purse seine fleet operating on the Jack mackerel fishery in the SPRFMO area and Chilean EEZ between January and July 2019 consisted of 61 fishing vessels. During 2016 and 2019 operations on Jack mackerel have been concentrated within the Chilean EEZ.

During the first semester of 2019, Jack mackerel catches (315,000 t) were the highest of the period between 2016 and 2019. These catches started in December 2018 until June 2019 with a monthly average of 60,000 t during the first semester. For the first semester of 2019, the range of sizes from catches of the south central fleet varied between 22 and 61 cm Fork Length (FL). The main mode was 31 cm FL and the secondary mode 35 cm FL.

The jumbo squid fishery has participation of artisanal and industrial vessels. The allocation of the national quota for the industrial sector corresponds to 20% and the remaining 80% is assigned to the artisanal sector. During 2018, the total of artisanal vessels that operated on the jumbo squid resource corresponded to 2075 vessels, of dimensions equal to or less than 18 m in length. Among the vessels with the greatest operation, those less than 12 m in length stand out. This represented 96.15% of the artisanal operation in this resource.

The industrial landings made during 2018, were mainly executed by vessels that used the midwater trawl as an extraction method for jumbo squid as the target fishery (91.05%). However, the extraction of this resource with trawl represented 8.90%, as a consequence of the presence of jumbo squid as an accompanying fauna in other fisheries. On the other hand, the operation with purse seining fence and jigging accounted for 0.04% and 0.01% respectively of the extraction in this year.

The largest jumbo squid landings in recent years can be identified in 2010, 2014 and 2016. During 2010 the industrial landings exceeded the artisanal landings, which explains the high value of the total landings in that year. As of 2011, the artisanal fleet has made more than 70% of the total landing. The 2018 season was characterised, as in 2017, by a decrease in landings made by the artisanal fleet compared to the previous year. On the other hand, the total catches were made in the Exclusive Economic Zone (EEZ) of the Chilean maritime territory.

## China

Two Chinese trawlers operated in the SPRFMO Convention Area for Jack mackerel in 2018, and the total catch was 24,678 t, in which 311 t of Chub mackerel were included. The main fishing season this year was from March to August (last year was from April to August). Similar to previous years, the fishery first took place in the high seas off south central Chile and then moved to northern Chile, where the young Jack mackerel were distributed, at the end of the fishing season. The total catch, as well as nominal CPUE, reached a higher level than in previous years. This may be because the biomass has been recovering. A total of 12 189 Jack mackerel were measured by scientific observers in 2018. The observations and biology samples covered the main fishing season and fishing ground. 86 fishing days and 149 tows were observed, and the coverage rate was 37.4%.

435 Chinese squid jigging vessels were registered to fish in the SPRFMO Convention Area. The number of active fishing vessels varied from 190 (March) to 373 (November). A total of 346 thousand tonnes of jumbo flying squid were caught in 2018. The number of total fishing vessels, annual catch, total fishing days and nominal CPUE all increased in 2018 compared with 2017. Two onboard observers and one studying vessel were designated to implement the observer programme for collecting length composition data and biological information from February 2018 to May 2019.

## Cook Islands

The Cook Islands confirmed it had nil activities in the SPRFMO Area during 2018.

## Ecuador

Ecuador's report presents brief biological and fishing aspects of Jack mackerel, a resource caught as bycatch in the small pelagic fishery on the Ecuadorian continental coast, specifically when this species is accessible to the fleet.

## European Union

The European Union (EU) submitted a report on fishing activity in 2018 in the South Pacific Regional Fisheries Management Organization (SPRFMO) Convention area. The data on catches of *Trachurus murphyi* by one EU trawler in 2018 covers the period from January to July. A short section on the PFA self-sampling programme was included in the report. In addition, some general information on the EU fishing activity in 2019 in the SPRFMO Convention area was included.

A separate report covering the activities of the observer programme of the European Union (EU) in the SPRFMO Convention area in 2018 and 2019 was also submitted.

## Korea

Korean commercial trawl fishery targeting on *Trachurus murphyi* (Jack mackerel) have been operating in the SPRFMO Convention Area since 2003. The number of active Korean fishing vessels was stable within the range of 1-3, but their size became larger than those at the beginning of the fishery. The highest catch of *T. murphyi* in the Convention Area was approx. 15 thousand tonnes in 2009, and the lowest catch was in 2017. In 2018, catch has recorded a threefold increase over the preceding year. Nevertheless, the CPUE slightly decreased to 4.2 t/hour due to extended operation days.

Korea jigging fishery has been commercially operating in the SPRFMO Convention Area since 1990 and the target species is *Dosidicus gigas* (jumbo flying squid). The number of fishing vessels ranged from 1 to 50 with the average 15 vessels over 1990-2018. The highest catch of *D. gigas* was about 69 thousand tonnes in 1994, and the lowest catch was about 2 thousand tonnes in 2006. After 2008, the catch trend is relatively constant compared to the prior fishing seasons. CPUE of *D. gigas* ranged from 4 to 28 t/day over the past 7 years.



Since 2015, Korea has dispatched scientific observers on board each commercial jigging vessel to conduct a fishing ground survey including biological research in the Convention Area. The survey items include collecting fishing operation data; biological measurement of the target species; observations of bycatch species, marine mammals, seabirds and other species of concern; monitoring of marine environment and waste disposal; and biological sampling. In particular, collected samples of jumbo flying squid will be utilised for future research on age determination, prey composition, and genetic studies.

In 2018, observers on board the trawl vessels have reported four observations of *L. nasus* from both of the trawl vessels in operation. However, there was no bycatch of marine mammals, reptiles or any other species of concern.

## New Zealand

SC7-Doc23 provides an update on New Zealand's fishing activities in the SPRFMO Convention Area in 2018. Nine New Zealand vessels fished in the SPRFMO Convention Area, six using trawl methods and three using bottom line methods. Overall catch and effort was slightly lower than in 2017, with 858 trawl tows completed taking 1,570 t of fish. The majority of the trawl catch was orange roughy (1,232 t). There were 110,000 hooks set using bottom line methods with a total catch of 78 t, the majority of which was bluenose and wreckfish (34 and 27 t respectively). New Zealand met all requirements for observer coverage, with 100% coverage in bottom trawl fisheries, and 24% coverage of bottom line fisheries. Over 9,000 fish were measured, including nearly 7,000 orange roughy and over 1,000 alfonsino. Length frequency information on a number of species is provided in the report.

The majority of research activities by New Zealand in 2018 were continuations of previous projects supporting the development and implementation of the new bottom fishing conservation and management measure. New Zealand also provides information on interactions with seabirds, marine mammals, reptiles, other species of concern, and other ecosystem considerations including non-target fish and elasmobranch catch and catch of benthic organisms. There were four seabird captures observed on New Zealand vessels in 2018, all four of which were released alive. There was one encounter with potential VMEs that triggered New Zealand's move-on rule in 2018.

## Peru

As of June 2019, there are 99 Peruvian vessels authorised and registered in the Commission record of vessels authorised to fish within the SPRFMO Convention Area. In 2014, up to 5 Peruvian purse seine/traulers caught 2,556.9 t of *Trachurus murphyi* and 1,190.0 t of *Dosidicus gigas* in the SPRFMO Convention area. This fleet of Peruvian larger multipurpose purse seine/trawl vessels has now been reduced to only 2 vessels, and no Peruvian vessel has fished for *Trachurus murphyi* in the SPRFMO Convention area since 2015. A total of 1,122.3 t of *Scomber japonicus* were caught by 5 Peruvian purse seiners in 2016.

Two Peruvian scientific research vessels caught a total of 1.6 t of *Dosidicus gigas* in 2015 and one of them caught 1.0 t in 2018. Details of all these catches have been reported in previous annual reports to the SC. In addition, a variable number of small artisanal jigger vessels, not registered in the Commission record of vessels authorised to fish in the SPRFMO Convention area, has been reported to have occasionally fished for *Dosidicus gigas* in the SPRFMO Convention between 2014 and 2018. The fishing activities of the large Peruvian artisanal fishing fleet, comprising around 17,920 small vessels with maximum hold capacity of 32.6 m<sup>3</sup> and maximum length of 15 m, are recorded through a port interview and sampling programme for scientific research purposes implemented as part of IMARPE's fishery monitoring system. IMARPE records indicate that a small fraction of these small artisanal vessels that usually fish in coastal areas, within the 200 nautical mile distance from the coast, have occasionally extended their hand-jigging fishing activities beyond 200 nautical miles from the coast, entering into the SPRFMO Convention area, where according to IMARPE estimates, a maximum of 557 small artisanal vessels may have caught an estimated total of 6,904 t of *Dosidicus gigas* between 2014 and 2018. The available details of these catches are provided in this report. No fishing activities by Peruvian vessels in the SPRFMO Convention area have been reported for the first semester of 2019.

The recent situation of the marine environment off Peru is characterised by the sequence of warmer and cooler than normal events intercalated with relatively short periods of neutral or 'normal' conditions. Since 2014 there has been a weak El Niño in mid-2014, a strong El Niño during 2015 and the first half of 2016, a moderate-coastal El Niño from late 2016 to early in 2017, a weak-to-moderate La Niña from late 2017 to early 2018, and a weak El Niño from very late in 2018 to early 2019.

These have impacted the Peruvian fishery for Jack mackerel (*Trachurus murphyi*) in Peruvian national waters by causing a more dispersed distribution, reduced availability, lower abundance indexes and consequently lower catches of Jack mackerel in Peru between 2014 and the first part of 2018; while the slightly warmer than neutral conditions associated with the weak 2018-2019 El Niño favored the presence of denser concentrations, increased availability to the industrial purse seine fleet, much higher abundance indexes and consequently higher catches of Jack mackerel during the second half of 2018 and the first half of 2019.

Jack mackerel abundance indexes from scientific surveys and from the fishery increased noticeably between January 2018 and August 2019, and composite yearly CPUE values of 2018 and 2019 were well above the CPUE values observed between 2002 and 2017. In early January 2018 IMARPE updated the available 2018 Jack mackerel assessment made for the Peruvian (far-north) stock during the SC6 and estimated a TAC for 2019 of 79,000 t, with an  $F_{2019} = 0.032$  and an estimated risk of 17.5% that the biomass projected to January 1st, 2020 be lower than that estimated for January 2019. A readjustment of the estimated TAC, by an additional 20,000 t, bringing the revised TAC to 99,000 t for the whole year was made by the end of March 2019 based on an updated assessment of the situation on the basis of the newer information and data collected during January, February and March 2019. The main results of an updated 2019 assessment using information about catch, catch at length, and catch at age updated to June 2019 was also presented.

## Russian Federation

Russia presented its national report. In 2019 only one Russian trawler "Aleksandr Kosarev" worked in the high seas of the Southeast Pacific. The total catch was 4,321 t for Jack mackerel and 44 t for chub mackerel in 66 fishing days. The average catch from March to July 2019 was 6.2 t per hour. The highest CPUE was recorded in April - 99.3 t per fishing day. A Russian scientific observer was onboard the trawler "Aleksandr Kosarev" during the whole period of activities in 2019. In 2019, 16,686 specimens of Jack mackerel were measured, 3,050 specimens were analysed, and 1,301 specimens were taken for age sampling by the scientific observer. The by-catch of chub mackerel was very low and therefore, the amount of collected material was limited – 1,594 specimens were measured, 252 specimens were analysed, and 37 specimens were taken for age sampling.

## Chinese Taipei

Jumbo flying squid inhabit in the eastern Pacific and have been targeted by Chinese Taipei's squid-jigging fleet since 2002. The number of fishing vessels varied from 5 to 29 between 2002 and 2018. There were 14 vessels involved in the fishery in 2018, and they produced 3,848 t of jumbo flying squid. The nominal CPUE was 2.76 t/vessel/day in 2018 which was lower than the previous year.

The major fishing grounds for the fishing vessels were located around 75°–83°W and 15°–20°S, while few vessels operated in the waters around the equator (95°–115°W) in 2018. Data of logbook, transshipment and landing of Chinese Taipei's squid-jigging fleet have been collected entirely and submitted to the Secretariat of SPRFMO. Research on the stock status and spatial dynamics of jumbo flying squid have been conducted. The length composition of jumbo flying squid was converted from weight categories. Two squid samples were collected in the fishing season of 2017 and a preliminary examination done this year.

A biological sampling programme has been designed following the protocol of the SPRFMO and will be carried out by one fishing vessel in the fishing season of 2019. No bycatch was recorded for the squid-jigging fleet in the fishing season of 2018. The observer programme for the squid fishery has been developed in 2018 and ten observers finished the training course in April 2019.

## United States of America

The United States currently has no vessels participating in the fisheries managed by SPRFMO. As such, the United States has no data or information to provide regarding U.S. fisheries operating under SPRFMO jurisdiction in 2019. Similarly, the United States has no information to provide regarding 1) catches, effort, and CPUE summaries; 2) fisheries data collection and research activities; 3) biological sampling and length/age composition of catches; 4) ecosystem approach considerations; and 5) observer implementation reports for fishing activities under SPRFMO jurisdiction.

The United States has a continuing interest in the fisheries managed by SPRFMO and may have vessels that enter these fisheries in the future. If U.S.-flagged vessels enter SPRFMO-managed fisheries, the United States would provide the Commission with all relevant data and information and abide by all relevant measures adopted.

## Vanuatu

Vanuatu submitted a nil report and maintains its interest in SPRFMO fisheries and may have fishing activities in the SPRFMO area in the future.



## SPRFMO SC7-Report Annex 5. SC Multi-Annual Plan

### Jack Mackerel Working Group

Task	Objective	Timeline	Coordinator	Funding
Jack mackerel assessment data	Review available input data JM assessment	2020	US/EU	In-kind
	Develop quality control diagnostics of the catch input data to the assessment	2020	EU	In-kind
	Evaluate the impact on age-length keys due to any revisions in age determinations	2020		In-kind
	Update and compare of standardizations of commercial tuning indices among different fleets	2020		In-kind
	Review industry data availability and usability (using self-sampling biological data and acoustic data from fishing vessels in the JM assessment)	2020		In-kind
Jack mackerel assessment	SC and other funds to support experts	2020 +	SC Chair/ Secretariat	NZ\$10k (SC)
	An evaluation of alternative stock structure hypotheses	2020 +		In-kind
	Provide TAC advice according to Commission request ("adjusted Annex K")	2020		In-kind
	Review biological reference points (BRPs), develop and carry out MSE evaluation to design alternative harvest control rule	2020	EU	NZ\$126k (EU)
	Explore alternative stock assessment models and hold a benchmark workshop	2020-2021		NZ\$10K (SC)
Estimation of growth	Analyse growth estimation in light of spatial- temporal changes using a variety of techniques such as daily increment, carbon dating, tagging	2020		In-kind
	Update growth estimation to be provided to the SC intersessional prior to SC08 to allow the SC to schedule a data compilation workshop at its earliest convenience	2020		In-kind
Predict recruitment under climatic drivers	Investigate SPRFMO specific drivers of recruitment such as El Niño to improve productivity prediction	2020-2025		In-kind
Jack mackerel connectivity	Use modelling and observation data to predict connectivity and seasonal to decadal variability therein	2020-2021		In-kind

## Deepwater Working Group

Task	Objective	Timeline	Coordinator	Funding
Orange roughy assessment	Relevant Tasman Sea stock(s): • Explore alternative stock assessment models • Estimate stock status • Provide advice on sustainable catch levels	2020	NZ	In-kind
	Louisville Ridge stock(s): • Explore alternative stock assessment models • Estimate stock status • Provide advice on sustainable catch levels	2022	NZ	In-kind
Orange roughy assessment data	Ageing of existing and new orange roughy samples	2020-2022	NZ	In-kind
	Coordinate and design acoustic surveys for relevant stocks (intersessional consideration)	2020-2022	NZ	In-kind
Deep water stock structure	Review the list for deepwater stock structure analyses based on assessment for non-orange roughy stocks	2025		In-kind
	Use modelling and observation data to predict connectivity: Using genetic, microchemistry, morphometric, parasite prevalence and tagging experiments	2021		NZ\$23.6k (Source?)
	Develop workplan to drive stock structure delineation studies for orange roughy and alfonso and other key target species	2020-2021		In-kind
Other stock assessments, including ecological risk assessment	Review the risk assessment of teleost and elasmobranch species considering new available information and methods	2024-2025		In-kind
	Recommend relevant reference points and/or management rules for all assessed DW stocks	2020		In-kind
VME Encounter	Finalise list of VME taxa and design approach for benthic bycatch review	2020-2021		In-kind
	Annually collect and review VME catch and other benthic sampling data	2020 +		In-kind
Spatial management	Update and re-assess VME and habitat suitability modelling as appropriate including model testing and updating using all new data, review of historical bycatch data, review of naturalness layer, relationship between likelihood of occurrence and abundance, sensitivity to issues of scale, and reassessment of the performance of the spatial management measure	2020		In-kind
CMM 03 request regarding Encounters with VMEs.	Review all reported VME encounters and: • provide advice on whether each encounter is consistent with the models applied to prevent SIAs on VMEs • determine whether any encounters were unexpected based on the relevant VME habitat suitability models, • provide advice on appropriate management actions (including but not limited to any proposed by the relevant Member or CNCP). This review should include consideration of: • analyses provided by a Member or CNCP; • historical fishing events within 5nm of the encounter, in particular, any previous encounters, and all information on benthic bycatch; • model predictions for all VME indicator taxa; • details of the relevant fishing activity, including the bioregion; and • any other relevant information	2020+		In-kind

Task	Objective	Timeline	Coordinator	Funding
CMM 03 request regarding VME management measures	Review and provide advice on the effectiveness of the applied management measures, including: <ul style="list-style-type: none"> <li>• VME indicator thresholds;</li> <li>• The number of encounters;</li> <li>• The number of encounters that were expected based on habitat suitability models;</li> <li>• The appropriateness of the management approach (e.g. scale);</li> <li>• Additional relevant VME indicator species that have not been modelled, assessed or for which thresholds have not been established;</li> <li>• Refinement of the encounter protocol;</li> <li>• Measures to prevent the catch and/or impacts on rare species; and</li> <li>• Anything else the SC considers relevant to ensure the measure is achieving its objective and the objectives of the Convention</li> </ul>	2020+		In-kind
CMM 03 request regarding ongoing appropriateness of CMM	Review all available data and provide advice on the ongoing appropriateness of the management measures to ensure the CMM continues to achieve its objective and the objectives of the Convention	2020		In-kind
Bottom Fishery Impact Assessment	Consider any possible changes to BFIAS adopted in 2019 in the light of the cumulative BFIA done in 2020.	2021		In-kind
	Review updated BFIA, including cumulative impacts, from members relative to revised BFIAS	2020		In-kind
CMM 03 request regarding Marine mammals, seabirds, reptiles and other species of concern.	The Scientific Committee shall provide advice biennially to the Commission on: <ul style="list-style-type: none"> <li>• Direct and indirect interactions between bottom fishing and marine mammals, seabirds, reptiles and other species of concern;</li> <li>• Any recommended spatial or temporal closures or spatially/temporally limited gear prohibitions for any identified hotspots of these species; and</li> <li>• Any recommended bycatch limits and/or measures for an encounter protocol for any of these species.</li> </ul>	2020, 2022, 2024+		In-kind

## Squid Working Group

Task	Objective	Timeline	Coordinator	Funding
Squid workshop	Organise a workshop to estimate fishing effort prior to SC08 (two days meeting), provide advice on a potential management measure	2020	SQWG Chair/ Secretariat	NZ\$10K
Squid assessment and CMM development	Develop a plan for more detailed within-season fishery monitoring	2020	SQ WG	In-kind
	Develop and present alternative assessment approaches	2020-2021	SQ WG	In-kind
	Design and evaluate MSE and harvest control rules	2022+	SQ WG	In-kind
Standardise biological sampling	Identify where protocols differ e.g. type of sampling, areas and timing of sampling, maturity staging, ageing	2020	Peru, Chile	In kind
Observer data collection template	Develop a template to support stock assessment	2021	China & Chile with Secretariat, CAMALASUR	In kind
	Develop a template to monitor the fishery	2020	China & Chile with Secretariat, CAMALASUR	In-kind
Squid assessment data	Identify data needs and recover historical data	2020		In-kind
	Sample biological information year-round in its entire distribution area	2020		In-kind
	Reconstruct historical total catch records including non-CNCPs and non-members	2020		In-kind
	Record and analyse diet data	2020		In-kind
	Review on the acoustic surveys for Squid biomass estimation (pros, cons, challenges)	2020		In-kind
	Evaluate stock structure and assessment approaches applicable to stocks found in the SPRFMO area throughout their entire range (potential benchmark workshop)	2021-2022		In-kind
Squid connectivity	Collect and analyse genetic samplings (Convention area and adjacent EEZs)	2020-2022		In-kind
	Use modelling and observation data to predict connectivity and seasonal to decadal variability possibly using genetic, microchemistry, morphometric, parasite prevalence, and tagging experiments	2020-2022		In-kind



## Habitat Monitoring Working Group

Task	Objective	Timeline	Coordinator	Funding
Evaluate the applicability of data collected from fishing vessels targeting pelagic species	Mapping spatial-temporal population density distribution of jack mackerel using a combination of the existing acoustic survey data and acoustic information as obtained from industry vessels	2020	Peru/Chile	In-kind
Further developments of standardised oceanographic data products and modelling	Characterise jack mackerel habitat (e.g., past studies done in Peru and Chile)	2020	Peru/Chile	In-Kind
	Provide ecosystem status overview for SC at seasonal to decadal scale	2020-2021	Peru/Chile	In-kind
Habitat monitoring	Review the state of the art of habitat research in order to recommend specific lines of investigation in this topic within the framework of the SPRFMO	2020-2021		In-kind
	Explore the concept of jack mackerel habitat under an interdisciplinary ontogeny approach for jack mackerel and other species (by life history stages and regions)	2020-2021		In-kind
	Define a list of existing environmental data: satellite, acoustic surveys, acoustic fisheries surveys, fishing data, fishing vessel data (VMS, Observers) in time and space that already exist inside the SPRFMO area	2020-2021		In-kind
	Retrospective analyses based on the integration of databases provided by different members of the HMWG and other working groups of the SC with linkage to a metadata repository	2020-2021		In-kind
	Develop an inventory of technologies available aboard fishing vessels in order to identify the potential to collect data using the technologies currently being deployed	2020		In-kind
	Develop an inventory of research programmes currently being developed by industry and scientific institutions regarding data collection and monitoring of marine habitats	2020-2021		In-kind
Species behaviour and preferences	Analyse the habitat preferences of jumbo squid and Jack mackerel, noting the useful data and analyses provided by Peru and Chile	2020		In-kind
	Habitat suitability modelling of Jack Mackerel	2020-2021		In-kind

Task	Objective	Timeline	Coordinator	Funding
	Incorporate behaviour, distribution and abundance information about mesopelagic, euphausiids and other key species of the Humboldt Current System	2020-2021		In-kind
Use of new Tools	Develop new approaches based on different tools such as GAM, GLM, INLA, ROMS, Biogeochemical, Geostatistics, big data and machine learning (e.g. for acoustic classification of targets)	2020-2021		In-kind
	Utilization of different platforms: Scientific surveys, fishing vessels, satellite oceanography, gliders, buoys, AUV	2020-2021		In-kind
2021 Symposium	Symposium on Habitat Monitoring is organised prior to the 2022 meeting of the Commission ideally during the first half of 2021 in South America	2021	Peru/Chile	NZ\$63k (Source?)

### Other (Crosscutting issues)

Task	Objective	Timeline	Coordinator	Funding
Observer programme	Analyse observer coverage rates from simulation studies for SPRFMO fisheries and recommend values to Commission (periodically review)	2020		In-kind
	Evaluate available observer data on seabird interaction rates (jack mackerel, different squid fisheries, demersal) and determine where estimates can be improved	2020		In-kind
	Provide advice on the appropriate levels of observer coverage for fisheries for which there is no fishery -specific CMM in force	2020		In-kind
Exploratory fishing	Evaluate and review analyses on data collected from second year voyages of Cook Islands exploratory lobster/crab fishery and provide advice to Commission	2020	Cook Islands	In-kind
	Review results from the New Zealand exploratory toothfish fishery and provide advice on progress, including whether any stock indicators show sustainability concerns and what, if any, additional measures might be required to restrict the likely bycatch of deep-water sharks or other non-target species	2020-2022	New Zealand	In-kind
	Review results from the EU exploratory toothfish fishery and provide advice on progress, including whether any stock indicators show sustainability concerns and what, if any, additional measures might be required to restrict the likely bycatch of deep-water sharks or other non - target species (including VMEs)	2020	EU	In-kind

Task	Objective	Timeline	Coordinator	Funding
Seabird / bycatch monitoring	Progress southern hemisphere quantitative risk assessment (SEFRA)	2020		In-kind
EBSA	Evaluate impacts of fishing activities	2020		In-kind
CMM 17 Marine pollution	SC Members and CNPCs are encouraged to undertake research into marine pollution related to fisheries in the SPRFMO Convention Area to further develop and refine measures to reduce marine pollution and are encouraged to submit to the SC and the CTC any information derived from such efforts	2020+		In-kind
Climate change	Identify key area and management implications of climate change on VMEs and main fisheries in the SPRFMO area	2020+		In-kind



## SPRFMO SC7-Report Annex 6. Report of the Squid Workshop

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Available at: <https://www.sprfmo.int/assets/0-2019-SC7/Reports/SPRFMO-SCW8-Report-2019.pdf>



## SPRFMO SC7-Report

### Annex 7. Report of the Habitat Monitoring Workshop

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Available at: <https://www.sprfmo.int/assets/0-2019-SC7/Reports/SPRFMO-SCW9-Report-2019.pdf>



## SPRFMO SC7-Report

### Annex 8. Jack Mackerel Technical Annex

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Available on the SPRFMO website at: <https://www.sprfmo.int/meetings/scientific-committee/7th-sc-2019/>



## SPRFMO SC7-Report Annex 9. Jack Mackerel Advice Sheet

### Stock status summary for Jack mackerel, October 2019

Stock: Jack Mackerel (*Trachurus murphyi*)

Region: Southeast Pacific

### Advice for 2020

The SPRFMO Science Committee advises 2020 catches to be at or below 680,000 t.

### Stock status

		2017	2018	2019
Fishing mortality in relation to:	$F_{MSY}$	Below	Below	Below
Spawning stock biomass in relation to:	$B_{MSY}$	Below 80%	Below 100%	Over 100%

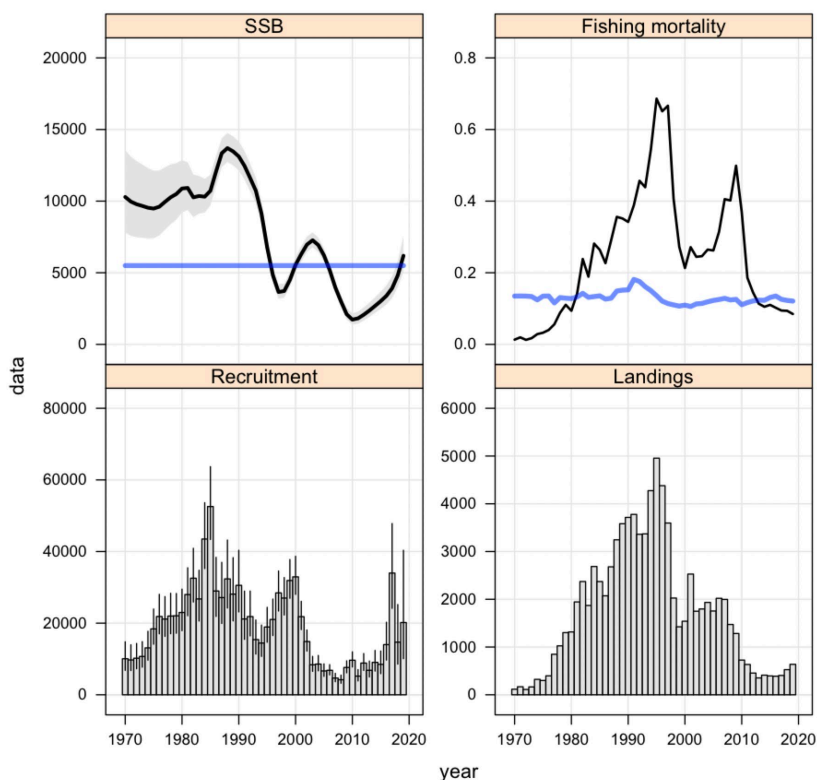


Figure 1. Jack mackerel in the southeast Pacific. Summary of stock assessment. Recruitment (age one) is measured in thousands, catch and SSB in thousands of tonnes, and harvest (fishing mortality) as a rate per year. Note that  $B_{MSY}$  is fixed at 5.5 million t (shown as the horizontal blue line in the top left), while dynamic values for  $F_{MSY}$  are used for the horizontal blue line in the top right.



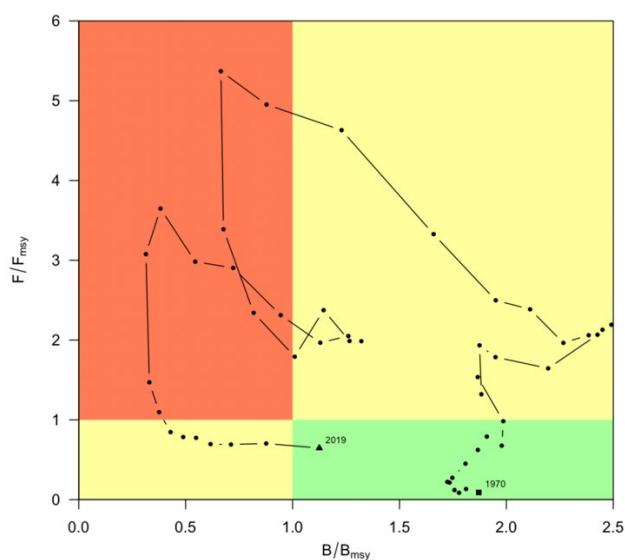


Figure 2. Phase plane (or “Kobe”) plot of the estimated trajectory for Jack mackerel under high productivity and low productivity with reference points set to  $F_{MSY}$  estimated for the time series 1970-2015 and  $B_{MSY}$  set to 5.5 million t.

Constant fishing mortality scenarios were explored at 0%, 50%, 75%, and 100% of  $F_{2019}$ , and also at  $F_{MSY}$ . Advice is based on maintaining the likelihood of spawning biomass to increase (above the 2019 estimate of 6.2 million t).

Model 1.00, steepness=0.65, recruitment from 2000-2015				
Multiplier of $F_{2019}$	$B_{2021}$	$P(B_{2021} > B_{MSY})$	Catch 2020 (kt)	Catch 2021 (kt)
0	8 549	98%	0	0
0.5	8 033	96%	360	445
0.75	7 790	94%	535	648
1	7 556	92%	706	840
$F_{MSY}$	7 074	88%	1 072	1 225

Table 1. Summary results for the short-term predictions for the selected model under the single-stock hypothesis. Note that “B” in all cases represents thousands of tonnes of spawning stock biomass and  $B_{MSY}$  is taken to be 5.5 million tonnes of spawning biomass in all cases.

Year <sup>1</sup>	Advice	Catch
2009		1 283 474
2010		726 573
2011	711 783	634 800
2012	520 000	454 746
2013	441 000	353 120
2014	440 000	410 703
2015	460 000	394 332
2016	460 000	389 067
2017	493 000	404 609
2018	576 000	526 323
2019	591 000	637 811*
2020	680 000	

Table 2: Advised and reported catch of Jack Mackerel in the southeast Pacific.

<sup>1</sup> 2011, 2012 and 2013 advice was given by the Science Working Group.

\* As estimated at SC7



## SPRFMO SC7-Report

### Annex 10. Responses to the Performance Review Recommendations

Paragraph	Recommendation of the Panel This only refers to recs seeking action – eg ‘recommends’ or ‘encourages’ or ‘urges’	Responsible body	SC Response	When
Conservation and management				
3.1 –Status of fishery resources				
51 (d)	<b>Recommends</b> that the Commission, Scientific Committee and Members of the Commission accelerate efforts to advance robust stock assessments of Orange roughy and Jumbo flying squid and give priority to collecting the necessary data for stock assessment purposes.	SC	<b>Orange Roughy:</b>  In accordance with the SC workplan, progress has been made towards orange roughy stock assessment in SPRFMO. Specifically, new assessments for three stocks on the Louisville Seamount Chain were tabled and accepted by SC7, with a precautionary yield forming part of the relevant recommendations to the Commission. New Zealand tabled an assessment for the ORH7A stock, which contains the Westpac Bank proportion in the SPRFMO area. SC7 has provided advice on a range of precautionary catch limits for this portion of the stock to the Commission. Progress towards more robust assessment of Tasman Sea stocks has also been made, with the North West Challenger and potentially Lord Howe Rise, if the time and resources permit to be assessed in 2020 using new length and age data.	2020

			<p>Jumbo flying squid:</p> <p>Developments have taken place on separate area based stock assessments and genetic studies for jumbo flying squid but there is still work to do including understanding the phenotype dynamics, improving the quantity and quality of fishery data and biological sample collection, and development of a whole stock assessment methodology.</p> <p>The SC agreed to develop data templates to support stock assessment and monitor the fishery of jumbo flying squid and organising a workshop on the study of fishing effort dynamics and fishing power estimates.</p>	
51 (e)	<p><b>Notes</b> that there is little information on the status of non-target and bycatch species or the impact of SPRFMO fisheries on associated or dependent species and <b>Urges</b>, as a first step, that the Commission increase data collection in order to improve understanding of the impacts of fishing on associated and dependent species.</p>	SC	<p>The SC has made considerable progress on understanding potential relative risks to non-target and bycatch species through two ecological risk assessments; one covering 101 deepwater chondrichthyans (sharks, rays and chimaeras) thought to interact with demersal fishing gears and the other covering 159 demersal teleost species.</p> <p>Based on the results of the risk assessment for deepwater chondrichthyans, SC has recommended that biological data collection should be strengthened and that attempts are made to improve the species-level identification of sharks using available guides. The results of the ERA for SPRFMO teleosts have been used to undertake preliminary categorisation of species into the SPRFMO stock assessment framework, as well as to inform efforts towards better stock structure delineation for key species. Future ecological risk assessments are likely to be expanded to include marine mammals, seabirds, marine reptiles and other species of interest or concern. Such ERAs could consider the use of more powerful and quantitative risk assessment methodologies that are able to estimate cumulative impacts across fisheries.</p>	

			Limited progress has been made towards quantitative assessment of seabird interactions and mortality across all gears in the SPRFMO area. The SPRFMO Secretariat has begun compiling bycatch records for annual presentation to the SC.	
<b>3.2 Ecosystem Approach</b>				
68 (c)	<p><b>Recommends</b> that the Scientific Committee develop a workplan to progress fisheries management decisions, which takes into account a more holistic ecosystem-based approach. Elements of that workplan could include:</p> <p>A review of available tools and processes to lead to an integrated ecosystem fisheries management approach;</p> <p>Identification of environmental data that will assist in both applying an ecosystem approach and to assessing the effect of climate change impacts and the subsequent consideration of management decisions;</p> <p>A review of the Jack mackerel fishery to determine the impact of the fishery on non-target species and habitat, to identify gaps in habitat, biological and bycatch data, and a programme for collection of that data;</p> <p>Consideration of the use of cost and resource effective ecosystem-based models; and</p> <p>Exploration of cooperation mechanisms with other bodies that may assist or benefit SPRFMO in the development of a relevant ecosystem-based fisheries management approach that is both cost and resource effective for SPRFMO.</p>	SC	<p>The SC multiannual workplan does include many of these elements, although progress towards i., iv and v. could be strengthened.</p> <p>SC reviewed and revised the SPRFMO Bottom Fishery Impact Assessment Standard during 2018-19, with the revised BFIAS being agreed by SC7. Importantly, the scope of the BFIAS has been expanded to require consideration of the impacts of bottom fishing on marine mammals, seabirds, marine reptiles and other species of interest/concern, as well as retaining its requirement for bottom fishing impact assessment to consider the impacts of bottom fishing on deepwater fish stocks and vulnerable marine ecosystems. The revised BFIAS is now more aligned with the objective to implement an ecosystem approach, as required by the SPRFMO Convention.</p> <p>The members of the HMTWG have agreed on a Workplan to be developed in the next 5 years including groups of specialists to develop an interdisciplinary ontology approach; Retrospective analysis (data bases); Training, sharing and capacity building; Tools and Platforms.</p>	2020-2025
68 (e)	<p><b>Recommends</b> as an initial step that the Scientific Committee identify the research and data collection required for it to develop advice to inform the Commission on what action may be required to take into account the observed or expected impacts associated with a rapidly changing climate.</p>	SC	<p>One of the specific objectives of the Habitat Monitoring Working Group (HMTWG) is to study the relationships between jack mackerel habitat and environment (El Niño, Regime shift, Climate change). In this regard, climate is considered to be the most important driving factor in the Humboldt Current System (HCS).</p>	

			<p>The squid WG also recommended that more observer data are needed to estimate the difference in size composition of catch among fishing vessels and the sampling methods could be improved.</p> <p>Considering that climate change may result in substantial changes in ecosystem structure, SC <b>encourages</b> Members to collect and make available environmental data to deliver on the identified environmental indicators associated to support sound decision making on fisheries management.</p>	
<b>3.3 Data Collection and Sharing</b>				
100 (b)	<p><b>Recommends</b> the Commission and Scientific Committee regularly review data collection requirements to ensure they align with the needs of new or revised CMMs, while recognising the challenges to SPRFMO database management through the addition of new data collection, access and storage requirements and <b>Notes</b> the need for investment in building the capacity of the SPRFMO database to meet these challenges.</p>	COMM FAC SC	<p>The SC <b>acknowledges</b> that a robust, accessible and comprehensive database supports the SC in fulfilling its mandate.</p> <p>Furthermore, considering the recent development of new CMMs and the added complexity in terms of data requirements on the revised CMMs, the SC <b>agrees</b> with this recommendation and supports the need for investing in building the capacity of the SPRFMO database.</p>	
Commission & Subsidiary Bodies Responses	<p>COMM7: Instructs SC to provide advice to the Commission sufficient to enable its consideration of this recommendation.</p> <p>FAC: The FAC notes that in order to have a database serving its purpose, the Commission should invest accordingly on the needs of having an operational database.</p>			
100 (c)	<p><b>Recommends</b> that the Commission strengthen the timelines for the submission and independent verification of catch and effort data for the Jumbo flying squid fishery and <b>Urges</b> such measures to be adopted together with a general management measure for that fishery.</p>	COMM SC	<p>The SC <b>acknowledges</b> that robust catch and effort data is essential for supporting a general management measure for the Jumbo flying squid fishery. Therefore, the SC agreed to develop data templates (including catch and effort data) to support stock assessment and monitor the fishery of Jumbo flying squid.</p> <p>The SC <b>noted</b> that there are CMMs (CMM 02-2018, CMM 05-2019, CMM 06-2018, CMM 12-2018, CMM 16-2019) that request Members/CNCPs participating squid jigging fishery in the Convention Area to submit data including catch and effort data and transshipment data.</p>	
Commission Response	<p>COMM7: Instructs SC to provide advice to the Commission sufficient to enable its consideration of this recommendation.</p>			

			The SC <b>urges</b> the Commission to support the actions related to squid data in the multiannual SC workplan in order to deliver on the verification of catch and effort data.	
100 (d)	<b>Recommends</b> that the Commission implement more effective and comprehensive bycatch data collection and reporting, particularly but not limited to dependent and associated species in each fishery and identified species of concern, the collection of sufficient biological data to support the development of reliable stock assessments for all fisheries, and the extension of data collection programmes to include environmental data and other data to assist in estimating potential impacts on non-target species.	COMM SC	<p>Data collection and reporting for dependent and associated species is relevant to the 1) management and scientific objectives/research needs; 2) the levels of observer coverage across the different fisheries; and 3) specific issues of concern. Current observer coverage in a number of fisheries is likely to be inadequate for collecting robust information on interactions with bycatch species, many of which (especially seabirds, marine mammals, and other species of concern) are relatively rare events. As a very broad guideline, observer coverage of &lt;10% may be sufficient to identify more common bycatch issues and assist with stock assessments, but will not be sufficient to generate reliable estimates of bycatch for some fisheries. Previous SC reports have described the higher levels of coverage required to provide such estimates (e.g., SC6 <b>advised</b> the Commission that observer coverage of 20% or more may be required to robustly estimate the incidental mortality of Seabirds, Marine Mammals, and Other Species of Concern in some fisheries, and that design should address multiple influencing factors to obtain representative coverage, and <b>sought guidance</b> from the Commission on the nature and certainty of its information needs on the bycatch of Seabirds, Marine Mammals, and Other Species of Concern, so that SC can more precisely advise on observer deployment requirements in SPRFMO fisheries.). Advice may be required from the Commission if there are specific areas of concern for where bycatch data collection and reporting needs to be strengthened.</p> <p>At a general level (for key target stocks), biological data to allow for the development of reliable stock assessments is being collected and submitted in accordance with relevant CMMs.</p>	
Commission Response	COMM7: Instructs SC to provide advice to the Commission sufficient to enable its consideration of this recommendation.			



			The Habitat Monitoring Working Group has been considering the collation and application of environmental data, which could eventually be used to evaluate impacts on non-target species.	
100 (e)	<b>Recommends</b> that the Scientific Committee review and provide advice on any additional data requirements necessary to support the implementation of an effective VME protocol.	SC	SC has an extensive workplan relevant to the implementation of CMM 03-2019 and specific tasks therein (see paragraph 36). Additional data requirements to support implementation of the VME protocol are included within the SC 2020 multiannual workplan.	2020
100 (f)	<b>Recommends</b> that the Commission review, as a matter of priority, dataset sharing processes and procedures, both for data exchange within SPRFMO and externally, and provide specific guidance to the Secretariat with a view to removing impediments to the exchange and sharing of data.	COMM SC	SC discussed the beneficial aspects of better data sharing for SQ and JM. The SC <b>agrees</b> on the benefit of having access to VMS data to support specific scientific advice requested by the Commission. The SC <b>requests</b> the Secretariat to draft a template to access VMS data.	2020
Commission Response	COMM7: Recognises that this has been indicated as a high priority by the Panel and instructs SC to provide advice to the Commission sufficient to enable its consideration of this recommendation as a priority.			
100 (g)	<b>Recommends</b> that the Commission work towards a standardisation of scientific data collection processes and procedures for observers across the different fisheries, and consider mechanisms to harmonise coordination of data collection with other regional and/or sub-regional observer programmes.	COMM SC	The SC <b>notes</b> the progress on the OP accreditation provider as provided by the Secretariat. The SC <b>encourages</b> Members of the Commission to pursue accreditation under the SPRFMO Observer Programme well in advance 31 December 2023. The SC <b>recommends</b> the Commission to consider the mechanisms to harmonise coordination of data collection in observer programmes within the Memorandum of Understanding with those relevant regional and/or sub-regional bodies.	
Commission Response	COMM7: Instructs SC to provide advice to the Commission sufficient to enable its consideration of this recommendation.			
3.4 Quality and provision of scientific advice				
108 (a)	<b>Recommends</b> that the Commission take urgent action to implement management measures for the Jumbo flying squid fishery, and for precautionary measures to be put in place until sufficient information is available to undertake a reliable stock assessment.	COMM SC		

Commission Response	COMM7: Recognises that this has been indicated as a high priority by the Panel and instructs SC to provide advice to the Commission sufficient to enable its consideration of this recommendation as a priority.		<p>The SC <b>noted</b> that steps forward have been made with respect to stock assessment for the jumbo flying squid. The SC also <b>noted</b> that the workshop participants supported a future CMM including data gathering and reporting for the jumbo flying squid fishery with several possible management approaches including catch limits, fishing efforts limits and temporal and spatial closures being discussed, however, there was no agreement on common elements for an appropriate CMM to be developed at this stage.</p> <p>The SC <b>recommends</b> the Commission to consider the current situation on CMM discussion from the squid working group and allow adequate time to develop the elements of the CMM for the Jumbo flying squid fishery.</p> <p>Developments have taken place on separate area based stock assessments and genetic studies for jumbo flying squid but there is still work to do including understanding the phenotype dynamics, improving the quantity and quality of fishery data and biological sample collection, and development of a whole stock assessment methodology.</p> <p>The SC could not agree on any management measure, while it duly notes the uncertainty on stock status and exploitation rate.</p>	
3.5 Adoption of CMMs				
166 (g)	<b>Recommends</b> that the Commission and its subsidiary bodies strictly apply the procedural and substantive requirements of CMM 13-2018 for all new and exploratory fishery proposals.	COMM		2019

Commission & Subsidiary Bodies Responses	COMM7: Instructs SC to provide advice to the Commission sufficient to enable its consideration of this recommendation.  CTC: Endorses this recommendation.	CTC  SC	To better assess exploratory fishing applications, the SC developed a Checklist for Exploratory Fisheries Proposals during SC6. This checklist was considered very useful and was provided in annex 12 of the SC6 report. SC7 has reviewed the Checklist and agreed to develop interpretative notes for the checklist categories (which came directly from CMM-13) to ensure consistency of review between applications and years as the SC noted that a number of ambiguities remain in the interpretation of aspects of CMM 13-2019. Commission may wish to consider reviewing the measure in collaboration with the SC given its operational experience with application of this measure.  The two proposals received in 2019 were assessed rigorously against the checklist. Following some revisions during the meeting, SC7 was able to finalise reviews by the end of the meeting. This avoided the need for any intersessional processes.	
178 (c)	<b>Recommends</b> that the Commission consider the implementation of fishing effort limits in the Jumbo flying squid fishery based on existing fishing capacity as a precautionary interim measure pending further scientific and management advice from the Scientific Committee.	COMM  SC	The SC acknowledges that fishing efforts limits is an important management tools and more information and studies are needed to support development of more comprehensive management measures for jumbo flying squid.	
Commission Response	<i>COMM7: Instructs SC to provide advice to the Commission sufficient to enable its consideration of this recommendation.</i>			
Compliance and Enforcement				
4.1 Flag States Duties				
202 (h)	<b>Recommends</b> that the Commission, in conjunction with the Secretariat, consolidate, and make publicly available, a list of capacity building needs and requests identified by Members and CNCPs in order to track progress, prioritise the needs and requests, and facilitate the ability of others to meet them.	COMM  SC	The SC recognises the need for capacity building. The SC has received no input for assessing how the capacity building needs concerning the flag States duties may be relevant to the work of the SC.	

<p>Commission &amp; Subsidiary Bodies Responses</p>	<p>COMM 7: Requests Members and CNCs to advise the Secretariat of their capacity building needs, noting the utility of having these needs consolidated in a single place for consideration by the Commission.</p> <p>Notes that New Zealand has agreed to lead intersessional work on this issue in 2019.</p> <p>Instructs the SC with considering this recommendation in 2019 and providing advice to the Commission on how capacity building needs relevant to the work of the SC might be better managed.</p> <p>CTC: Recommends that the Commission requests Members and CNCs to advise the Secretariat of their capacity building needs, noting the utility of having these needs consolidated in a single place for consideration by the Commission.</p> <p>Notes the need to avoid over-burdening the Secretariat.</p> <p>Notes that capacity building needs may be easier to identify if audit points are developed as per recommendation 202(f).</p> <p>Notes that New Zealand has agreed to lead intersessional work on this issue in 2019.</p> <p>Recommends that the Commission task the Scientific Committee with considering this recommendation.</p>	<p>CTC</p>	<p>The SC, would like to take takes this opportunity to <b>Note</b> the specific SC capacity building needs as follows:</p> <ul style="list-style-type: none"> <li>• Scientific capacity development: external experts participating in workshops and assessments.</li> <li>• External review of SC activities (Convention Article 10, para 5)</li> <li>• Exchange of practice on identification of seabirds, mammals, sharks.</li> <li>• Advancement of geospatial analysis (VMS + SPRFMO data base synergies) while taking into account that VMS data will not be shared without prior agreement.</li> </ul>	
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## SPRFMO SC7-Report

### Annex 11. Exploratory Fisheries Checklist

#### Scientific Committee Considerations

##### *Fisheries Operation Plans*

The Scientific Committee shall provide recommendations and advice to the Commission on each Fisheries Operation Plan on the following matters, as appropriate:

	Chile (Toothfish)	Cook Islands (Potting)
<i>a) management strategies or plans for fishery resources;</i> [Notes that SC interpreted this to mean “having a clear objective for the fishery”]	Yes	Yes
<i>b) reference points, including precautionary reference points as described in Annex II of the 1995 Agreement;</i>	Not available	Partial – CPUE used
<i>c) an appropriate precautionary catch limit;</i>	Likely, but needs context	No - pending desktop estimates
<i>d) the cumulative impacts of all fishing activity in the area of the exploratory fishery;</i>	Yes - no other fishing	Yes - no other fishing
<i>e) the impact of the proposed fishing on the marine ecosystem;</i>	Yes – subject to inclusion of bycatch provisions	Yes – note concerns relating to c) above
<i>f) the sufficiency of information available to inform the level of precaution required and the degree of certainty with which the Scientific Committee’s advice is provided;</i>	Yes	Partial – note concerns relating to c) above
<i>g) the degree to which the approach outlined in the Fisheries Operation Plan is likely to ensure the exploratory fishery is developed consistently with its nature as an exploratory fishery, and consistently with the objectives of Article 2 of the Convention<sup>6</sup>; and</i>	Yes	Yes – note concerns relating to c) above
<i>h) in respect of a Fisheries Operation Plan that proposes any bottom fishing activity, advice and recommendations in accordance with paragraph 20b of CMM 03-2019 (Bottom Fishing)<sup>7</sup>.</i>	Yes	Yes

<sup>6</sup> The objective of this Convention is, through the application of the precautionary approach and an ecosystem approach to fisheries management, to ensure the long-term conservation and sustainable use of fishery resources and, in so doing, to safeguard the marine ecosystems in which these resources occur.

<sup>7</sup> The Scientific Committee shall:

- a) assess, on the basis of the best available scientific information, whether the proposed bottom fishing would have significant adverse impacts on VMEs and if it is assessed that these activities would have significant adverse impacts, recommend measures to prevent such impacts, or recommend that the proposed bottom fishing should not proceed;
- b) assess, taking into account, *inter alia*, the cumulative impacts of other fishing occurring in the region where such information is available, whether the proposed activities are consistent with paragraph 1 of this CMM and Article 2 of the Convention;
- c) provide recommendations and advice to the Commission on the assessment.

## Data Collection Plans

When considering a Fisheries Operation Plan... the Scientific Committee shall develop a Data Collection Plan in respect of that exploratory fishery which should include research requirements, as appropriate. The Data Collection Plan shall identify and describe the data needed and any operational research actions necessary to obtain data from the exploratory fishery to enable an assessment of the stock, the feasibility of establishing a fishery and the impact of fishing activity on non-target, associated or dependent species and the marine ecosystem in which the fishery occurs. The Scientific Committee shall review and update the Data Collection Plan for each exploratory fishery annually as appropriate.

The Data Collection Plan shall require, as appropriate:

	Chile (Toothfish)	Cook Islands (Potting)
<i>a) a description of the catch, effort and related biological, ecological and environmental data required to undertake the evaluations described in paragraph 24;</i>	Yes	Yes – pending desktop work
<i>b) the dates by which the data must be provided to the Commission;</i>	Yes	Yes
<i>c) a plan for directing fishing effort in an exploratory fishery to allow for the acquisition of relevant data to evaluate the fishery potential and the ecological relationships among harvested, non-target and associated and dependent populations and the likelihood of adverse impact;</i>	Yes	Yes – pending desktop work
<i>d) where appropriate, a plan for the acquisition of any other research data obtained by fishing vessels, including activities that may require the cooperative activities of scientific observers and the vessel, as may be required by the Scientific Committee to evaluate the fishery potential and the ecological relationships among harvested, non-target, associated and dependent populations and the likelihood of adverse impacts; and</i>	Yes	Yes
<i>e) an evaluation of the time scales involved in determining the responses of harvested, dependent and related populations to fishing activities</i> [Note that SC interpreted this to mean “when will data be analysed and available”]	Partial – intention to do analyses but when is unknown.	Partial – intention to do analyses but when is unknown.

### *Particularly regarding Exploratory Fisheries for Cook Islands– CMM 14b-2019*

The SC notes that compliance with the actual fishing operations will be assessed under the CMS process by the CTC. However, in terms of scientific considerations:

At the 7<sup>th</sup> meeting of the Scientific Committee the Cook Islands will present a full and comprehensive amended exploratory fishing proposal which conforms, in full, with SPRFMO CMMs and the Convention, in particular CMM 13-2019 (Exploratory fisheries) and CMM 03-2019 (Bottom fishing), and take into account the SC advice as described in the SC6 report. The *proposal will include the following*:

	Cook Islands (Potting)
<i>a) A detailed and specific proposal and Fisheries Operation Plan that includes formal sampling designs and data collection plans for all phases of the proposed exploratory fishery that conform with CMM13- 2019 (Exploratory fisheries);</i>	Yes
<i>b) A description of how the proposed fishing meets the requirements of the Convention and relevant CMMs, including a bottom fishing impact assessment;</i>	Yes
<i>c) Propose measures to ensure the long-term viability of the target species, including reproduction;</i>	Yes
<i>d) A description of any fishing conducted to date, including effort, catch, and information on measures taken to protect VMEs.</i>	Yes

### *Recommendations in relation to the Exploratory Fisheries for Cook Islands– CMM 14b-2019*

Relative to the check list(s)<sup>8</sup> for exploratory fisheries shown above which contains the specific SC assessments and recommendations relative to the Fisheries Operational Plans, Data collection plans and other considerations; In respect of the Cook Islands proposal the SC:

After considering SC7-DW01\_rev2, the SC7:

- 1) **Recommends** that the SPRFMO Commission extend the expiry date of CMM 14b-2019 to 2022, aligning the CMM to the start of fisheries operations.
- 2) **Endorses** the following management actions to:
  - a. Set the total allowable catch (TAC) at 300 t a year for fishing years 2 and 3.
  - b. Set a trip specific total allowable effort (TAE) at 80 days per trip, setting and hauling no more than five lines of 100 traps a day, with a limit of 75% of the TAE on Kopernik Seamount (60 days).
  - c. Allow for five additional fishing days for experimental fishing to accommodate the proposed experimental trapping as outlined in Appendix 7 of the revised FOP.
  - d. Set CPUE limit of 4 kg per trap for Kopernik Seamount assessed weekly through a moving 30-day window starting on day 30 and being assessed every 7 days thereafter. Should this limit be reached, MMR will close Kopernik Seamount as allowed for in Section 52 of the MMR act of 2005, if this limit is triggered Kopernik Seamount will remain closed to fishing pending SC's review of the Cook Islands planned ongoing response.

<sup>8</sup> Noting that the checklists were assessed with respect to the original versions of the Fishery Operational Plan.



- e. Lift the limit on fishable Seamounts as specified in paragraph 6c of CMM 14b-2019, which restricts effort to eight out of 13 identified seamounts, to allow for fishing on 15 seamounts within the region specified under paragraph 5 of CMM 14b-2019.

### *Recommendations in relation to Chile's proposal for an Exploratory Fisheries for Toothfish*

Relative to the check list(s)<sup>9</sup> for exploratory fisheries shown above which contains the specific SC assessments and recommendations relative to the Fisheries Operational Plans, Data collection plans and other considerations; In respect of Chile's proposal the SC:

- With regards to point 8c above the SC **Recommends** that the FOP is updated to include information for nearby stocks which may possibly be straddling with this proposed exploratory fishery (e.g. context for the proposed limit of 54 t compared with the neighbouring fishery with TAC of 12,000).
- With regards to point 8e above the SC **Recommends** that the FOP is updated to align with the bycatch provisions (i.e. as detailed in the EU and NZ exploratory toothfish fisheries).
- With regards to point 10e above the SC **Recommends** that the FOP is updated to include a catch limit for the second year of the fishery to enable time for data analysis and presentation.

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<sup>9</sup> Noting that the checklists were assessed with respect to the original versions of the Fishery Operational Plan.



## SPRFMO SC7-Report

### Annex 12. SC Guidelines for Annual Reports to the SPRFMO SC

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#### Purpose of Annual Reports

Participants should submit reports to the Scientific Committee (SC) on an annual basis in order to keep the SC informed, in a concise format, of their fishing, research and management activities over the previous year. A “nil report” is still required in cases where there was no fishing inside the Convention Area.

Provision of information on straddling stocks (and for stocks other than jack mackerel) is strongly encouraged due to the value of those reports for SC deliberations.

Annual reports are also intended to assist Members and CNCPs in meeting obligations detailed in the SPRFMO Conservation and Management Measures (CMMs) including, *inter alia*, CMM 01 (*T. murphyi*, para 18), CMM 02 (Data standards, para 2d), CMM 03 (Bottom fishing, para 18), CMM 09 (Seabirds, paras 8 & 9), CMM 16 (Observer programme, paras 15 & 44) and CMM 17 (Marine pollution, para 2).

Such annual reports are not intended to replace data submissions under CMM 02 on Standards for collection, reporting, verification and exchange of data, or submission of detailed scientific papers. Catch and effort data should still be submitted to the SPRFMO Secretariat in accordance with the prescribed data submission standards and procedures. Detailed information or scientific analyses on aspects of fisheries should be presented in specific scientific papers to SC meetings.

#### Annual Report Sections

Annual Reports for Members and CNCPs fishing in the Convention Area should include the following sections of specific relevance to the work of the Scientific Committee<sup>10</sup>:

##### *Description of Fisheries*

A general overview description of the fisheries of the flag State concerned over the previous five years, providing summarised information on:

Fleet composition (number of vessels by gear type and size) and how this has changed by year.

Summary tables of effort and total catches by year, gear-type, season and area.

Brief description of significant changes and new developments in fisheries over the past year.

##### *Catch, Effort and CPUE Summaries*

Overview summary figures of trends in nominal effort, catch and CPUE in the SPRFMO Area over the history of the fishery, including:

Trends and estimates for nominal fishing effort by gear type over time.

Trends and estimates for catch by species for the main target, by-catch, as well as associated and dependent species<sup>11</sup>.

Trends and estimates for nominal CPUE by gear type for the main species contributing to catches.

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<sup>10</sup> Reports for Members and CNCPs with no activity in the Convention Area may instead comprise of an overall summary.

<sup>11</sup> All species should be reported by scientific names throughout these reports and identified taxonomically as far as possible.

For Jack mackerel CPUE considerations the time spent searching should be included if available.

### *Fisheries Data Collection and Research Activities*

Brief description of the fisheries data collection systems implemented, and the research and assessment activities conducted, including:

Description of the statistical data collection systems in use, and how these have changed or been improved over the past year.

Description of surveys conducted, scientific analyses and stock assessments undertaken, or other relevant research activities conducted.

Description and coverage levels for fisheries sampling programmes (e.g. self-sampling or conducted in port), and how these have changed or been improved over the past year.

Information on other SPRFMO-related research activities over the past year.

### *Biological Sampling and Length/Age Composition of Catches*

Overview summary of the coverage of biological and size-frequency sampling conducted.

If available, simple summary table or figure showing length and age-frequency distribution of the target species by gear, and how this has changed over the past five years.

### *Ecosystem Approach considerations*

Description of the seabird mitigation measures used by each vessel (refer CMM 09<sup>12</sup>) as well as those used for other taxa.

Reporting of observed bycatch by species, fishery and location for all seabirds, marine mammals, reptiles and other species of concern.

Summary of observed seabird interactions, bycatch per unit effort, number of live birds released vs estimate of total birds killed (and potentially for other taxa).

VME encounters, including a summary of relevant State processes.

Information relating to Abandoned, Lost, Discarded or Retrieved Fishing Gear (ALDFG, refer CMM 17<sup>13</sup>).

### *Observer Implementation Reports (refer CMM 02<sup>14</sup> and CMM 16<sup>15</sup>)*

Programme design and coverage including observer allocation methods.

Training.

Type of data collected, including information on overall coverage rates achieved by observer programmes.

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<sup>12</sup> Paragraph 9 of [CMM 09 \(Seabirds\)](#) requires Members and CNCPs to report annually, on the seabird mitigation measures used by each vessel flying their flag and fishing in the Convention Area, as well as any observed seabird interaction data and the level of observer coverage focussed on recording seabird bycatch

<sup>13</sup> Paragraph 2 of [CMM 17 \(Marine pollution\)](#) requires Members and CNCPs to compile information relating to Abandoned, Lost, Discarded or Retrieved Fishing Gear and include it in its annual national report.

<sup>14</sup> Paragraph 2d) of [CMM 02 \(Data standards\)](#) requires provision of annual observer implementation reports adequate enough to allow the SC or the Commission to evaluate the implementation and effectiveness of such programmes.

<sup>15</sup> Paragraph 15 of [CMM 16 \(Observer programme\)](#) requires Members and CNCPs to document and provide information on the methods used to allocate observers on fishing vessels. Paragraph 44 requires Members and CNCPs to include a brief overview of the national observer programmes or service providers covering their fishing activity.

Information on the level of observer coverage solely focussed on recording bycatch of seabirds, marine mammals, reptiles and other species of concern<sup>16</sup>.

Any problems encountered (including safety issues) as well recent programme changes or improvements.

### Submission Deadlines

Consistent with the Protocol for submissions to the SC, these reports should be provided to the Secretariat in electronic form at least 30 days prior to the SC Annual meeting (normally held September/October).

It has become customary to also provide a short (1-2 paragraph) executive summary which is ultimately collated into an Annex for inclusion into the Scientific Committee's final report.

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<sup>16</sup> "Other species of concern" are defined in annex 14 of CMM 02 (Data standards)



## SPRFMO SC7-Report

### Annex 13. SC Protocol for SPRFMO SC Submissions

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#### Agenda

1. The Commission Rules of Procedure 4.1 provides for the Provisional Agenda to be prepared 90 days before the meeting. According to the Commission's Rule of Procedure 4.2 supplementary items on the Provisional Agenda could be included at least 65 days before the meeting if accompanied by a memorandum and any relevant documents on the proposed supplementary item.
2. At the beginning of the meeting the SC shall adopt its agenda. The Commission's Rule of Procedure 4.3 provides the possibility of additional items of an urgent character being included on the agenda. Supporting papers may accompany any request for additional items of an urgent character. Such additional items shall be included on the agenda subject to the approval<sup>17</sup> of the SC.

#### Submission of Papers

3. Rule of Procedure 4.6 states that any papers pertaining to any item on the Provisional Agenda or supplementary items are to be provided to the Executive Secretary in electronic form no less than 30 days before the opening of the meeting. These papers will be included in the draft Document List as meeting Papers.

The Executive Secretary shall circulate them at least 20 days before the start of the meeting as per Rule of Procedure 4.6.

#### Exploratory Fishing Proposal

4. Paragraph 5 of CMM 13-2019 (Exploratory Fisheries) states proposals for an exploratory fishery shall be submitted no later than 60 days before the opening of the meeting. These proposals will be included into the draft Document List as meeting Papers and, consistent with the Rule of Procedure 4.5, shall be circulated by the Executive Secretary no later than 45 days before the opening of the meeting.
5. The SC utilises a Checklist (refer annex 12 of the SC6-Report) to assess Exploratory Fishing Proposals and hence any proponent should ensure that each item in the Checklist is fully addressed within their proposal. In addition, the SC has recommended that a proponent ensures that scientific personnel with appropriate expertise and experience are present at the meeting in which the proposal is discussed.

#### Submission of Late Papers

6. Papers that are pertinent to the Provisional Agenda or supplementary items that are submitted later than 30 days before the meeting will be included as Late Papers in the draft Document List.

The Scientific Committee will decide whether or not to accept the Late Papers and will approve the final Document list as per Rule of Procedure 4.4.

#### Information Papers

7. Commission members, Cooperating Non-Contracting Parties and Observers (Rules of Procedure 9) may submit Information Papers to the Executive Secretary. Information Papers that are submitted at least 30 days before the meeting will be included in the draft Document List.

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<sup>17</sup> Decisions of the Scientific Committee are made in accordance with Article 16 of the Convention

Any information papers submitted later than 30 days before the meeting will be included as Late Information Papers in the draft Document list.

## Formatting

8. All submitted papers should include a summary paragraph. Inclusion of this paragraph is intended to streamline the drafting of the Final Scientific Committee report.

## Presentations

9. All presentations to the SC should conform with the following guidelines:
  - a copy of the presentation should be provided to the Secretariat no later than the day prior to it being discussed;
  - describe clearly the SC research question being addressed;
  - indicate if the presentation is:
    - new unfinished work presented for information only; or,
    - a completed work, with suggested advice and recommendations;
    - an update of previous work presented to the SC;
  - omit large, unreadable tables and excessive (especially small) text;
  - finish with a slide that requests advice / provides recommendations to the SC;
  - use one slide per minute as a rule of thumb;
  - presentations should be less than 15 minutes; if additional time is needed seek prior permission from the SC Chairperson.



## SPRFMO SC7-Report

### Annex 14. CALAMASUR Statement

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CALAMASUR is committed to improving the overall management of the jumbo flying squid fishery.

In order to assist in making progress in this regard, CALAMASUR would like to offer to co-host the proposed workshop on fishing effort estimation. As this is a newly proposed workshop at this meeting, we have not yet had time to define options for venues or timing but in order to have direct information from fishers, we have an initial preference for a location in Latin America. CALAMASUR believes that working directly with fishers on, for example, how and where they fish will enable the workshop to address some of the issues that were discussed during the SQWG but that were not resolved.

Regarding timing, this workshop will be quite technical and there may be significant advantages in allowing more time between the workshop and SC8 to prepare adequate reporting to the SC and to enable Members to consider the key outputs of the workshop.

If the SC considers this as a positive initiative, CALAMASUR will work closely with the Secretariat to define what is possible over the next few weeks so as to appropriately advise the Commission.