REPORT OF THE SPRFMO SC DEEPWATER WORKSHOP SCW13
21-23/22-24 September 2021

1   Opening of the meeting

1.   The Interim Chairperson of the SPRFMO SC Deepwater Working Group, Dr John Syslo opened the meeting and proceedings.

2.   Heads of Delegations (HoDs) were asked to introduce themselves and their delegations. A list of participants is included in Annex 1.

3.   The Chairperson sought proposed changes to the Provisional Agenda and suggested postponing discussion of the vulnerable marine ecosystem (VME) encounter review to give participants time to read New Zealand's REV 1 of SC9-DW09. New Zealand summarized the main changes in the revised paper. After discussion, the final agenda was adopted (Annex 2), including the suggested change.

2   Vulnerable Marine Ecosystems (VMEs)

Updated list of VME taxa (incorporating FAO criteria)

4.   New Zealand presented SC9-DW11 which is an updated list of VME taxa (incorporating FAO criteria). This paper updates the lists of Vulnerable Marine Ecosystem (VME) indicator taxa known from the Evaluated Area of the SPRFMO Convention Area by identifying taxa that meet a combination of FAO criteria for defining VMEs, rather than a single criterion. The criteria were: uniqueness or rarity, functional significance of the habitat, fragility, life-history traits of component species that make recovery difficult, and structural complexity. These lists will provide an important resource for future SC work on defining VME indicator taxa.

5.   Recommendations in the paper included the following:

> It is recommended that the Scientific Committee:
> - Notes that the lists of VME taxa presented in SC8-DW11 have been updated to take into consideration combinations of the FAO's VME criteria.
> - Reaffirms that the lists of VME taxa should be reviewed periodically and updated as necessary when better information on the taxa become available, so that taxa can be assessed against more VME criteria.
> - Recommends discussion with the FAO and other RFMOs on the potential usefulness of different criteria combination approaches and how they could be standardized among RFMOs

6.   The Workshop raised questions regarding the definition of slow and fragile and the presenter explained that the definition was presented in more detail to SC8 but recovery rate was related to fragility (not quantified- but in relation to delicate 3D structures) and recovery (30 years).

7.   The Workshop discussed consistency of the recommendations with FAO criteria and UN resolutions and the effect of the FAO criteria being used individually or in combination. The concern about combining various criteria is that it might result in a narrowing to the number of taxa defined as VME. It was clarified the FAO guidelines explicitly reference using the criteria individually or in combination, and the benefit of doing both allows better determination of impacts of bottom fishing related to the life-history and ecological characteristics of VME taxa. It was noted that some RFMOs have limited criteria, in which NPFC only recognizes coral, for example, whereas the purpose of including VMEs is to protect all species that are part of VMEs.

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8. The Workshop:
   - **Noted** that the lists of VME taxa presented in SC8-DW11 have been updated to take into consideration combinations of the FAO's VME criteria.
   - **Reaffirms** that the lists of VME taxa should be reviewed periodically and updated as necessary when better information on the taxa become available, so that taxa can be assessed against more VME criteria.
   - **Recommends** discussion with the FAO and other RFMOs on the potential usefulness of different criteria combination approaches and how they could be standardized among RFMOs.

Update Candidate VME taxa thresholds

9. New Zealand presented SC9-DW10, with updated candidate encounter thresholds for VME indicator taxa in the SPRFMO Area. This paper updates candidate encounter thresholds for the 13 VME indicator taxa included in Annex 5 of CMM 03-2021, with the intention of developing an authoritative set of candidate encounter thresholds for all VME indicator taxa. A range of percentiles (70th, 80th, 85th, 90th, 95th, 96th, 97th, 98th, 99th) were calculated using linear interpolation on ordered bycatch records of each taxon. The use of interpolation overcomes issues related to the lower limit of the sample size required for the estimation of the percentile from ordered values. These thresholds can be used to inform any future refinement of VME encounter thresholds to adjust the level of precaution included in CMM 03 (if required).

10. The Workshop asked why the paper refers to "location specific" catchability, and why catchability might be expected to be different between locations. The presenter explained that the fishery is fundamentally different within different areas of the Convention Area. In the Tasman Sea, the tows are conducted on the continental shelf with longer periods of bottom contact and hence more opportunity for VME material to be broken up and lost. Towards the east of New Zealand, on the Louisville Seamount Chain, the tows are shorter with less time spent on the bottom. It was suggested that rather than "location specific" it would be better to refer to the topography and the operation of the fishery.

11. The Workshop appreciated the updating of the list using multiple methods and the most recent available data. The Workshop agreed that the paper responded to the Commission's needs and updates the previously presented statistical analysis to provide the full range of percentiles for taxa and there was support for the methodological improvements in estimation. The Workshop was pleased to see reporting of two potentially important threshold points – which meant that there were two indexes that could be used for the move on rule. They felt that it represented a reasonable statistical approach for defining reasonably large catches and that the information provided in appendix 4 of SC9-DW10 could provide Commission with alternative way to use thresholds and provide an additional series of potential reference points which relate to same protection scenarios in SC9-DW06_rev1.

12. The Workshop suggested that a step forward could be to provide estimates for full VME impacts through catchability with an appropriate representation of catchability in relation to uncertainty. This might be possible for some taxa using the relative catchability information presented last year. There was support for recommendation 4 of the paper that suggests that catchability be applied in future which would move SPRFMO away from arbitrary thresholds. The catchability question is common to much of this work, and it was noted that it will arise under a number of papers in this Workshop.

13. DSCC noted that although the paper cites 2017 advice that taxa limits should be set high, recent discussions at the Scientific Committee and Commission and increasing awareness of uncertainty mean that it is now agreed that these limits should be decreased. Catchability is a key issue, as it is difficult to assess the relevance of encounter protocols/thresholds without knowing about catchability, and so the Scientific Committee should recommend precautionary levels that can take into account damage to VMEs given what we know about catchability. Other factors such as different catchability of different taxa, cryptic species and family level species identification mean that greater caution and protection is needed for this reason. BBNJ 6472 which takes into account historical catches was suggested as an alternative approach.

14. The Workshop recommended that the Scientific Committee:
    - **Notes** that the candidate encounter thresholds for VME indicator taxa presented in Table 3 have been updated using the most up-to-date New Zealand bycatch data.
    - **Recommends** to the Commission that the updated candidate encounter thresholds for VME indicator taxa presented in Table 3 are used to inform any future refinement of the VME indicator taxa thresholds included in Annex 6A and 6B of SPRFMO CMM03-2021.
    - **Recommends** to the Commission that it adds to the VME Encounters and Benthic Bycatch task in the Scientific Committee Multi-Annual Work Plan a 2023+ subtask to develop a research programme within the SPRFMO Convention Area to allow the determination of taxon-specific estimates of catchability for VME indicator taxa.
    - **Recommends** that in the interim, the best available catchability estimates are used to improve the Commissions understanding of the implications of the current encounter thresholds with regard to preventing significant adverse impacts on VMEs

Determination of optimal move-on distance

15. New Zealand presented SC9-DW07 a determination of optimal move-on distance in SPRFMO bottom fisheries. This paper presents the results of analyses on the theoretical protection afforded, and the impact to fisheries, of the current move-on distance and potential alternative move-on distances, based on the size and distribution of predicted Vulnerable Marine Ecosystem (VME) habitat patches. This work used *Solenosmilia variabilis* in the Louisville Seamount Chain for its analysis, as it was the only VME indicator taxa for which sufficiently detailed information was currently available, but recommends that further taxa and areas should be explored in the future. Results suggest that the current move-on distance seems to provide a suitable level of avoidance of additional interactions with the stony coral *Solenosmilia variabilis* on the Louisville Seamount Chain, while not placing undue burden on fishing operators.

16. The paper recommended that the Scientific Committee:
    - **Notes** that an analysis has been provided detailing the effectiveness and impact of the current move-on distance in SPRFMO, and its comparison with other potential move-on distances to avoid additional encounters with VMEs;
    - **Notes** that the analysis was focused on stony coral reef habitat on the Louisville Seamount Chain, as it was the only available information suitable for this task at this time. Also notes that other taxa and areas could only be addressed in the future, when abundance models are available to perform such analyses (in particular, such models for 'slope' environments). Finally notes that abundance models are already included in the SC multi annual work plan for 2022;
    - Agrees to **recommend** to the Commission that, utilising the best available scientific information, the current move-on distance seems to provide a suitable level of avoidance of additional interactions with the stony coral *Solenosmilia variabilis* on the Louisville Seamount Chain, while not placing undue burden on fishing operators.

17. The Workshop noted that the Commission had asked a challenging question, given the limited data that was available. There was general agreement with the method presented, and the new analysis was considered to be informative. However, there was discussion about the difficulties caused by the lack of suitable data from more than one taxon/area available for analysis, and how this affected the way the work should be presented to the Commission.

18. HSFG noted that if a move-on distance is too great, it risks moving fishing to areas where vessels have never fished before, which may actually increase the risks to VMEs.

19. DSCC wanted to emphasize what they felt were several major limitations to the study: 1) it is based only on one taxon (stony coral); 2) only based on Louisville seamount chain; 3) it is reliant on defining VME indicator patches (which are not defined anywhere) as one of the suggested tests of abundance. This is a problem because it is inconsistent with the ecosystem approach which defines VMEs by ecosystems and not by taxa or one taxon. They also suggested that it was not consistent with the precautionary approach which would

require a longer move on distance to account for uncertainty. It balances VME protection against burden on fishery operators, which is a policy and not a science consideration. It was unclear whether the analysis should be extrapolated to other areas and taxa.

20. With regard to the third recommendation from the paper, which balances the level of avoidance with burden on fishing operators, the Workshop agreed that the Scientific Commission was not in a position to make a judgement about the trade off between VME protection and the impact on the fishery. It was therefore suggested that the recommendation could be re-drafted to use factual information such as the quantitative effect of on encounter avoidance and reduction in the previously fished area for a given change in move-on distance.

21. The Workshop recommended that the Scientific Committee:
    - **Notes** that an analysis has been provided detailing the effectiveness and impact of the current move-on distance in SPRFMO, and its comparison with other potential move-on distances to avoid additional encounters with VMEs;
    - **Notes** that the analysis was focused on stony coral reef habitat on the Louisville Seamount Chain, as it was the only available information suitable for this task at this time. Also notes that other taxa and areas could only be addressed in the future, when abundance models are available to perform such analyses (in particular, such models for 'slope' environments). Finally notes that abundance models are already included in the SC multi annual work plan for 2022;
    - **Agrees** to recommend to the Commission that, utilising the best available scientific information, for the stony coral *Solenosmilia variabilis* on the Central Louisville Seamount Chain, increasing the move-on distance from 1 to 5 nm would increase encounter avoidance by an additional 7% and result in a reduction in the previously fished area by an additional 53%.

Design of a review process for VME encounters

22. New Zealand presented SC9-DW08, the design of a review process for VME encounters in bottom fisheries in the SPRFMO Area. This paper proposes the process for Members to review encounters with potential vulnerable marine ecosystems (VMEs) in bottom fisheries. This paper also outlines a suggested process for the SPRFMO Scientific Committee (SC) to implement when it reviews Member submissions on encounters at its annual meeting. In summary, the paper proposes that Members provide a suite of details of the encounter area environment, known VME indicator taxa distributions and historical bycatch data. The Member should also provide an evaluation of the presence of a potential VME, the encounter impact and the likelihood of future impacts to formulate a suggestion of appropriate management measures to prevent SAIs. This information is meant to inform a subsequent review of the encounter by the SC and the development of SC advice to the Commission on management actions.

23. The Workshop agreed that this is a challenging and complex task, especially without in situ cameras and data. What comes up in the net only gives a partial picture of what was on the bottom. It was agreed that the CMM requirement to assess consistency of encounters with models could be problematic.

24. Observer organisation DSCC had a concern that the review process places too much emphasis on habitat suitability modelling, which can only point to suitable habitat but not evidence of presence, which can only be gained by in-situ surveys or encounters. They would prefer more studies and further consultation with other Members and Coastal states to facilitate mapping of VMEs, on-site camera observations from ROVs etc to identify areas where VMEs are likely to occur. Their second concern is that a discussion of all taxa found close to an encounter location would help to inform whether other VMEs are present and all available information should be used to determine the level of impact. Overall, they considered that this approach does not sufficiently account for uncertainty and apply the precautionary approach, so the areas should remain closed due to uncertainties.

25. However, the authors noted that the provision requiring the consideration of habitat suitability comes from the CMM. And as it is necessary to make an FMA scale assessment using specified thresholds, the encounters are defined for VME indicator taxa, for most of which we have habitat suitability models. The protocols aim at using the best available information, which includes bycatch of all taxa and catchability as far as it is available. They have aimed to use the best available information, which included bycatch of all taxa, and catchability as far as it was available.

26. Regarding consistency with model predictions, Australia maintains that whether a VME encounter is from a location consistent with the model is of limited relevance to an SC review of each encounter and advice on management actions. They do not consider those models to be fit for this purpose, and have low level of confidence in the models, especially in highly focused high scale areas. The encounter itself is one piece of reasonable evidence that a VME may be present on seafloor in that location, regardless of the model. However, the CMM does currently contain references to consistency of encounters with models, which cannot be ignored, but may not be a central consideration to the Scientific Committee's advice on future management actions in the area or whether they should open it.

27. The presenters noted that the intention of CMM is to have a first check evaluation as to whether the encounter indicates that the habitat suitability models underpinning the spatial management regime are flawed. The spatial management regime acts as the primary mean for SPRFMO to prevent SAI, whereas encounter and move on rules are secondary/backstop measure. This has less relevance for broader aspects, for example impact assessment or risk of SAI to VME.

28. Australia noted that, regarding catchability, as already mentioned, understanding how a particular encounter catch relates to impacts on seabed seems to be central to gauging whether it may represent a VME on the seabed and assessing the degree of impact. If a trawl brings up 30 kg of VME and triggers the threshold, the measure should require us to gauge whether the 30 kg means the existence of a VME and the scale or significance of historical or future impact and then formulate recommendations. This may not be feasible without some acknowledgement of catchability to give significance to that bycatch, although clearly an encounter above threshold levels is already an indication that an SAI may have occurred.

29. Evaluation of impacts at different spatial scales is needed when thinking about preventing SAI to VME as it is very easy to see that an SAI may have occurred at small spatial scale but need to be evaluated at larger spatial scales as well.

30. DSCC suggested that the Scientific Committee could perhaps recommend that an entire feature be closed if there was likely to be other VMEs on the feature, while mapping continued to get the full picture to determine whether future fishing would have an impact. States are committed to do so in terms of FAO guidelines (UNGA resolution 64/72 (2009)), however the workshop noted mapping is expensive (particularly in an RFMO such as SPRFMO, which covers such a large area), and may not be feasible in the timeframe of a review process. The Workshop discussed whether it was the Scientific Committee that should adopt the protocol (which the Commission would note), or whether the protocol needed to be adopted by the Commission. The Workshop agreed that their understanding was that it was the Scientific Committee that would adopt the protocol.

31. The Workshop agreed on the following to be forwarded to SC9:
    - **Notes** that a geodatabase with Habitat Suitability layers for 10 VME indicator taxa is held by the Secretariat and can be provided to Members and CNCPs to aid in the evaluation of encounters each year;
    - **Adopts** the components of a process identified in SC9-DW08 as an interim protocol for the review of encounters with potential VMEs under CMM 03-2021.
    - **Agrees** that this protocol be further developed intersessionally and as science advances or to reflect any changes to the CMM.
    - **Agrees** to recommend to the Commission that it **Notes** that SC9 has adopted an interim protocol for reviewing encounters

New Zealand 2020 VME Encounter Review

32. New Zealand presented SC9-DW09_rev1, a review of a 2020 New Zealand VME encounter. This paper provides a Member review of the vulnerable marine ecosystem (VME) encounter that occurred in 2020 on a New Zealand flagged vessel that was bottom trawling in the SPRFMO area (North Lord Howe Rise Fisheries Management Area). New Zealand provided a Member review of its encounter, including details of the encounter and its consistency with habitat suitability models, and an evaluation of impacts and management actions to prevent significant adverse impacts on VMEs. Given the small scale of historical impacts and the assessment of a low likelihood of VME presence based on available data, New Zealand recommended that reopening the area to fishing was unlikely to cause further SAIs to VMEs at the FMA scale.

33. SC9-DW09_rev1 suggested to SC that the following recommendations might be appropriate:
    - Notes that New Zealand provided a Member review of its encounter, including details of the encounter and its consistency with habitat suitability models, and an evaluation of impacts and management actions to prevent significant adverse impacts on vulnerable marine ecosystems;
    - Notes that, given the small scale of historical impacts and the assessment of a low likelihood of VME presence based on available data, New Zealand recommended that reopening the area to fishing was unlikely to cause further SAIs to VMEs at the FMA spatial scale;
    - Considers this Member review to develop its advice to Commission on management actions to prevent significant adverse impacts on vulnerable marine ecosystems.

34. The objective of the CMM is to prevent significant adverse impacts on VMEs, and New Zealand's interpretation is that this was to be done primarily through spatial management, with encounter protocols as a secondary and backstop tool (as agreed in SC5). There was much discussion at SC8 about spatial scale, and a scale comparable to an FMA has previously been agreed on as being appropriate for evaluating the effectiveness of the spatial management areas. The purpose of the comparison of the encounter with the models is to determine whether the encounter indicates that the habitat suitability models underpinning the spatial management regime are flawed or whether they are missing crucial information. The risk of further Significant Adverse Impacts was estimated to be moderate at the encounter area spatial scale, and low at the FMA scale, considering the evidence on other high-density areas of VME indicator taxa, and the suitable habitat of Gorgonian Alcyonacea protected by spatial management. In the encounter area, if the fishers expand the footprint there is a moderate risk that they will contact another VME.

35. Australia suggested that the fact that the CMM sets thresholds at all suggests that there is a possibility of managing at smaller than FMA scale, but the CMM is open to some interpretation.

36. The Workshop discussed at length the issue of scale in VME protection. If there is impact at a local scale but not an FMA scale, and lots of other VMEs in the area remain, the Workshop discussed the question of whether this would be an acceptable level of protection under the CMM. At the scale of an FMA it may not be possible for a single tow to ever reach the threshold of being considered an SAI, unless the VME taxon involved had low protection levels or was rare in that area. New Zealand noted that a review process that would always give the same response, irrespective of considerations based on the taxa and the area, would not be a credible process.

37. SC9-DW09_rev1 notes a VME at the scale of operation but there is no empirical evidence to suggest that other high-density areas of Gorgonian Alcyonacea (or high densities of combinations of other VME indicator taxa) were present within the historic footprint. Apart from "cluster 5" where there may be VME (but which was already closed when CMM02-2019 came into force), the encounter area is the only gorgonian VME that could be identified from empirical (fishery dependant) evidence within the open area. It was noted that this could be important when it comes to questions of scale and the conclusion of low risk at scales larger than the Encounter Area.

38. New Zealand argued that the FAO guidelines are clear that the scale and significance of the impact should be considered in the context of the amount of suitable habitat, and the evidence presented suggests that there

is a lot of suitable habitat, so the scale and significance of impact is likely to be low, if the scale of the assessment is at FMA scale (as agreed at SC8).

39. DSCC asked what information there was about other species associated with that VME, and their range of distributions, in order to understand impacts on non-VME taxa or other species. New Zealand explained that because of the compliance investigation they cannot give details about what was caught in this encounter, but that nearby research trawl data and benthic trawl in the area has provided some information on how widespread the species found in the area are likely to be. The Gorgonian Alcyonacea species and genera reported from and around the encounter area were either cosmopolitan or widespread in the Tasman Sea. The paper reviews known associations with other species but initial investigations have focussed on species recorded in association with Gorgonian Alcyonacea.

40. Australia noted the earlier Workshop discussion about the need to consider catchability which may provide a more transparent and rigorous approach to assessing impacts.

41. It was noted that a published paper has estimated that nearly 90%[1] of gorgonians go under the net and only 3% are caught in the trawl net (affecting estimates of catchability). Studies vary greatly, but if it is assumed that approximately 50% of gorgonians would be left after the trawl, then the probability of further adverse impacts occurring in the particular location may be greater than was assumed in SC9-DW09_rev1.

42. The Workshop agreed with the conclusion that a VME was present in the Encounter Area and was subject to SAI, but there was debate on whether the VME had been extirpated by the trawl. The Encounter Area may still contain VME that would be further impacted by continued trawling.

43. DSCC suggested that a practical implementation of the precautionary and ecosystem approach would be to identify and protect the VME in its entirety, and not just some taxa, and suggested that the Workshop should recommend that the area around the VME should be closed for 5 nm in order to avoid further Significant Adverse Impacts on VMEs. Adjustment of the boundaries in the CMM should be considered. Paragraphs 32 and 33 of CMM 03-2021 suggest that the Scientific Committee has to review the encounter and provide advice, and the Commission will make their decision taking into account that advice.

44. DSCC also noted that population dynamics and connectivity could also have an impact on the implications of the encounter, for example if this particular VME was a source population for some taxa. New Zealand clarified that SC9-DW09_rev1 does includes references to connectivity issues.

45. The Workshop agreed that the general message from the Workshop to the Scientific Committee was that at a small scale there appeared to have been a Significant Adverse Impact, but that this was not true at a larger, FMA, scale. It was suggested that the recommendation should reflect the SC8 request to the Commission in respect of the required percentage protection levels. However, it was not possible to finalise the wording of the recommendation within the Workshop, and discussions would continue prior to SC9.

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[1] Burridge, C.Y., Pitcher, C.R., Wassenberg, T.J., Poiner, I.R., and Hill, B.J. 2003. Measurement of the rate of depletion of benthic fauna by prawn (shrimp) otter trawls: an experiment in the Great Barrier Reef, Australia. Fisheries Research 60: 237–253.

46. These discussions came up with the following text:

It is recommended that the Scientific Committee:
- **Notes** New Zealand assessed the risk of SAI resulting from reopening the encounter area to be moderate at the spatial scale of the encounter area, low at the spatial scale of the Bottom Trawl Management Area and low at the spatial scale of the FMA.
- **Notes** that the Deepwater Working Group:
  o **Agreed** that a high-density area of Gorgonian Alcyonacea indicating the presence of a VME which was impacted by fishing, and is likely to persist at this location;
  o **Noted** that available empirical evidence did not suggest the presence of other areas with high density of Gorgonian Alcyonacea (or combinations of other VME indicator taxa) being present near the encounter area;
  o **Agreed** that the risk of SAI resulting from reopening the encounter area to be [moderate to] high at the spatial scale of the encounter area and low at the spatial scale of the FMA;
  o **Noted** that reviews of future encounters would be improved by the explicit use of catchability to support more robust review outputs
- **Notes** the previous agreement from SC8 that, while the appropriate scale to assess and manage impacts on VMEs has not been defined in SPRFMO, the scale of the Fishery Management Areas is likely to be a more biologically appropriate scale at which to assess and manage SAIs on VMEs than larger scales;
- **Notes** that at the scale of the North Lord Howe Rise FMA, 82.8% of the Gorgonian Alcyonacea (based on PowerMean, unimpacted baseline from SC9-DW06) is afforded protection through the spatial management regime [acknowledging the uncertainty in the underlying habitat suitability models];
- **Noting** that the Commission is still deliberating on appropriate levels of protection;
- **Recommends** that:
  o If assessing SAI on VMEs at the scale of FMAs, reopening the Encounter Area would likely not result in SAI on VMEs; and
  o If assessing SAI on VMEs at the scale of the Encounter Area, reopening the Encounter Area may result in SAIs on VMEs

3   Bottom Fishery Impact Assessment Review

Westpac Bank BFIA addendum

47. New Zealand presented SC9-DW02 which is an addendum to the Cumulative BFIA for Australian and New Zealand bottom fisheries in the SPRFMO Convention Area 2020, which was presented and agreed at SC8. The addendum details missing information on the current protection levels afforded in the Westpac Bank area.

48. The Workshop agreed that in order to provide the best scientific advice available, the BFIA should be supplemented with this new information.

Spatial protection scenarios of VME taxa in the SPRFMO area

49. New Zealand presented SC9-DW06 on behalf of Australia and New Zealand which describes the development of spatial management scenarios for bottom trawling. This paper updates the SC on the methods being used and on the progress in developing spatial management scenarios for bottom trawling. In accordance with the Commission request, potential spatial management scenarios for protection levels of 70%, 80%, 90%, 95% for the modelled VME indicator taxa, using temporally static and temporally dynamic assessment methods, are provided for reference. The paper also provides information to the Commission on approaches or references to potentially inform determination of the level of protection required to prevent SAIs on VME in the SPRFMO Convention Area.

50. The Working Group expressed its appreciation for the work, with the addition of various scenarios and incorporating what had been learned from the BFIA. It represents a large amount of work, based on methods that had been agreed at SPRFMO SC workshops in 2020.

51. DSCC noted that there was little guidance from other RFMOs on spatial scales on which to prevent SAIs but SPRFMO's approach is different from other RFMOs in using Habitat Suitability models for spatial management in order to minimize SAI in VME. DSCC argue that this is inconsistent with good science and management and represents a failure to apply the ecosystem approach and UN requirements. SPRFMO should be aiming for the prevention of Significant Adverse Impacts and not merely minimisation. There should be no trade-off between impacts on the fishery and prevention of SAI on VME. Catchability is a recurring issue as due to the low catchability of VME taxa, even 5 kg can translate to significant VME impact (1-2 tons depending on species and catchability). This work analyses the specific taxa for which data was available, rather than describing whole ecosystem impact by trawling. DSCC is also concerned about HSI models themselves without ground-truthing.

52. New Zealand pointed out that many of these issues were not relevant to this particular paper, as the work was driven by a specific request from the Commission, and the Workshop is not being asked for a recommendation on particular levels of protection, but only whether the method is appropriate to meet the Commission's request. They agreed that full ground truthing would be fantastic, but noted that resources are limited.

53. The Workshop recommended that the Scientific Committee:
    - **Notes** the metrics used to assess the protection levels for VME indicator taxa, ROC 0-linear and Power Mean, are representative of the metrics spectrum presented in the BFIA.
    - **Notes** that protection level assessment was completed for all protection levels using both temporally static and a temporally dynamic methods, as requested by the Commission.
    - **Agrees** that the approach taken to develop spatial management protection scenarios and report on their performance is appropriate and work will continue intersessionally to refine scenarios to meet all protection targets for presentation to Commission.
    - **Recommends** that the Commission consider the results of the spatial protection scenarios including to inform its determination of the level of protection required to prevent SAI on VMEs in the SPRFMO Convention Area.
    - **Notes** that ecologically relevant spatial scales for assessing protection levels to prevent SAIs on VME indicator taxa still remain to be agreed, but that the existing information at the FMA is likely to be more biologically appropriate compared with larger scales.

54. DSCC expressed its view that it did not agree with these recommendations, had suggested rewording that they hoped NZ would have taken into account, and would like their concerns noted.

4   Other matters

Assessment on how ID guides for VME taxa could be developed

55. New Zealand presented SC9-DW12 which is an assessment on how ID guides for VME taxa could be developed. This paper proposes 10 steps for the development of a user-friendly identification (ID) guide and training videos that can be used by observers and fishers to identify benthic bycatch landed during bottom fishing activities. Additionally, this paper proposes the development of training videos to familiarise users with the ID guides, and enable information provided to observers to be standardized, accurate and clear, paying particular attention to the identification, weighing, subsampling and collection of benthic bycatch samples.

56. The Workshop discussed the importance of testing the guides with scientific observers to ensure usability, and the possibility of developing an app was also raised. It was suggested that this could include videos or photographs and the ability for a scientific observer to ask questions if they are uncertain of taxa. SPRFMO may be able to learn from what other RFMOs and Members are doing in this area. The ABNJ project (see SC9-Doc13) identifies a project activity which may relate well to this project.

57. There was some discussion about whether this guide would only be used by scientific observers, or whether fishers may also be end users, but the idea was to identify bycatch on deck and relate it back to the VME/encounter protocol as well as to aid increasing taxonomic resolution in research.

58. The Workshop recommended that the Scientific Committee:
    - **Notes** that steps have been proposed for the development of an updated SPRFMO-specific ID guide for benthic bycatch and the development of associated training videos.
    - **Recommends** that the development of ID guide for benthic bycatch, following the steps proposed in this paper, and associated training videos, are added to the SC Multi-annual Work Plan with a 2022+ timeframe.

Joint AUS/NZ LHR ORH otolith age reading

59. Australia and New Zealand presented SC9-DW14 an analysis of age data of orange roughy from the Lord Howe Rise. This paper describes the age data from samples of the commercial catch of orange roughy (*Hoplostethus atlanticus*) taken from the Lord Howe Rise in 1989, 1990, 1992, 1993, 2013, and 2015. Estimated age at maturity, based on the timing of formation of the transition zone, was 27 years for both sexes. Age estimates ranged from 19 to 133 years.

60. The Workshop recommended that the Scientific Committee:
    - **Notes** that additional age samples of orange roughy are available to inform future stock assessment of the Lord Howe stock.

Framework for providing precautionary advice on captures of marine mammals, seabirds, reptiles, and other species of concern

61. New Zealand presented SC9-DW13 describing the development of a framework for providing advice on species of concern captures. This paper proposes a framework for providing precautionary advice on captures of marine mammals, seabirds, reptiles and other species of concern, which are rare in midwater trawl for bentho-pelagic species and bottom trawl fisheries and appear to be rare in bottom line fisheries. However, the small number of reported and observed captures does not necessarily mean that the captures are inconsequential, as some of these species face a risk of extinction in the wild, so even a low number of captures can present a substantial species level threat. An assessment of relevant data sources proposed minimum criteria and methodological approaches for the key questions that are required to assess the risk to a species from fisheries captures are considered and could be used by the SC when providing advice to the Commission.

62. Australia noted the potential of Electronic Monitoring as a relevant data source for providing scientific advice on such captures and for improving the quality of fishery dependent (logbook) data.

63. At the last COMM9, Australia offered to undertake a paired trial of human and electronic monitoring data collection to examine the recording of seabird interactions during longline fishing. For trips with a physical observer onboard, the trial is comparing data collected by that observer with a 100 per cent review of EM data (including video) from the same trip. The trial commenced in March 2021 and has collected paired data from two trips (up to Sept 2021) from two different demersal automatic longline vessels. The trial will continue through into 2022 with a view to expanding the dataset and reporting the results to SC10 in 2022.

64. The Workshop recommended that the Scientific Committee:
    - **Adopts** the proposed set of guidance as a framework for providing scientific advice on the capture of seabirds, marine mammals, reptiles and other species of concern.
    - **Notes** the potential of EM as a relevant data source for providing scientific advice on such captures and for improving the quality of fishery dependent (logbook) data.
    - **Recommends** the Commission considers the type of advice that is sought from SC on the capture of species of concern, noting the resourcing and other implications associated with the data required to provide different types of scientific advice, as outlined in this framework.

DSCC SC9-Obs01 and SC9-Obs02

65. Observer Organisation DSCC presented (SC9-Obs01) entitled "The Precautionary Approach and Ecosystem Approach in the context of Prevention of Significant Adverse Impacts on Vulnerable Marine Ecosystems" and SC9-Obs02, a paper from frontiers in Marine Science entitled "Vulnerable Marine Ecosystems, Communities, and Indicator Species: Confusing concepts for conservation of seamounts".

66. The paper SC9-Obs01 noted that the Scientific Committee is required to apply the ecosystem and precautionary approaches to safeguard marine ecosystems, and recommended that the SC recognise and describe the uncertainties inherent in the scientific approaches used, including catchability of different VME taxa, advises that there is high risk that the amount of VME in areas closed to fishing is less than predicted by the models, and therefore follow the mandated UNGA approach of closing areas where VMEs are known to occur or likely to occur; advises that it is not possible to develop reliable protection level options for VME indicator taxa at ecologically-meaningful spatial scales, to encompass different protection levels due to the inadequate data and identified uncertainties in the models; advise that where VMEs are known to occur or likely to occur, the Commission should close such areas to bottom fishing and ensure that bottom fishing does not proceed, and advise that to date, reliable conservation and management measures cannot be established to prevent significant adverse impacts on VMEs; ensure in its advice that all species, including rare and cryptic species, will be protected; and that the Commission identifies and protects vulnerable marine ecosystems properly so called and identified, rather than just single taxa.

67. DSCC warned against confusing and conflating the designation and use of VME indicator species with the concept of the ecosystem of which they are a part. For example, where the probability of an encounter was calculated for one indicator taxon it was concluded that changing the move-on distance from 1 nautical mile would not make much difference to the encounter probability. But this is only one indicator taxon, and may in fact not be the best indicator of the overall ecosystem on that seamount. If a multiple indicator taxon model was used, it is possible that no move-on distance would allow any additional trawling on the seamount without disturbing at least one of the indicator species, because they are all part of the integrated ecosystem of the seamount.

68. The FAO Guidelines require that habitats and ecosystems should be evaluated against the criteria presented in paragraph 42, individually or in combination, using the best available scientific and technical information. The presence of a single species that meets any of the criteria in paragraph 42 of the Guidelines could be considered to be an indicator of a VME. That is, a VME could be one where there is a small, rare species that would be put at risk by the use of a bottom trawl. But one would not know when the trawl rolls over xenophyophores, for example, which meet the criteria or rareness and fragility but, they will never come up in any net. Their presence will only be known if a camera is used to document the fauna of an area.

69. DSCC stated that relating the weight of bycatch of individual, generally large, indicator taxa, to a mathematically determined threshold, really has nothing to do with knowing whether a vulnerable marine ecosystem is present or not.

70. HSFG noted that the Convention allows for sustainable use of fishery resources, and that 99% of the area is already closed to fishing on the basis of limited information and the results of modelling. They suggested that therefore move on rules within the small proportion of area currently open to fishing should not be necessary at all.

71. DSCC reiterated that under international agreements such as resolution 61/105 SPRFMO has a responsibility to ensure that VMEs are not destroyed and SAI are prevented.

Deepwater fisheries species profiles

72. At the second 2021 SPRFMO SC Web Meeting (29/30 June 2021) it was noted that the Species Profiles on the SPRFMO website require updating and Working Group Chairs were asked to coordinate revisions for the relevant resources.

73. The Workshop agreed that the ORD (Oreo) and EPI (Black cardinalfish) should be removed from the website rather than being updated, and that BWA (Bluenose), BYS (alfonsino) and ORY (orange roughy), would be updated collaboratively shortly after SC9 based on the truncated versions available on Teams.

Scientific Committee workplan

74. The interim DW Chairperson presented the Deepwater part of the SC multiannual workplan. The workshop reviewed each DW item and updated the workplan to reflect updated priorities and the latest planning.

5   Recommendations

The workshop compiled a set of recommendations to be considered by the SC and Commission:

Updated list of VME taxa (incorporating FAO criteria) (SC9-DW11)

> The Workshop:
> - **Noted** that the lists of VME taxa presented in SC8-DW11 have been updated to take into consideration combinations of the FAO's VME criteria.
> - **Reaffirms** that the lists of VME taxa should be reviewed periodically and updated as necessary when better information on the taxa become available, so that taxa can be assessed against more VME criteria.
> - **Recommends** discussion with the FAO and other RFMOs on the potential usefulness of different criteria combination approaches and how they could be standardized among RFMOs.

Update Candidate VME taxa thresholds (SC9-DW10)

The Workshop recommended that the Scientific Committee:
- **Notes** that the candidate encounter thresholds for VME indicator taxa presented in Table 3 have been updated using the most up-to-date New Zealand bycatch data.
- **Recommends** to the Commission that the updated candidate encounter thresholds for VME indicator taxa presented in Table 3 are used to inform any future refinement of the VME indicator taxa thresholds included in Annex 6A and 6B of SPRFMO CMM03-2021.
- **Recommends** to the Commission that it adds to the VME Encounters and Benthic Bycatch task in the Scientific Committee Multi-Annual Work Plan a 2023+ subtask to develop a research programme within the SPRFMO Convention Area to allow the determination of taxon-specific estimates of catchability for VME indicator taxa.
- **Recommends** that in the interim, the best available catchability estimates are used to improve the Commissions understanding of the implications of the current encounter thresholds with regard to preventing significant adverse impacts on VMEs

Determination of optimal move-on distance (SC9-DW07)

The Workshop recommended that the Scientific Committee:

- **Notes** that an analysis has been provided detailing the effectiveness and impact of the current move-on distance in SPRFMO, and its comparison with other potential move-on distances to avoid additional encounters with VMEs;
- **Notes** that the analysis was focused on stony coral reef habitat on the Louisville Seamount Chain, as it was the only available information suitable for this task at this time. Also notes that other taxa and areas could only be addressed in the future, when abundance models are available to perform such analyses (in particular, such models for 'slope' environments). Finally notes that abundance models are already included in the SC multi annual work plan for 2022;
- **Agrees** to recommend to the Commission that, utilising the best available scientific information, for the stony coral *Solenosmilia variabilis* on the Central Louisville Seamount Chain, increasing the move-

on distance from 1 to 5 nm would increase encounter avoidance by an additional 7% and result in a reduction in the previously fished area by an additional 53%.

Design of a review process for VME encounters (SC9-DW08)

The Workshop agreed on the following recommendations to be forwarded to SC9:

- **Notes** that a geodatabase with Habitat Suitability layers for 10 VME indicator taxa is held by the Secretariat and can be provided to Members and CNCPs to aid in the evaluation of encounters each year;
- **Adopts** the components of a process identified in SC9-DW08 as an interim protocol for the review of encounters with potential VMEs under CMM 03-2021.
- **Agrees** that this protocol be further developed intersessionally and as science advances or to reflect any changes to the CMM.
- **Agrees** to recommend to the Commission that it **Notes** that SC-09 has adopted an interim protocol for reviewing encounters

New Zealand 2020 VME Encounter Review (SC9-DW09_rev1)

It is recommended that the Scientific Committee:

- **Notes** New Zealand assessed the risk of SAI resulting from reopening the encounter area to be moderate at the spatial scale of the encounter area, low at the spatial scale of the Bottom Trawl Management Area and low at the spatial scale of the FMA.
- **Notes** that the Deepwater Working Group:
- **Agreed** that a high-density area of Gorgonian Alcyonacea indicating the presence of a VME which was impacted by fishing, and is likely to persist at this location;
- **Noted** that available empirical evidence did not suggest the presence of other areas with high density of Gorgonian Alcyonacea (or combinations of other VME indicator taxa) being present near the encounter area;
- **Agreed** that the risk of SAI resulting from reopening the encounter area to be [moderate to] high at the spatial scale of the encounter area and low at the spatial scale of the FMA;
- **Noted** that reviews of future encounters would be improved by the explicit use of catchability to support more robust review outputs
- **Notes** the previous agreement from SC8 that, while the appropriate scale to assess and manage impacts on VMEs has not been defined in SPRFMO, the scale of the Fishery Management Areas is likely to be a more biologically appropriate scale at which to assess and manage SAIs on VMEs than larger scales;
- **Notes** that at the scale of the North Lord Howe Rise FMA, 82.8% of the Gorgonian Alcyonacea (based on PowerMean, unimpacted baseline from SC9-DW06) is afforded protection through the spatial management regime [acknowledging the uncertainty in the underlying habitat suitability models];
- **Noting** that the Commission is still deliberating on appropriate levels of protection;
- **Recommends** that:

    If assessing SAI on VMEs at the scale of FMAs, reopening the Encounter Area would likely not result in SAI on VMEs; and

    If assessing SAI on VMEs at the scale of the Encounter Area, reopening the Encounter Area may result in SAIs on VMEs

Westpac Bank BFIA addendum (SC9-DW02)

- The Workshop **agreed** that in order to provide the best scientific advice available, the BFIA should be supplemented with this new information.

Spatial protection scenarios of VME taxa in the SPRFMO area (SC9-DW06)

The Workshop recommended that the Scientific Committee:
- **Notes** the metrics used to assess the protection levels for VME indicator taxa, ROC 0-linear and Power Mean, are representative of the metrics spectrum presented in the BFIA.
- **Notes** that protection level assessment was completed for all protection levels using both temporally static and a temporally dynamic methods, as requested by the Commission.
- **Agrees** that the approach taken to develop spatial management protection scenarios and report on their performance is appropriate and work will continue intersessionally to refine scenarios to meet all protection targets for presentation to Commission.
- **Recommends** that the Commission consider the results of the spatial protection scenarios including to inform its determination of the level of protection required to prevent SAI on VMEs in the SPRFMO Convention Area.
- **Notes** that ecologically relevant spatial scales for assessing protection levels to prevent SAIs on VME indicator taxa still remain to be agreed, but that the existing information at the FMA is likely to   be a more biologically appropriate compared with larger scales.

Assessment on how ID guides for VME taxa could be developed (SC9-DW12)

The Workshop recommended that the Scientific Committee:
- **Notes** that steps have been proposed for the development of an updated SPRFMO-specific ID guide for benthic bycatch and the development of associated training videos.
- **Recommends** that the development of ID guide for benthic bycatch, following the steps proposed in this paper, and associated training videos, are added to the SC Multi-annual Work Plan with a 2022+ timeframe

Joint AUS/NZ LHR ORH otolith age reading (SC9-DW14)

The Workshop recommended that the Scientific Committee:
- **Notes** that additional age samples of orange roughy are available to inform future stock assessment of the Lord Howe stock.

Framework for providing precautionary advice on captures of marine mammals, seabirds, reptiles, and other species of concern (DW13)

The Workshop recommended that the Scientific Committee:
- **Adopts** the proposed set of guidance as a framework for providing scientific advice on the capture of seabirds, marine mammals, reptiles and other species of concern.
- **Notes** the potential of EM as a relevant data source for providing scientific advice on such captures and for improving the quality of fishery dependent (logbook) data.
- **Recommends** the Commission considers the type of advice that is sought from SC on the capture of species of concern, noting the resourcing and other implications associated with the data required to provide different types of scientific advice, as outlined in this framework

ANNEX 1: LIST OF PARTICIPANTS

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Craig Loveridge
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ANNEX 2: SCW13 MEETING AGENDA

Session 1

1. Opening of the meeting
   a. Identification of participants
   b. Confirmation of discussion topics
2. Updated list of VME taxa (incorporating FAO criteria)
3. Update Candidate VME taxa thresholds
4. Determination of optimal move-on distance
5. Design of a review process for VME encounters
6. New Zealand 2020 VME Encounter Review

Session 2

7. Westpac Bank BFI addendum
8. Spatial protection scenarios of VME taxa in the SPRFMO area

Session 3

9. Assessment on how ID guides for VME taxa could be developed
10. Joint AUS/NZ LHR ORH otolith age reading
11. Framework for providing precautionary advice on captures of marine mammals, seabirds, reptiles, and other species of concern
12. DSCC SC09 Obs01 and 02
13. Deepwater fisheries species profiles
14. Other matters