7th MEETING OF THE SCIENTIFIC COMMITTEE

La Havana, Cuba, 7 to 12 October 2019

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Progress toward a review of spatial and other management measures required by CMM-03-2019

New Zealand

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South Pacific Regional Fisheries Management Organisation

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Progress toward a review of spatial and other management measures required by CMM-03-2019

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1. Purpose of paper

This paper summarises progress toward the various requirements of CMM-03-2019 to review the spatial management measures, VME indicator species, and encounter thresholds in 2020. This is required to allow the 8th meeting of the Scientific Committee in 2020 to advise the Commission on the ongoing appropriateness of the management measures … to ensure the measure continues to achieve its objective and the objectives of the Convention.

2. Review work summarised in papers to SC-07

VME encounters and benthic bycatch under the new measure

The new measure, CMM-03-2019, came into effect on 28 April 2019 and relatively little bottom fishing occurred between that date and the deadline for papers (7 September 2019) to the next meeting of the Scientific Committee (commencing 7 October 2019). There was no bottom trawl fishing until June 2019, no encounters[1] with potential vulnerable marine ecosystems (VMEs, see New Zealand's and Australia's annual reports to this Committee), and little benthic bycatch.

Encounters under the new measure were expected to be rare. Cryer et al (2018, SC-06-DW-09) estimated that 0.6% of bottom trawl tows might trigger the protocol in an average year, resulting in about 5 encounters each year if New Zealand flagged-vessels maintained the 2008–18 average fishing effort and a broadly similar distribution of fishing. The proportion for Australian-flagged vessels is not expected to be different but their fishing effort has been very much lower than New Zealand-flagged vessels. Cryer et al. (2018) noted that, although the proportion of tows likely to trigger an encounter was similar in Tasman Sea and Louisville fisheries, changes in fishing effort relative to the patterns between 2008 and 2018 may result in more or fewer triggers.

Processes for reviewing encounters and benthic bycatch

There have been no encounters since CMM-03-2019 came into force so no specific reviews of temporary closures are required this year. Cryer et al. (2019, see paper SC-07-DW-16) summarised the requirements of the CMM and developed proposals for the components of a review process that SC might follow to decide whether any given encounter (with potential VMEs) was unexpected, given the predictions of habitat suitability models, as specifically required by CMM-03-2019, and other matters that SC might consider relevant. It is expected that a significant amount of work at SC and/or intersessional work will be required to finalise the design of a review process.

Review of VME indicator taxa for the SPRFMO Area

Geange et al. (2019a, see paper SC-07-DW-13) reconsidered from first principles the suite of VME indicator taxa for SPRFMO using the FAO deep-seas fisheries guidelines (FAO 2009). Parker et al. (2009) identified the 10 VME indicator taxa used in CMM-03-2019 on the basis that they met the FAO criteria plus two additional criteria (appearance in bycatch and readily

[1] "Encounter" is used here as defined in para 27 of CMM-03-2019, being a catch of VME indicator taxa above threshold levels specified in Annex 6 of the measure.

identifiable by observers at sea). These 10 taxa did not include some groups explicitly mentioned in the FAO guidelines as potential VME indicator taxa because they had not been previously encountered in bycatch (e.g., xenophyophores), were probably poorly -retained by fishing gear (e.g., bryzoans), or were considered difficult to identify at sea (e.g., hydroids).

Geange et al. (2019a) re-applied the same criteria except that "appearance in bycatch" was replaced with "is likely to be catchable in bottom fishing gear" to enable rare species to qualify as VME indicator taxa as envisaged by the FAO deep-seas fisheries guidelines. They identified a slightly different 10 taxa than Parker et al (2009).

Catchability of VME indicator taxa

Following discussion of Cryer et al. 2018, SC-06-DW-09, SC-06 affirmed the recommendations of SC-05 (para 93 of SC6's report) that further work should be done to assess catchability in both trawl and bottom line fisheries.

Geange et al. (2019b, see paper SC-07-DW-14) compared estimates of the density of VME indicator taxa derived from photographic surveys, benthic sleds, and bycatch in bottom trawl tows to estimate catchability. Largely because of scale and spatial (and possibly temporal) mismatches, the data available for this analysis were found to be insufficient to yield meaningful quantitative estimates of catchability for VME indicator taxa although the indications were that catchability was low. Australia holds additional data comprising co-located observations and sampling that should provide more certain catchability estimates for the locations and gears deployed, but further analyses of existing or additional un-paired (opportunistic) data are likely to suffer from similar limitations to the existing analysis. Geange at el (2019b) concluded the best approach to quantifying the catchability of VME indicator taxa would be to compare the biomass of VME indicator taxa landed on deck with quantification of VME cover on the seabed (and correspond estimates of seabed biomass), using cameras mounted on trawl headlines and nets.

Review of data available to test habitat suitability models

Rowden & Anderson (2019, see paper SC-07-DW-12) interrogated New Zealand databases holding records of benthic invertebrates, especially VME indicator taxa, to determine whether sufficient new data had become available to test the habitat suitability models reported by Georgian et al. (2019). Those models were key input layers in Zonation modelling to assess the priority areas to exclude from areas open to fishing to protect VME indicator taxa (see Cryer et al. 2018, SC-06-DW-12, and Delegation of New Zealand 2019, Comm-7-prop-3.1).

Rowden & Anderson (2019) assessed both the number / proportion of new records for each taxon and the distribution of new records relative to the spatial predictions of habitat suitability. Using the proportion of data often used for internal cross-validation of models (20–30%) as a guide, they considered there were sufficient new data to test models for sea pens (Pennatulacea), hexactinellid sponges (Hexactinellida), and the stony coral *Solenosmilia variabilis*. These new records occur in locations with a range of habitat suitability predictions for all VME indicator taxa, which is ideal for testing models.

Review of approaches used by other RFMO/As to protect VMEs

Cryer & Soeffker (2019, see paper SC-07-DW-18) summarised spatial and other management measures used by other RFMOs and CCAMLR to protect VMEs and prevent significant adverse impacts. Most RFMOs have a combination of large areas closed to all fishing, often designated as or including designated VMEs, and protocols to deal with encounters with potential VMEs during the course of fishing. The latter protocols differ in detail among R(F)MOs but are mostly well-defined in Conservation and Management Measures. Procedures for designating and closing larger areas (e.g., as designated VMEs) are usually not tightly specified, although some RFMOs have guidance on what is expected.

Review and revision of the Bottom Fishery Impact Assessment Standard

After consultation with all interested Members and CNCPs, Georgeson & Cryer (2019, see paper SC-07-DW-19) reviewed SPRFMO's Bottom Fishery Impact Assessment Standard (BFIAS) which was agreed by the Deepwater subgroup of the 10th meeting of the interim Science Working Group in September 2011 and subsequently adopted by the 3rd Session of the SPRFMO Preparatory Conference in February 2012. The standard has not been reviewed since SPRFMO entered into force in August 2012.

Georgeson & Cryer (2019) collated feedback from several Members and noted that:

- Feedback was varied, comprehensive, sometimes conflicting but often shared;
- There was general support for simplifying the document and reducing, removing or moving much of the procedural and supporting text to annexes;
- There was general support for structuring the BFIAS around a tiered, hierarchical approach to impact assessment in line with an ecosystem approach;
- There were numerous detailed comments on technical aspects, particularly regarding definitions of 'SAIs' and VMEs and relevant questions of scale. These remain unresolved.

Based on this feedback, a version of the BFIAS has been submitted to the Scientific Committee as a basis for discussions during the meeting.

3. Additional work underway

Australia have indicated they will submit paper SC-07-DW-21 "*Progress with investigating uncertainty in the habitat suitability model predictions and VME indicator taxa thresholds underpinning CMM 03-2019*" with more details of work underway at CSIRO. This paper was not available at the time of submission but high-level summaries of work areas known to New Zealand are provided below.

Relationship between probability of presence and actual abundance of VME taxa

Australia (CSIRO) has been investigating the relationship between predicted probability of presence of selected VME indicator taxa and observed abundance on the sea bed. Initial results for the stony coral *Solenosmilia* suggest that relationship is highly non-linear and showed significant densities of coral only at high predicted probability of occurrence. If this is found to be a general result, it would have important implications for estimates of protection provided by the spatial management measures.

Initial assessment of data available to New Zealand suggests that the pattern indicated in the results to date shared by Australia (in paper SC-07-DW21) cannot be applied uncritically to all SPRFMO bottom fishing areas and significant amounts of coral are sometimes found in cells with low predicted probabilities of presence. Further detailed collaborative work on these relationships will be required to determine the most appropriate approach to estimating the level of protection provided by the spatial management measures.

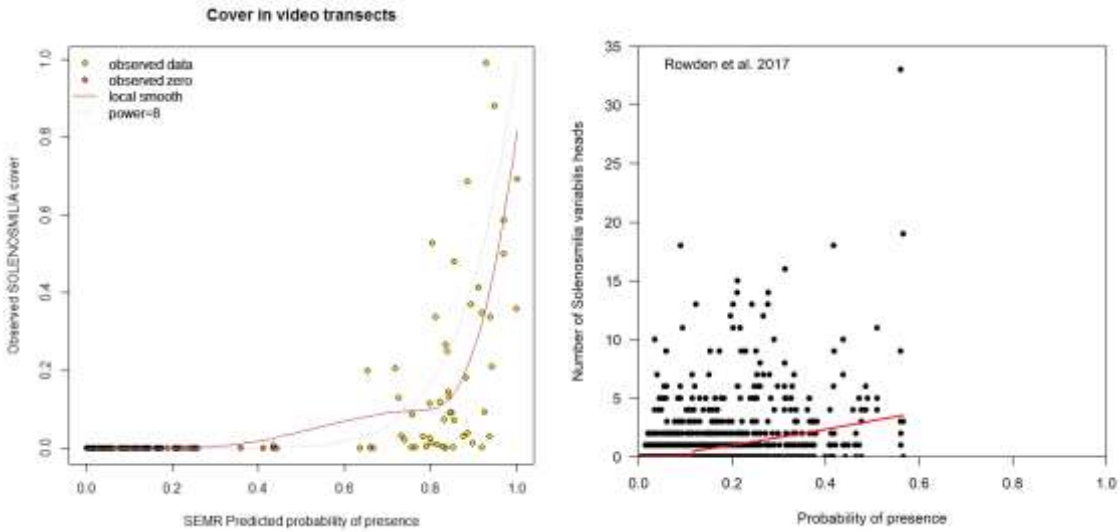

Figure 1. Left: Relationship between predicted probabilities of presence and observed proportional cover of *Solenosmilia variabilis* in southeast Australia from SC-07-DW21. Right: comparable plot for *S. variabilis* on Louisville Seamount Chain based on the models published by Rowden et al (2017) showing that significant amounts of coral are sometimes found in cells with low predicted likelihood of occurrence.

Potential over-prediction of habitat suitability probability of VME indicator taxa

Australia (CSIRO) is working on the performance of the habitat suitability models published by Georgian (2019) and used in the design of spatial management measures in CMM-03-2019. Initial results suggest there may be some over-prediction of some taxa. If this is found to be a general result, it would have important implications for estimates of protection provided by the spatial management measures. Initial assessment of data available to New Zealand suggests that the pattern indicated in the results to date shared by Australia (in paper SC-07-DW21) cannot be applied uncritically to all SPRFMO bottom fishing areas and significant amounts of coral are sometimes found in cells with low predicted probabilities of presence. Further detailed collaborative work on these relationships and testing of habitat suitability models will be required to determine the most appropriate approach to estimating the level of protection provided by the spatial management measures.

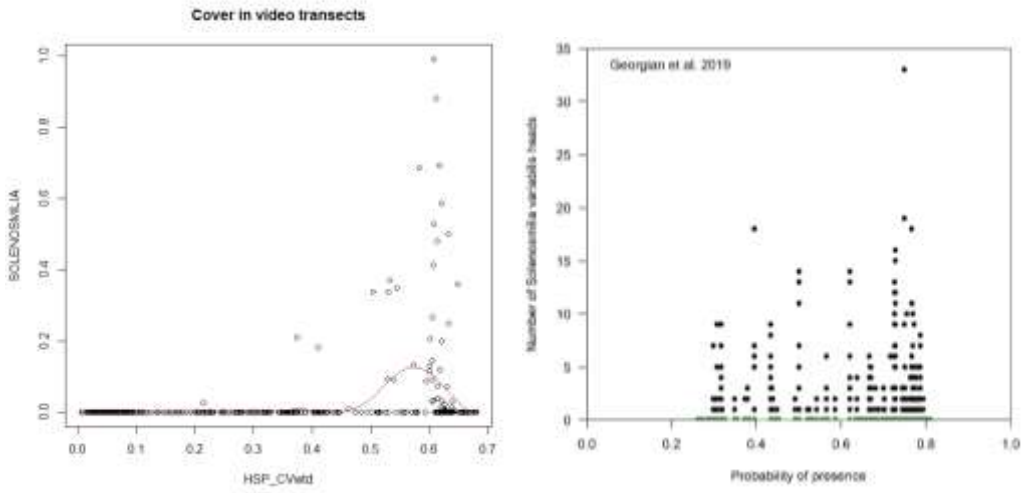

Figure 2. Left (from SC-07-DW21): Relationship between SPRFMO predicted habitat suitability probabilities (HSP) and proportional cover (abundance) of *Solenosmilia variabilis* observed in tow-video transects in southeast Australia. Right: comparable plot for *S. variabilis* on Louisville Seamount Chain based on the models published by Georgian et al (2019).

Estimating catchability of VME taxa

Australia (CSIRO) has been investigating the catchability of VME indicator taxa using datasets, where two or more sampling devices, sometimes including video, were deployed at stations. Initial results suggest that the catchability of VME indicator taxa by fish trawl is very low. Further work is anticipated in collaboration with New Zealand (NIWA and government agencies) using Australian and New Zealand data.

4. Work planned for 2020

Testing of habitat suitability models

Using the new information collated by Rowden et al. (2019), it is likely that some of the habitat suitability models will be tested and, if found wanting, updated. Australia also holds data that can be used in the tests or the updates. Testing may also include using existing observed absence records to examine over-prediction of habitat suitability where VME taxa have not been observed. Before this work can progress, however, it is important that the new records are groomed for errors that could reduce the reliability of the tests or the performance of any updated models.

Testing the influence of the naturalness layer

A “naturalness layer” was used in the design of spatial management areas to account for loss of VME indicator taxa within areas that had been fished. Other ways of estimating this layer have been suggested and these will be explored collaboratively by Australia and New Zealand.

Review of relationship between likelihood of occurrence and density of VME indicator taxa

Further detailed collaborative work is planned using existing data and modelling outputs to examine relationships between predicted probability of presence and the observed

abundance of VME indicator taxa on the sea bed. This is required to determine the most appropriate approach or approaches to estimating the level of protection provided by the spatial management measures.

Estimating catchability of VME indicator taxa

Further collaborative work is planned using existing data on seabed observations and samples to estimate the catchability of key VME indicator taxa.

Reassessment of the performance of spatial management measures

Using new habitat suitability models, alternative naturalness layers, and new estimates of the relationship between predicted likelihood of occurrence and observed or likely density of VME indicator taxa (or using sensitivity runs), the performance of the current management areas will be re-evaluated.

Issues of scale

The issue of the spatial scale at which significant adverse impacts on VMEs must or should be prevented is not specified quantitatively in the objectives of the Convention or CMM-03-2019, nor in UNGA resolutions or FAO's 2009 Guidelines. In adopting CMM-03-2019, the Commission accepted that preventing significant adverse impacts on VMEs at a fairly broad bioregional scale was appropriate. However, VMEs are variously considered to occur at spatial scales ranging from site/local scales (e.g., such as associated with a move-on event), through VME population or "stock" scales (e.g., similar to the management scale of the management areas agreed for orange roughy stocks), to bioregional and regional (ocean) scales. Given the lack of concrete guidance, these are essentially policy determinations, but it would be very helpful to have the issue resolved because the required scale of management will drive the design of appropriate approaches and the assessment of likely performance (e.g., of spatial management measures). In their paper on the BFIAS (SC-07-DW-19), Georgeson & Cryer recommend that the SC requests the Commission[2] to work with other RFMOs to progress the issue. Accepting that rapid progress and agreement among RFMOs is unlikely, New Zealand and Australia will work collaboratively with other interested Members in the meantime to reconfirm the existing "bioregional" scale or develop and agree an alternative.

Cumulative Bottom Fishery Impact Assessment

New Zealand and Australia will jointly prepare a cumulative bottom fishery impact assessment leading up to SC-08 in 2020. It is anticipated that this will be based on the interim BFIAS and use all available trawl and bottom line fishing effort from New Zealand and Australia and others historical fishing by other nations as available. Model predictions of the distributions of key VME indicator taxa will be combined with the fishing information in quantitative models to map impacts, assess the likely performance of existing spatial management measures, and suggest any necessary changes to the spatial management areas or other management settings.

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[2] **From SC-07-DW-19: It is recommended that the SC: Requests** 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 Fisheries Guidelines and relevant UNGA resolutions, and taking into account efforts by RFMO/As to meet their obligations in this regard.

Recommendations

It is recommended that the Scientific Committee:

- **Notes** that considerable progress has been made on the work programme required by CMM-03-2019 on bottom fisheries;
- **Notes** that much work remains for Australia and New Zealand to conclude a cumulative bottom fishery impact assessment before SC-08 as required by CMM-03-2019.

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