SPRFMO

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COMM5-INF05

Revised Bottom Fishing Conservation and Management Measure

New Zealand & Australia

I. PURPOSE

1. The purpose of this paper is to update the Commission on progress towards the development of a revised bottom fishing conservation and management measure (CMM). This work has mainly been undertaken by New Zealand and Australia.

2. The revised bottom fishing measure will be comprehensive and based on a spatial management approach. This requires:

   a) the identification of an appropriate fishing footprint that is implemented consistently across the membership,

   b) the mapping of the vulnerable marine ecosystem (VME) distribution within the footprint,

   c) the setting of sustainable catch levels for target species;

   d) determining precautionary measures to ensure no adverse impacts of fishing on the populations of species taken as bycatch; and

   e) the determination of management measures to prevent significant adverse impacts on VMEs and, in particular, areas that will be open or closed to fishing within the footprint.

3. These elements of the spatial management approach are discussed in this paper.

4. The paper also identifies work that has been undertaken to date and the work required to finalise the revised bottom fishing CMM.

II. ELEMENTS OF THE REVISED BOTTOM FISHING CMM

Fishing footprint

5. The revised bottom fishing CMM will require the identification of a fishing footprint to determine where bottom fishing has occurred and to inform where bottom fishing may occur in the future.

VME identification/mapping

6. VME identification and mapping will be used to identify where VMEs are known or are likely to occur. This information will be used to develop spatial management measures that will be incorporated into the revised bottom fishing CMM. These spatial management measures, including the use of spatial closures, will be designed to prevent significant adverse impacts on VMEs from bottom fishing in the SPRFMO Convention Area.

Catch limit determination

7. Catch limits will be set in the SPRFMO Convention Area, to ensure the fisheries' long term sustainability. The catch limit will be a function of the stock's biological characteristics. A stock assessment framework will be developed to ensure the catch limits include the precaution necessary to accommodate for uncertainties in available data.

Spatial management – open/closed areas

8. The spatial management approach will be used to develop a CMM that 1) permits bottom fishing within agreed catch limits and 2) prevents significant adverse impacts on VMEs.

9. This area of work will draw on the previously described elements of the CMM, i.e.:

   - the definition of a SPRFMO footprint in terms of spatial extent and intensity of impact;
   - VME mapping results;
   - catch limits for bottom fishing (for identified species and areas).

10. The CMM will define areas that are open or closed to bottom fishing using the spatial management approach. The decision of which areas to open or close to bottom fishing will depend on the results of the VME mapping work to be undertaken by Australia and New Zealand through the SPRFMO Scientific Committee. The CMM will establish a balance of open areas that allow for sustainable fisheries and closed areas that prevent significant adverse impacts on VMEs. Spatial management (open and closed areas) can be used as a stand-alone option (i.e. having no move-on-rule) if there is sufficient confidence that the spatial management approach prevents significant adverse impacts on VMEs in the Convention Area. The spatial management approach can also be complemented with other measures, such as an encounter protocol when there is not enough information to rely on the spatial management approach alone.

III. WORK UNDERTAKEN TO DATE

Fishing footprint

11. New Zealand and Australia have identified their bottom fishing footprints over the period 1 January 2002 to 31 December 2006 and have included these in their bottom fishing impact assessments[1].
12. New Zealand and Australia currently constrain vessels flying their flag to fishing within their respective footprints and to catches no higher than their average annual bottom fishing catch level between 1 January 2002 and 31 December 2006 (unless otherwise agreed by the Commission, see paragraphs 16 to 20 of CMM 4.03). New Zealand and Australia have open and closed blocks within their respective footprints but have different thresholds in applying their respective move-on rules.

13. Use of midwater trawls to target bentho-pelagic species like alfonsino fall within the definition of bottom fishing in paragraph 4 of CMM 4.03 and such fishing has been constrained within New Zealand's bottom trawl footprint since 2013.

VME identification/mapping

14. Records of the location or density of VMEs or VME indicator taxa such as reef-forming corals within the SPRFMO Convention Area are sparse and inadequate to accurately map the distribution of VMEs directly. This means that model-based predictive methods are required to map the distribution of VMEs. Models are based on physical and chemical information from across the SPRFMO Convention Area at all relevant depths (200 to 1600 meters).

15. New Zealand has made steady progress developing such predictive models using a variety of approaches and spatial scales. SPRFMO-scale models and models using presence-only data to predict the likelihood of VMEs occurring within a given cell have been superseded by regional-scale models and, increasingly, models that use absence as well as presence of given VME indicators (e.g., Cryer 2015 and New Zealand's National Report to fourth meeting of the Scientific Committee (SC4)). An independent test of the model has, however, highlighted inaccuracies with some global bathymetry information layers (Anderson et al. 2016). This is a significant problem because many of the variables that are important for the prediction of VME indicator taxa are highly correlated with depth.

16. The latest model development (briefly summarised in New Zealand's National Report to SC4) is a feature-scale model using both presence and absence records as well as

[1]Chile and Korea have submitted bottom fishing footprints to SPRFMO but have not undertaken a bottom fishing impact assessment.

abundance data. It will not be possible to develop such models for all seamounts until more information on the distribution of VMEs has been collected.

Catch limit determination

17. The bottom fisheries within the SPRFMO Convention Area are data poor. Despite this, there are data relating to these fisheries that are available, including historic catches, effort and some recent biological data. Catch data has also been published by FAO.

18. Various effort data exist, including amounts of fishing in terms of vessel days, number of tows, distance towed and hours fished (trawl), numbers of hooks fished (longline). Coupled with the appropriate catch data, these effort data open the possibility of exploring CPUE as a tool to examine stock status. Other data exist but may not be currently available for analyses, or only partially available, including for example, details of fishing fleets (vessel size or power) that can also be useful in analyses of effort and catch-per-unit-effort (CPUE).

19. Orange roughy is the primary target of New Zealand's bottom trawl fisheries in the SPRFMO Convention Area. Midwater trawling close to the seabed primarily targets alfonsino. Bottom longline fisheries initially targeted primarily bluenose but, since the reference year period, the catch has gradually shifted toward wreckfish. Catches of major target fisheries are currently limited to the average of catches between 2002 and 2006 (see New Zealand's National Report to the third meeting of the Scientific Committee (SC3)).

20. Orange roughy and Alfonsino are the primary target of Australia's bottom trawl fisheries while Jackass Morwong, Kingfish, Flame snapper, Blue-eye and Redthroat emperor are the primary targets of the bottom longline fleet in the SPRFMO Convention Area.

21. Complete CPUE information is available for New Zealand vessels (New Zealand's National Report to SC3) and should be available also from Australia (Australia's National Report to SC3). New Zealand has developed a spatially-disaggregated CPUE analysis to identify biomass trends. This approach was reviewed by SC3 (Roux et al 2015) and is undergoing simulation testing to assess its robustness.

22. New Zealand has applied the spatially-disaggregated CPUE indices in preliminary Bayesian biomass dynamic (surplus production) models fitted using a state-space approach. This approach has been simulation tested on similar New Zealand fisheries with more data and has been found to generate estimates of stock depletion similar to more complex methods (McAllister and Edwards 2016). Reasonable fits to the available data were found for four of the six areas within the western SPRFMO Convention Area. Fits were not attempted for two other areas because there were insufficient data. This work was the subject of a separate paper by New Zealand to SC4 (Roux et al. 2016).

23. It is not considered feasible to develop stock assessment models at this stage for alfonsinos, bluenose, or wreckfish given the highly variable effort and CPUE for these fisheries. A risk assessment approach to the management of these stocks will be developed by Australia and New Zealand for consideration by the Scientific Committee throughout 2017 to aid our consideration of this issue.

Spatial management – open/closed areas

24. Spatial management of fishing and the protection of VMEs requires knowledge of the spatial distribution of fishing and the distribution of known or potential VMEs. Bringing together the data regarding bottom fishing and the distribution of potential VMEs offers opportunities to optimise the development of spatial management within SPRFMO.

25. Zonation software is being used to consider potential spatial management approaches within the SPRFMO Convention Area (Cryer 2015 and New Zealand's National Report to SC4). This approach requires information or predictions on the distribution of biodiversity attributes to be protected, on the potential cost of achieving protection through spatial closure, and on the objectives to be met.

26. Work in the last two years has focussed on assessing the sensitivity of outputs to choices among habitat modelling approaches and design choices implemented in Zonation (see Cryer 2015 and New Zealand's National Report to SC4). Decision-support software can be used to generate candidate spatial management areas for discussion with stakeholders and decision-makers. The software can be used to identify and quantify trade-offs among specified objectives and the extent to which such objectives are met by different candidate measures (e.g., Kukkala & Moilanen 2012; Ardron et al. 2014). The utility of the approach depends on the quality of the input layers and the ability of stakeholders to identify and express their objectives.

27. Where there is an overlap between areas that are both important for bottom fishing and for benthic protection, this approach will provide the tool for policy makers, scientists and stakeholders to explicitly consider the trade-offs between opening and closing areas to bottom fishing. The optimisation models incorporate the relative value of an area to both fishing and habitat conservation (including bioregional differences). Ultimately, the goal is to agree, based on this knowledge, on those areas that should be proposed as 'open to bottom fishing' and proposed as 'closed to bottom fishing' to achieve an outcome that delivers both benthic habitat protection and a workable fishery.

IV. STEPS REQUIRED TO FINALISE THE REVISED BOTTOM FISHING CMM

Catch limit determination

28. Further work is still required to be able to identify sustainable catch limits for each orange roughy stock. This includes additional simulation testing of the spatially-disaggregated CPUE method and a revision of the New Zealand CPUE time series for each stock. Additional work will also be required to incorporate Australian catch and effort data in the modelling for each orange roughy stock. Bayesian state-space biomass dynamic models for each stock of orange roughy will also be developed and finalised using catch data from all bottom fishing nations in the assessed areas.

29. Australia and New Zealand propose to work together to prepare an assessment framework for bottom fish stocks in the SPRFMO Convention Area for consideration by the Scientific Committee in 2017.

30. It is anticipated that a recommended catch limit for orange roughy can be considered by the Commission at its annual meeting in 2018.

VME identification/mapping

31. Regional-scale models and maps of the distribution of VMEs within the western part of the SPRFMO Convention Area need to be finalised and their reliability assessed. Current work on the genetic connectivity between seamount features within the western part of the SPRFMO Convention Area also needs to be finalised. This is expected to happen in early 2017.

32. Australia and New Zealand will continue to work together to improve the predictive capacity of the VME distribution models and their application in Bottom Fishing Impact Assessments.

Spatial management – open/closed areas

33. The spatial management approach will require the identification of open and closed areas that allow for bottom fishing within agreed catch limits while preventing significant adverse impacts on VMEs. This work will be assisted through the use of Zonation software.

34. The need for, nature of, and response to move-on rules designed to prevent significant adverse impacts on VMEs will also need to be considered.

35. Consideration will need to be given to the management of bottom fishing methods with different potential for impact on VMEs (bottom line methods have less potential for impact on VMEs than midwater trawls for bentho-pelagic species which, in turn have less potential for impact than bottom trawls). The Second meeting of the Scientific Committee recommended that the relative impact on VMEs of different fishing methods and practices should be taken into account in the revised bottom fishing CMM.

Revised bottom fishing CMM

36. It is anticipated that a revised bottom fishing CMM will be prepared for consideration by the Commission meeting in early 2018 or, if this proves difficult, a report on progress at the 2018 annual meeting. The CMM could initially focus on the western part of the SPRFMO Convention Area where New Zealand and Australia have bottom fishing footprints.

37. Further consideration will also need to be given to the structure of the CMM. Two possible approaches have been identified for the revised bottom fishing CMM:

- Development of a prescriptive revised bottom fishing CMM with a single footprint for all bottom fishing members, a consistent approach to move-on rules that applies to all bottom fishing members, and move-on triggers that apply to all bottom fishing members; or

- Development of a high-level revised bottom fishing CMM that defines just the performance objectives, standards and evaluation criteria for management; each bottom fishing member could determine how to give effect to the CMM's requirements (as in the current CMM 4.03). Such an approach would recognise there are a number of possible management approaches and would provide some flexibility to the members in how the scientific and regulatory objectives were to be achieved.

V. RECOMMENDATIONS

38. It is recommended that the Commission:

- **Note** the progress that has been achieved in developing a revised bottom fishing CMM;

- **Note** that New Zealand and Australia will continue to progress the development of a revised bottom fishing CMM in the 2017 intersessional period.

- **Note** the further work that is required to finalise the revised bottom fishing CMM;

- **Comment** on the merits of a prescriptive bottom fishing CMM versus a high-level bottom fishing CMM.

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