North Pacific Fisheries Commission

3rd Meeting of the Small Scientific Committee on Bottom Fish and Marine Ecosystems
REPORT

8-10 December 2022

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Agenda Item 1. Opening of the Meeting

1. The 3rd Meeting of the Small Scientific Committee on Bottom Fish and Marine Ecosystems (SSC BF-ME03) took place as a virtual meeting via WebEx, and was attended by Members from Canada, China, Japan, the Republic of Korea, the Russian Federation, and the United States of America. The Deep Sea Conservation Coalition (DSCC) and the Pew Charitable Trusts (Pew) attended as observers. Dr. Ryan Gasbarro and Ms. Derya Whaley-Kalaora participated as invited experts.

2. The meeting was opened by the SSC BF-ME Chair, Dr. Chris Rooper (Canada), who welcomed the participants. The Science Manager, Dr. Aleksandr Zavolokin, outlined the procedures for the meeting. Mr. Alex Meyer was selected as rapporteur.

Agenda Item 2. Adoption of Agenda

3. The Chair proposed the following amendments to the agenda:
    (a) A new agenda item on the summary of the SSC BF-ME02 meeting should be added as Agenda Item 2.1.
    (b) A new agenda item on the splendid alfonsino (SA) maturity should be added as Agenda Item 4.2.2.
    (c) A new agenda item on the joint Canada-USA seamount cruise should be added as Agenda Item 7.1.5.
    (d) A new agenda item on the Japanese sea-floor survey in 2022 should be added as Agenda Item 7.1.6.
    (e) A new agenda item for a vulnerable marine ecosystems (VME) presentation by Russia should be added as Agenda Item 7.1.7.

4. The SSC BF-ME agreed to the proposed revisions.

5. The revised agenda was adopted (Annex A). The List of Documents and List of Participants are attached (Annexes B, C).

2.1 Summary of SSC BF-ME02 meeting

6. The Chair summarized the discussions and outcomes of the SSC BF-ME02 meeting.

Agenda Item 3. Stock assessment and scientific advice on the management of North Pacific armorhead (NPA)

3.1 Review of Members fishing statistics for NPA in 2022

7. The Science Manager presented the fishing catch and effort statistics for NPA including the latest available data for 2021. Total catch in 2021 was around 25 tons, the lowest level since 2002. 1 Japanese trawl and 1 Japanese gillnet vessel were in operation targeting NPA and SA in the Convention Area, and 1 Russian longline vessel was in operation targeting skilfish in the Convention Area.

3.2 NPA monitoring survey and Adaptive Management Procedure (AMP)

3.2.1 Review of the results from 2022 monitoring survey

8. The Science Manager presented the results of the monitoring survey for NPA in the Emperor Seamounts in 2022 (NPFC-2022-SSC BFME03-IP02). The fishing vessel Kaiyo Maru No. 51 conducted four trawl hauls for at least one hour each in the Koko Seamount from March to June 2022. The criteria for high recruitment were not met.

3.3 Review of Members' research and joint research activities on NPA

3.3.1 Analysis of recruitment relationships to oceanography

9. The Chair informed the SSC BF-ME that the joint research conducted by Canada, Japan, Korea, Russia, and the United States on the effects of oceanography on NPA recruitment in the Emperor Seamounts, which was presented at the previous meeting as NPFC-2021-SSC BFME02-WP02, has been published as a paper in *Fisheries Oceanography* (NPFC-2022-SSC BFME03-IP03).

3.3.2 Update on analyses or progress on biomass estimates from the NPA acoustic survey

10. Japan presented updated NPA distribution information and abundance estimates based on acoustic surveys conducted on Colahan and C-H Seamounts from 2016 to 2020 (NPFC-2022-SSC BFME03-WP05). Five acoustically important fish were identified by three species identification methods. NPA were mainly distributed on the flat top of C-H Seamount and on the northwestern slope of Colahan Seamount. The estimated abundance of NPA on C-H Seamount indicated an increasing trend. Although the abundance on Colahan Seamount was mostly similar to the value for C-H Seamount, the estimated density was lower because the

area of Colahan Seamount is larger than the one of C-H Seamount.

11. The Lead of the Small Working Group on North Pacific Armorhead and Splendid Alfonsino (SWG NPA-SA), Dr. Kota Sawada (Japan), suggested that the abundance estimates for NPA could be used for comparing with the standardized catch-per-unit-effort for NPA.

12. The Chair suggested that it may be useful to collect acoustic data from the Japanese vessel conducting the monitoring survey. Japan agreed but explained that it would need to consult with the vessel to see if this would be possible.

3.3.3 Species summary document for NPA update
13. The SWG NPA-SA Lead presented an updated species summary of NPA in the Emperor Seamounts (NPFC-2022-SSC BFME03-WP13).

14. The SSC BF-ME recommends that the SC adopt the updated species summary (Annex D).

Agenda Item 4. Stock assessment and scientific advice on the management of splendid alfonsino (SA)
4.1 Review of Members fishing statistics for SA in 2022
15. The Science Manager presented the fishing catch and effort statistics for SA including the latest available data for 2021. Total catch in 2021 was around 700 tons, the lowest level since 2002. 1 Japanese trawl and 1 Japanese gillnet vessel were in operation targeting NPA and SA in the Convention Area, and 1 Russian longline vessel was in operation targeting skilfish in the Convention Area.

4.2 Review of Members' research and joint research activities on SA
4.2.1 Species summary document for SA
16. The SWG NPA-SA Lead presented the updated species summary of SA in the Emperor Seamounts (NPFC-2022-SSC BFME03-WP14).

17. The SSC BF-ME recommends that the SC adopt the updated species summary (Annex E).

18. The SSC BF-ME noted that Members' annual reports indicated the catch of both NPA and SA in 2021 were the lowest in the time series of that fishery (although NPA catch has reportedly increased slightly in 2022). Effort has also declined so that only a single trawl and single gillnet vessel are currently operating in this fishery. Since its inception in 2019 the monitoring survey has not detected positive signs of recruitment for NPA. Members continue to be concerned about the two stocks and the SSC BF-ME agreed to task the SWG NPA-SA to monitor the

effectiveness of current management measures in sustaining the fishery.

4.2.2 SA maturity

19. Japan presented an analysis for defining the reproductive season and maturity stages, and estimating the size at sexual maturity of SA in the Emperor seamounts (NPFC-2022-SSC BFME03-WP06). The analysis was conducted based on biological data of SA in the Emperor seamounts shared by NPFC Members. Size at sexual maturity was estimated by calculating the fork length at which 50% of the population reaches sexual maturity (FL_{50}). Monthly changes in gonadosomatic index and maturity stages based on macroscopic and microscopic analyses suggested that reproduction occurs from March through December, with July being the intense spawning period. The FL_{50} values estimated by a logistic regression model ranged between 257 and 365 mm. This wide range may be due to the different fish sizes used in the analysis, as well as variations in fish size and growth by sampling location and year. Therefore, further analysis considering temporal and spatial variability in fish size is needed to produce a more reliable estimate of FL_{50} for conducting a stock assessment of SA in the Emperor Seamounts area.

Agenda Item 5. Stock assessment and scientific advice on the management of sablefish
5.1 Review of Members fishing statistics for sablefish in 2022

20. Canada informed the SSC BF-ME that no Canadian vessels have fished for sablefish in the Convention Area since 2020.

5.2 Review of Members' research and joint research activities on sablefish
5.2.1 Updated stock status for sablefish (Canada and USA)

21. Canada presented a summary it prepared together with the United States on the current sablefish status in the eastern North Pacific including the NPFC Convention Area (NPFC-2022-SSC BFME03-WP11 (Rev. 2)). The most recent domestic stock assessments conducted by Canada and the United States all indicate that the sablefish stock is healthy and not subject to overfishing. In the NPFC Convention Area, there has been no fishery catch or effort since 2020.

5.2.2 Results of analysis of sablefish association with VME indicators

22. Canada presented the results of an analysis to determine if there is a significant association between Northeast Pacific Ocean sablefish and VME indicator taxa for the entire stock (from California to Alaska) using data collected from fisheries-independent bottom trawl surveys (NPFC-2022-SSC BFME03-WP19). The data from trawl surveys on the west coast of North America throughout the sablefish range indicate that none of the VME indicator species have a significant impact on sablefish CPUE. Scleractinian (stony coral) presence was associated with a decrease in sablefish abundance. The data showed that sea whips and sea pens (Pennatulaceans) were the only structure-forming taxa that had a positive effect on sablefish

catch. This likely reflects the preference for soft substrates for both the fish and the invertebrates, rather than a particular dependence of sablefish on sea whips. Regardless of the mechanism of the association, it might be expected that areas with Pennatulaceans would be fished to a larger extent than areas without them, due to the potential for higher sablefish catch rates in these substrates.

5.2.3 Update catch limits relative to stock status if needed

23. Canada informed the SSC BF-ME that it is evaluating potential changes to the sablefish catch limits for the NPFC Convention Area to reflect its domestic conservation measures, namely the closure of seamounts in its exclusive economic zone (EEZ) to fishing.

5.2.4 Species summary document for sablefish

24. The SSC BF-ME reviewed the updated species summary of sablefish (NPFC-2022-SSC BFME03-WP15).

25. The SSC BF-ME recommends that the SC adopt the updated species summary (Annex F).

26. The SSC BF-ME reviewed the updated species summary of blackspotted and rougheye rockfishes (NPFC-2022-SSC BFME03-WP16).

27. The SSC BF-ME recommends that the SC adopt the updated species summary (Annex G).

Agenda Item 6. Progress on data-limited approaches to assessment of NPA and SA

6.1 Update from SWG NPA-SA

28. The SWG NPA-SA Lead presented a summary of the intersessional progress made by the SWG NPA-SA on the tasks it was assigned by SSC BF-ME02 (NPFC-2022-SSC BFME03-WP07 (Rev.1)). Further details are described in Agenda Items 6.1.1–6.1.4 below.

6.1.1 Data sharing and spatial resolution of shared data

29. The SWG NPA-SA Lead explained that the SWG NPA-SA agreed to use seamount names as a spatial resolution for the data template to analyze spatial variations in life history. It also reviewed discrepancies in the shared data and agreed to:
   (a) aggregate Kammu and Yuryaku Seamounts into Milwaukee.
   (b) convert standard length (SL) and total length (TL) into fork length (FL) using the following equations:
      ➢ NPA: $SL=0.90\ FL$, $SL=0.88\ TL$, $FL=0.97TL$ (newly estimated),
      ➢ SA: $SL=0.91\ FL$, $SL=0.77\ TL$, $FL=0.84TL$ (Shotton 2016).
   (c) conduct separate analyses for different methods to assess maturity.

Furthermore, the SWG NPA-SA noted the difference of measurement resolutions and the lack of age data for NPA in shared data.

6.1.2 Joint work on life history based approach to stock assessment

30. The SWG NPA-SA Lead explained that the SWG NPA-SA has:
    (a) conducted analysis of monthly changes in length potentially for length-based analyses for NPA and agreed that estimating the growth of NPA from length frequency distribution is not recommended.
    (b) conducted analysis of the relationship between fecundity and fatness to evaluate fecundity changes for NPA.
    (c) started analysis of the growth curve for SA and recommended to use Template Model Builder (TMB) in R for fitting models to data.
    (d) started analysis of the maturity ogive for SA and suggested that temporal and spatial variation should be considered to evaluate the effect of location and year.
    (e) started evaluation of spatial variation in life history for SA and noted the possible use of different spatial aggregations (to complement small sample size for some seamounts) and possible confounding effects (e.g. gear and season), and that density dependent effect may be considered as a factor in future analyses.

6.1.3 Update on CPUE standardization work

31. The SWG NPA-SA Lead explained that the SWG NPA-SA has:
    (a) agreed to conduct CPUE standardization separately by Members based on their own data and submit standardized CPUEs to the SWG NPA-SA.
    (b) encouraged Members to continue discussion on methodology and framework for CPUE standardization.
    (c) re-affirmed that CPUE standardization is a low priority task and agreed to focus on a life history based approach to stock assessment.

6.1.4 Review of Fish ID guide

32. The SWG NPA-SA Lead presented a field guide for identification of fishes of the Emperor Seamount Chain captured by bottom fisheries (NPFC-2022-SSC BFME03-WP08).

33. The SSC BF-ME endorsed the field guide and requested the Secretariat to edit it based on the recommendations of the SWG NPA-SA and to present the edited version at the next SWG NPA-SA meeting.

34. Japan presented a proposal regarding the scientific name to be used when referring to the oreosomatid fish in the Emperor Seamounts area (NPFC-2022-SSC BFME03-WP09). An

oreosomatid fish (oreo) of the genus *Allocyttus* is one of the target stocks of bottom fisheries in the Emperor Seamounts area. However, its taxonomic identity was uncertain, because two different scientific names, i.e., *A. verrucosus* and *A. folletti*, have been used for it. Recently, Hoshino et al. (2022) concluded that the oreosomatid fish in the Emperor Seamounts area is *A. folletti*, based on morphological analyses. Japan therefore requests the Secretariat to revise the NPFC website and other relevant materials to use the scientific name *Allocyttus folletti*, instead of *A. verrucosus*, when referring to this fish.

35. The SSC BF-ME recommends that the SC endorse the use of the scientific name *Allocyttus folletti*, instead of *A. verrucosus*, when referring to the oreosomatid fish in the Emperor Seamounts area.

36. The SSC BF-ME recommends that the SC establish a formal procedure for changing species' scientific and common names used by the NPFC.

Agenda Item 7. Assessment and scientific advice on the management of Vulnerable Marine Ecosystems (VME)

7.1 Review of Members' research and joint research activities on VME

7.1.1 Review of progress towards developing a definition of VMEs

37. Canada presented an update to its proposed quantitative approach to identifying VMEs originally described in NPFC-2021-SSC BFME02-WP05 (NPFC-2022-SSC BFME03-WP03). In this approach, Canada used predictive habitat models to identify areas likely to be VMEs and visual data to identify VMEs, as outlined by the NPFC framework for identifying data that can be used to identify VMEs in the NW and NE parts of the NPFC's Convention Area (Conservation and Management Measure (CMM) 2021-05 for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the NW Pacific Ocean and CMM 2019-06 For Bottom Fisheries and Protection of VMEs in the NE Pacific Ocean). Canada's quantitative approach is based on work by Rowden et al. (2020), who identify thresholds related to the amount of VME indicator taxa in an area and how it contributes to an increase in associated species richness as a result of providing structural complexity. Canada's proposed approach to identifying VMEs shows an example of an extension of the Rowden et al. (2020) approach to presence/absence data and models. Preliminary results from the Cobb-Eickelberg seamount chain study area detect a VME density threshold of 0.57 VME indicators taxa/m^2 and a VME occurrence threshold of 0.78. Applying these thresholds to visual data and predictive habitat models results in a total area of 750m^2 identified as VMEs on Cobb Seamount and a total area of 1,542 km^2 identified as likely to be VMEs along the Cobb-Eickelberg seamount chain, respectively. Canada recommends that the SSC BF-ME and the SC endorse this process as one of the NPFC's processes for identifying VMEs and areas likely to be VMEs in the Convention Area.

With the endorsement of the SSC BF-ME and the SC, Canada intends to move forward with using this method to identify VMEs and areas likely to be VMEs in the eastern part of the Convention Area.

38. The SSC BF-ME recommends that the SC endorse the process proposed by Canada in NPFC-2022-SSC BFME03-WP03 as one of the NPFC's processes for identifying VMEs and areas likely to be VMEs in the Convention Area, and Canada's use of this method in the eastern part of the Convention Area.

39. The DSCC presented an overview of the Project on a Community Consensus on Designation of VMEs from Imagery under the Deep-Ocean Stewardship Initiative (NPFC-2022-SSC BFME03-OP02). The project seeks to clarify which taxa are considered VME indicator species, whether a VME can be identified from a single image, what criteria can be used to designate a VME from a single image, and what thresholds (density or diversity) need to be met to make a designation with a single image of a VME. An initial assessment has identified inconsistencies in VME taxa lists among different regional fisheries management organizations (RFMOs), shown that it is possible to designate a VME from a single image, and found that a wide range of natural VME densities have been observed. In future, it is recommended that a wider study be conducted to allow a range of values for building thresholds.

40. The SSC BF-ME agreed to consider the methodology outlined by the DSCC as a potential alternative process for identifying VMEs in the NPFC Convention Area.

7.1.2 Assessing the relative risk of SAIs
41. Dr. Ryan Gasbarro, an invited expert, presented an assessment of the relative risk of significant adverse impacts (SAIs) to VMEs in the northeast part of the NPFC's Convention Area (NPFC-2022-SSC BFME03-WP02). The assessment focuses specifically along part of the Cobb-Eickelberg seamount chain where most of Canada's fishing effort for sablefish in the NPFC Convention Area has taken place. It draws on the fishing footprint of Canada's sablefish fishery from 2006 to 2020 and its overlap with the distribution of VMEs and areas likely to be VMEs. The assessment describes the occurrence, spatial scale, and footprint of cumulative fishing activities for sablefish in the NPFC Convention Area. It also describes how these data were used with the distribution of VMEs and areas likely to be VMEs to assess the relative risk of SAIs. The assessment categorizes 1 km x 1 km grid cells in the study area into areas at high, medium, or low relative risk of SAI. To fall into the highest relative risk category, both the cumulative fishing footprint and the VME indicator occurrence probability had to have values above the highest thresholds. Most (94%) of the grid cells are in the medium-risk category and 5% are in the high-risk category. High-risk areas are found on Brown Bear, Cobb, and Warwick

Seamounts, where cumulative (i.e., summed over time) fishing is greater. This assessment can be used to inform precautionary management decisions, including spatial closures, to protect VMEs and areas likely to be VMEs from SAIs.

42. It was noted by the DSCC that a high proportion of grid cells are in the medium and high risk categories, which suggested action should be taken. However, the Chair noted that some of the underlying species distribution models could be improved and these inaccuracies may be elevating the perceived risk to VMEs. Canada also noted that it was quantifying the relative risk of SAI but that it is unknown how these relative risk categories correspond to potential impacts to VMEs. The invited expert also explained that most of the areas in the medium risk category had no or limited cumulative fishing effort.

7.1.3 Update on trade-off analysis between VME protection and sablefish fishing

43. Canada provided an update on its spatial optimization analysis for balancing the objectives of sablefish fishing and conserving VMEs in the northeastern part of the NPFC Convention Area (NPFC-2022-SSC BFME03-WP04). The process was first outlined in NPFC-2020-SSC BFME01-WP13 (Rev. 1), and has been updated based on results from updated methods proposed to identify VMEs and areas likely to be VMEs. The analysis provides results from a range of scenarios with differing conservation targets and parameters to be selected by managers and demonstrates how areas for protection can be identified.

7.1.4 Update on progress on standardizing an approach to defining SAI

44. The SSC BF-ME agreed to task the Small Working Group on VME (SWG VME) to continue to work to develop a standardized approach to defining SAI.

45. Canada expressed its intention to conduct risk management work in parallel to the continued work to develop a standardized approach to defining SAI. Canada aims to assess the relative risk of SAIs in the eastern NPFC Convention Area in order to provide management advice for preventing potential SAIs.

7.1.5 Joint Canada-USA seamount cruise

46. Canada introduced the Joint Canada-USA International Seamount Survey (JCUISS) designed to study deep-sea coral and sponge communities on seamounts in international waters (NPFC-2022-SSC BFME03-WP12). The main focus of this survey was on benthic invertebrates and fish and the primary objective is to generate spatially-explicit data using underwater stereo cameras that can be used to map the distribution of deep-sea corals and sponges at the seamounts, document their size structure, visible impacts of human activity, and their species associations. As secondary objectives, the survey also collected eDNA samples, observations

of marine mammals and birds, oceanographic data and zooplankton samples, and fisheries acoustic data and acoustic doppler current profiler data.

7.1.6. Japanese sea-floor survey in 2022

47. Japan presented a report on its sea-floor visual survey to identify the distribution of VME indicator species in the area around the site where the high-density cold-water corals distribution reported in NPFC-2021-SSC BFME02-WP9 was confirmed (NPFC-2022-SSC BFME03-WP10). The survey was conducted by the Kaiyo Maru research vessel in Southeastern Koko and Yuryaku Seamounts from 22 July to 20 August 2022. Thirty-four sites were set in the Koko Seamount and thirty-five sites were set in the Yuryaku Seamount. The depth ranges were 448-736 m in Koko and 476-653 m in Yuryaku. On Koko Seamount, the survey found small patches of relatively dense *Acanella* sp. gorgonian corals extending from K46 to K49 to the north and south, and until K52 to the west. On the northwestern slope of Yuryaku Seamount, it found a relatively dense distribution of several gorgonians and, more sparsely, some Scleractinian corals around Y23 to Y25. On the southeastern part of Yuryaku Seamount, the survey found a relatively dense distribution of several large gorgonians and some Scleractinian or Antipatharian corals. Going forward, Japan intends to conduct further analysis to determine the detailed extent of the relatively dense coral communities at the three identified sites, compare the results of this survey with the results of the US research (Baco et al. 2020), and examine whether these communities can be defined as VMEs and therefore whether they should be subjected to SAI assessment.

7.1.7 Research on bottom ecosystems of the Emperor Seamount Chain by Russia

48. Russia presented results from research on the bottom ecosystems of the Emperor Seamount Chain based on the results of two Russian marine expeditions conducted in 2019 and 2021 (NPFC-2022-SSC BFME03-IP05). The surveys were conducted with a remotely operated underwater vehicle that performed 33 dives at depths of 2,182 m to 338 m across 158 sampling stations. Several stations containing abundant coral populations were recognized and reported at the Koko and Milwaukee Seamounts. Gorgonians were the main component of these communities. Dense populations of Hexactinellidae (glass sponges) were recognized at Jingu Seamount, with unique rich and diverse fauna. Echinoderm communities, which play a dominant role in their ecosystems, were recognized at the Ojin, Koko, and Kimmei Seamounts.

7.2 Review of intersessional activities of the SWG VME

49. The SWG VME Lead, Dr. Janelle Curtis (Canada), presented summaries of the 1st and 2nd intersessional meetings of the SWG VME (NPFC-2022-SSC BFME03-WP17 & WP18) as well as subsequent email correspondence. Further details are described in Agenda Items 7.2.1–7.2.4 below.

7.2.1 Recommendations on gear specific encounter thresholds

50. The SWG VME Lead explained that the SWG VME reviewed and discussed the gear-specific encounter thresholds used by other RFMOs and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) based on "Approaches used by other RFMOs and CCAMLR to avoid SAIs on VMEs" (Cryer and Soeffker (2019) SPRFMO SC7-DW18).

51. The SSC BF-ME agreed that it would be useful to understand the basis by which other RFMOs' encounter thresholds were determined by taxa and gear-type. The SSC BF-ME recommends that the SC establish a project for doing so. The SSC BF-ME noted that the NPFC does not currently have an encounter threshold for longline and pot gears, in contrast to several RFMOs and CCAMLR.

7.2.2 Review and discussion of scientific basis for move on rule and size of area closures

52. The SWG VME Lead explained that the SWG VME discussed the move-on rules and area closures applied by other RFMOs and CCAMLR based on Cryer and Soeffker (2019). The SWG VME has also identified the estimates of VME patch sizes presented in Williams et al. 2020 *FMARS* (0.02–1.16 km^2), patch size estimated by Japan from visual surveys (< 1 nm in length) and by Dr. Amy Baco-Taylor at SWG VME02 (linear length of coral reef ranged from ~3–786 m) for informing move-on distances.

53. Taking into account the estimated patch sizes of VME organisms based on observations from visual studies in the Convention Area and a literature review, the SSC BF-ME recommends that a move-on rule of 1 nautical mile be set for all bottom fishing gear. The SSC BF-ME agreed to revisit this matter as new information becomes available.

7.2.3 Proposals for revisions to VME indicator species list

54. The SWG VME Lead explained that the SWG VME agreed to recommend that the NPFC's list of VME indicator taxa be revised to Alcyonacea (which now includes the Gorgonacea), Antipatharia, and Scleractinia. However, recent revisions to coral taxonomy (McFadden et al. 2022) made these changes outdated.

55. The SWG VME Lead explained that the SWG VME agreed to discuss recommending that only three sub-orders in the Alcyonacea (Scleraxonia, Holaxonia and Calcaxonia) be included on the list of VME indicator taxa because of the differences in ecological characteristics and their larger size, however, due to the taxonomic revisions Alcyonacea is no longer an accepted taxonomic grouping (McFadden et al. 2022).

56. The SSC BF-ME agreed not to revise the list of corals on the NPFC list of VME indicator taxa in the manner recommended by the SWG VME, noting the difficulty and impracticality of revising the list each time new taxonomic research emerges.

57. Some Members emphasized the importance of large structure-forming corals, regardless of their taxonomic definition.

58. The SWG VME Lead explained that the SWG VME agreed to discuss recommending the addition of Porifera to the list of VME indicator taxa.

59. The SSC BF-ME recommends that the SC add the Hexactinellida and Demospongiae classes to the VME indicator taxa list.

60. The SSC BF-ME agreed to consider the order Pennatulacea as a VME indicator taxa.

7.2.4 Discussion of draft objectives for recovering VMEs
61. The SWG VME Lead explained that Canada has drafted objectives for recovering VMEs centered on uniqueness or rarity, functional significance of the habitat, fragility, life-history traits of component species that make recovery difficult, structural complexity, and connectivity, and circulated the draft objectives among SWG VME participants for comment.

62. Noting the decadal timeframe of VME recovery and that it has discussed this matter for a number of years without making much progress, the SSC BF-ME agreed that further discussions on recovering VME should be a lower priority for the SWG VME.

7.3 Data sharing for VME management
7.3.1 Discussion and revision of terms of reference for sharing VME data
63. The Chair presented draft terms of reference for sharing VME data for the consideration of the SSC BF-ME (NPFC-2022-SSC BFME03-WP20).

64. The SSC BF-ME reviewed the terms of reference for sharing VME data and recommends that the SC adopt them (Annex H).

7.3.2 Generation of template for data sharing for VME data
65. The Chair presented a draft template for sharing VME data (NPFC-2022-SSC BFME03-WP21), reflecting Members' responses to a questionnaire about visual surveys (NPFC-2022-SSC BFME03-IP01).

66. The SSC BF-ME reviewed the template for sharing VME data and recommends that the SC adopt it (Annex I).

7.4 Significant and adverse impacts (SAI) assessment

7.4.1 Literature review of impacts of fishing activities on VME

67. Ms. Derya Whaley-Kalaora, an invited expert, provided an update to the literature review presented at SWG VME02 on the recovery of VMEs from impacts of fishing activities.

Agenda Item 8. Data collection and reporting

8.1 Review of the template for collection of scientific observer data

68. The SSC BF-ME reviewed the template for collection of scientific observer data and determined that no revisions are currently required.

69. Regarding the SC's request for advice about whether or not there are any types of data that would be relevant to the SSC BF-ME's work that could be collected by a regional NPFC EM system or observer program, the SSC BF-ME reaffirmed that Members' existing observer programs are adequate for collecting the necessary data.

Agenda Item 9. 5-Year Rolling Work Plan

9.1 North Pacific armorhead

9.2 Splendid alfonsino

9.3 Sablefish

9.4 Vulnerable marine ecosystems

9.5 Other ecosystem components

70. The SSC BF-ME reviewed, revised and endorsed the 2022-2026 SSC BF-ME 5-Year Rolling Work Plan (NPFC-2022-SSC BFME03-WP01 (Rev. 1)).

Agenda Item 10. Review of CMMs 2021-05 and 2019-06 for bottom fisheries and protection of vulnerable marine ecosystems and CMM 2019-10 for sablefish

71. The Science Manager explained that the revisions to CMMs 2021-05 and 2019-06 that had been proposed by SSC BF-ME02 and endorsed by SC06 had not yet been considered by the Commission due to the postponement of the Commission meeting.

72. The SSC BF-ME reviewed and further revised CMM 2021-05 (Annex J).

73. The SSC BF-ME noted that in Paragraph 4A of CMM 2021-05, there is some ambiguity around the referenced effort limits of February 2007. The SSC BF-ME recommends that the SC recommend that the Commission consider amending the CMM to address this issue.

74. The SSC BF-ME reviewed and further revised CMM 2019-06 (Annex K).

75. The SSC BF-ME has suggested an encounter threshold for demosponges and Hexactinellidae sponges at 500 kg in CMM 2021-05 and CMM 2019-06 and noted that this will be reviewed in the SWG VME.

76. The SSC BF-ME reviewed CMM 2019-10 and determined that no changes are currently necessary.

Agenda Item 11. Other matters

11.1 Inter-sessional work and priority issues for next meeting

77. The SSC BF-ME discussed intersessional work and agreed priority issues for the next meeting as described under Agenda Item 12.

11.2 Update on PICES WG47 Seamount Ecology

78. The SC Chair, Dr. Janelle Curtis, provided an update on the activities of PICES Working Group 47 (WG-47) on Ecology of Seamounts (NPFC-2022-SSC BFME03-OP01). In 2022, WG-47 objectives included (1) identifying environmental and ecological predictors of patterns in the distribution and biodiversity of seamount taxa, (2) applying one or more modeling approaches to predict the distribution of seamount taxa in the North Pacific Ocean, (3) using available data to predict climate induced changes in the distributions of seamount fauna, and (4) convening a topic session on seamount ecology. The WG-47 co-convened a two-day Workshop on "Distributions of pelagic, demersal, and benthic species associated with seamounts in the North Pacific Ocean and factors influencing their distributions," as well as an annual business meeting, at PICES-2022 in Busan, Korea. In 2023, it will convene a session on "Seamount biodiversity: VMEs and species associated with seamounts in the North Pacific Ocean" at the 2023 PICES Annual Meeting in Seattle, USA. This session will focus on improving understanding of seamount biodiversity, exchanging ideas on methods to identify VME areas, and identifying potential indicators for assessing and monitoring the biodiversity of seamount taxa, and is of interest to both PICES and NPFC, which have identified VMEs as a priority area for cooperation in the NPFC-PICES Framework for Enhanced Scientific Collaboration in the North Pacific. The co-convenors therefore request that NPFC co-sponsor this session by contributing the equivalent of $5,000 USD.

79. The SSC BF-ME supported the request for the NPFC to co-sponsor the PICES session on "Seamount biodiversity: VMEs and species associated with seamounts in the North Pacific Ocean" by contributing the equivalent of $5,000 USD.

11.3 Other issues

80. No other issues were discussed.

Agenda Item 12. Recommendations to the Scientific Committee

81. The SSC BF-ME agreed to:
   (a) Task the SWG NPA-SA to:
      i.   Continue joint work on life history based approach to stock assessment
      ii.   Consider other possible approaches to stock assessment, especially for NPA
      iii. Assist the Secretariat to edit the fish ID guide
      iv.   Update species summaries
      v.   Monitor the effectiveness of current management measures in sustaining the bottom-fish fishery for NPA and SA, given the historically low catch and effort in the fishery and continuing low levels of recruitment in monitoring surveys since 2019
      vi.   Conduct CPUE standardization and comparison with other indices of abundance (e.g., acoustic survey abundance) (lower priority)
   (b) Request Russia to provide a report on the skilfish fishery and stock at SSC BF-ME04
   (c) Task the SWG VME to:
      i.   Review the basis for gear specific and taxa specific encounter thresholds from other RFMOs (SC suggested project)
      ii.   Synchronize and refine approaches to defining SAI so that one method can be applied to the eastern and western North Pacific Ocean
            • Determine data requirements and spatial/temporal resolution for SAI assessment
      iii. Review VME indicator taxa from coral relative to taxonomy revisions for Octocorallia and review the appropriateness of adding Pennatulaceans to the list of VME indicator taxa
      iv.   Bring together observation data on VME from visual survey sources
      v.   Update and refine quantitative definition of VME
            • Include consideration of single-image methodology (Baco-Taylor et al.)
      vi.   Develop management objectives for recovering VME sites (lower priority)

82. The SSC BF-ME recommends the following to the SC:
   (a) Adopt the updated species summaries of North Pacific armorhead (Annex D), splendid alfonsino (Annex E), sablefish (Annex F), and blackspotted and rougheye rockfishes (Annex G), and inform the Commission about the trends in catch and effort and other scientific information relevant to management of NPA and SA.
   (b) Endorse the field guide for identification of fishes of the Emperor Seamount Chain captured by bottom fisheries (NPFC-2022-SSC BFME03-WP08).

(c) Endorse the use of the scientific name *Allocyttus folletti*, instead of *A. verrucosus*, when referring to the oreosomatid fish in the Emperor Seamounts area.

(d) Establish a formal procedure for changing species' scientific and common names used by the NPFC.

(e) Endorse the process proposed by Canada in NPFC-2022-SSC BFME03-WP03 as one of the NPFC's processes for identifying VMEs and areas likely to be VMEs in the Convention Area, and Canada's use of this method in the eastern part of the Convention Area.

(f) Establish a project for understanding the basis by which other RFMOs' encounter thresholds were determined by taxa and gear-type.

(g) Recommend to the Commission that a move-on rule of 1 nautical mile be set for all bottom fishing gear.

(h) Endorse the Hexactinellida and Demospongiae classes as VME indicator taxa.

(i) Adopt the terms of reference for sharing VME data (Annex H).

(j) Adopt the template for sharing VME data (Annex I).

(k) Endorse the updated 2022-2026 SSC BF-ME 5-Year Rolling Work Plan (NPFC-2022-SSC BFME03-WP01 (Rev. 1)).

(l) Endorse the revised CMM 2021-05 (Annex J).

(m) Endorse the revised CMM 2019-06 (Annex K).

(n) Recommend that the Commission consider amending CMM 2021-05 to address the ambiguity around the referenced effort limits of February 2007 in Paragraph 4A.

(o) Recommend that the Commission co-sponsor the PICES session on "Seamount biodiversity: VMEs and species associated with seamounts in the North Pacific Ocean" by contributing the equivalent of $5,000 USD.

Agenda Item 13. Next meeting

83. The SSC BF-ME recommends holding a 3-day virtual meeting or a 2.5-day in-person meeting of the SSC BF-ME in 2023 and requests the guidance of the SC and Commission for determining the date, format and location of the meeting.

84. The SSC BF-ME agreed to hold intersessional meetings of the SWG NPA-SA and SWG VME.

Agenda Item 14. Adoption of the Report

85. The SSC BF-ME03 report was adopted by consensus.

Agenda Item 15. Close of the Meeting

86. The meeting closed at 11:35 on 10 December 2022, Tokyo time.

Annexes:

Annex A – Agenda

Annex B – List of documents

Annex C –List of participants

Annex D – Species summary for North Pacific armorhead

Annex E – Species summary for splendid alfonsino

Annex F – Species summary for sablefish

Annex G – Species summary for blackspotted and rougheye rockfishes

Annex H – Terms of Reference for Data Sharing for Visual Data on the Distribution and Abundance of VME Indicator Taxa

Annex I – Template for sharing VME data

Annex J – Revised CMM 2021-05 - Conservation and Management Measure for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the Northwestern Pacific Ocean

Annex K – Revised CMM 2019-06 - Conservation and Management Measure for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the Northeastern Pacific Ocean

Agenda

Agenda Item 1.   Opening of the Meeting

Agenda Item 2.   Adoption of Agenda
      2.1 Summary of SSC BF-ME02 meeting

Agenda Item 3.   Stock assessment and scientific advice on the management of North Pacific armorhead (NPA)
      3.1 Review of Members fishing statistics for NPA in 2022
      3.2 NPA monitoring survey and Adaptive Management Procedure (AMP)
          3.2.1 Review of the results from 2022 monitoring survey
      3.3 Review of Members' research and joint research activities on NPA
          3.3.1 Analysis of recruitment relationships to oceanography
          3.3.2 Update on analyses or progress on biomass estimates from the NPA acoustic survey
          3.3.3 Species summary document for NPA update

Agenda Item 4.   Stock assessment and scientific advice on the management of splendid alfonsino (SA)
      4.1 Review of Members fishing statistics for SA in 2022
      4.2 Review of Members' research and joint research activities on SA
          4.2.1 Species summary document for SA update
          4.2.2 SA maturity

Agenda Item 5.   Stock assessment and scientific advice on the management of sablefish
      5.1 Review of Members fishing statistics for sablefish in 2022
      5.2 Review of Members' research and joint research activities on sablefish
          5.2.1 Updated stock status for sablefish (Canada and USA)
          5.2.2 Results of analysis of sablefish association with VME indicators
          5.2.3 Update catch limits relative to stock status if needed
          5.2.4 Species summary document for sablefish update

Agenda Item 6. Progress on data-limited approaches to assessment of NPA and SA
      6.1 Update from SWG NPA-SA
          6.1.1 Data sharing and spatial resolution of shared data

6.1.2 Joint work on life history based approach to stock assessment

6.1.3 Update on CPUE standardization work

6.1.4 Review of Fish ID guide

Agenda Item 7.　Assessment and scientific advice on the management of Vulnerable Marine Ecosystems (VME)

7.1 Review of Members' research and joint research activities on VME

7.1.1 Review of progress towards developing a definition of VMEs

7.1.2 Assessing the relative risk of SAIs

7.1.3 Update on trade-off analysis between VME protection and sablefish fishing

7.1.4 Update on progress on standardizing an approach to defining SAI

7.1.5 Joint Canada-USA seamount cruise

7.1.6 Japanese sea-floor survey in 2022

7.1.7 Research on bottom ecosystems of the Emperor Seamount Chain by Russia

7.2 Review of intersessional activities of the SWG VME

7.2.1 Recommendations on gear specific encounter thresholds

7.2.2 Review and discussion of scientific basis for move on rule and size of area closures

7.2.3 Proposals for revisions to VME indicator species list

7.2.4 Discussion of draft objectives for recovering VMEs

7.3 Data sharing for VME management

7.3.1 Discussion and revision of terms of reference for sharing VME data

7.3.2 Generation of template for data sharing for VME data

7.4 Significant and adverse impacts (SAI) assessment

7.4.1 Literature review of impacts of fishing activities on VME

Agenda Item 8.　Data collection and reporting

8.1 Review of the template for collection of scientific observer data

Agenda Item 9. 5-Year (2022-2026) Rolling Work Plan

9.1 North Pacific armorhead

9.2 Splendid alfonsino

9.3 Sablefish

9.4 Vulnerable marine ecosystems

9.5 Other ecosystem components

Agenda Item 10.　Review of CMMs 2021-05 and 2019-06 for bottom fisheries and protection of vulnerable marine ecosystems and CMM 2019-10 for sablefish

Agenda Item 11.   Other matters

       11.1 Inter-sessional work and priority issues for next meeting

       11.2 Update on PICES WG47 Seamount Ecology

       11.3 Other issues

Agenda Item 12.   Recommendations to the Scientific Committee

Agenda Item 13.   Next meeting

Agenda Item 14.   Adoption of the Report

Agenda Item 15.   Close of the Meeting

List of Documents

MEETING INFORMATION PAPERS

Symbol	Title
NPFC-2022-SC07-MIP01	Meeting Information
NPFC-2022-SSC BFME03-MIP02	Provisional Agenda
NPFC-2022-SSC BFME03-MIP03 (Rev. 1)	Annotated Indicative Schedule

WORKING PAPERS

Symbol	Title
NPFC-2022-SSC BFME03-WP01 (Rev. 1)	Five-Year Work Plan of the SSC BF-ME
NPFC-2022-SSC BFME03-WP02	The Relative Risk of Significant Adverse Impacts to Vulnerable Marine Ecosystems in the northeast part of the NPFC's Convention Area
NPFC-2022-SSCBFME03-WP03	Vulnerable Marine Ecosystems (VMEs) in the Northeast Part of the North Pacific Fisheries Commission Convention Area
NPFC-2022-SSCBFME03-WP04	Balancing objectives of Sablefish fishing and conserving Vulnerable Marine Ecosystems in the Northeastern part of the NPFC Convention Area
NPFC-2022-SSC BFME03-WP05	Update on analyses of abundance estimation from the NPA acoustic survey
NPFC-2022-SSC BFME03-WP06	Sexual maturity of Splendid alfonsino (*Beryx splendens*) in the Emperor seamounts
NPFC-2022-SSC BFME03-WP07 (Rev. 1)	Small Working Group on NPA and SA - Summary for 2022
NPFC-2022-SSC BFME03-WP08	The Field Guide for Identifications of Fishes of the Emperor Seamount Chain (ESC) Captured by Bottom Fisheries
NPFC-2022-SSC BFME03-WP09	Scientific name for the oreosomatid fish caught by bottom fisheries in the Emperor Seamounts area
NPFC-2022-SSC BFME03-WP10	Report of Japanese sea-floor visual survey in the southern Emperor Seamounts (southern-ES) in 2022
NPFC-2022-SSC BFME03-WP11 (Rev. 2)	A brief update of Sablefish status in the eastern North Pacific including the NPFC Convention Area - 2022
NPFC-2022-SSC BFME03-WP12	Joint Canada-USA International Seamount Survey
NPFC-2022-SSC BFME03-WP13	NPA species summary
NPFC-2022-SSC BFME03-WP14	SA species summary
NPFC-2022-SSC BFME03-WP15	Sablefish species summary

NPFC-2022-SSC BFME03-WP16	Blackspotted and Rougheye Rockfishes species summary
NPFC-2022-SSC BFME03-WP17	Summary of the 1st SWG VME meeting
NPFC-2022-SSC BFME03-WP18	Summary of the 2nd SWG VME meeting
NPFC-2022-SSC BFME03-WP19	Sablefish Associations with VME Indicator Species in the NE Pacific
NPFC-2022-SSC BFME03-WP20	Terms of Reference for Data Sharing for Visual Data on the Distribution and Abundance of VME Indicator Taxa
NPFC-2022-SSC BFME03-WP21	VME Data Sharing Template (Draft)

INFORMATION PAPERS

Symbol	Title
NPFC-2022-SSC BFME03-IP01	Data from visual surveys conducted by NPFC Members
NPFC-2022-SSC BFME03-IP02	Results of a monitoring survey for North Pacific armorhead in the Emperor Seamounts in 2022
NPFC-2022-SSC BFME03-IP03	Effects of oceanography on NPA recruitment in the Emperor Seamounts
NPFC-2022-SSC BFME03-IP04	Recommendations on Gorgonian taxa in the Alcyonacea in SWG2022-VME01
NPFC-2022-SSC BFME03-IP05	Essential bottom ecosystems (VME) of the Emperor Chain

OBSERVER PAPERS

Document Number	Title
NPFC-2022-SSC BFME03-OP01	A summary of 2022 activities by PICES Working Group 47 (WG-47) on Ecology of Seamounts
NPFC-2022-SSC BFME03-OP02	A Community Consensus on Designating Vulnerable Marine Ecosystems from Imagery

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North Pacific armorhead (*Pentaceros wheeleri*)

Common names: Pelagic armorhead, Slender armorhead (English); 五棘鯛 (Chinese); クサカ
リツボダイ (Japanese); 북방돗돔 (Korean); кабан-рыба (Russian)

Biological Information

North Pacific armorhead has a unique life history consisting of a pelagic larva phase and a
demersal adult stage on the seamounts (Kiyota et al. 2016). Distribution of the larva includes Gulf
of Alaska to North Pacific Ocean off central California and south of Japan, with center of
abundance at the Emperor Seamounts. Following their settlements in the seamounts, adults make
morphological changes from the "fat" type to the "lean" type concurrent with their dietary shifts.
Vertical distribution of the adults ranges from 300-500 m. Juveniles at the epipelagic stage mainly
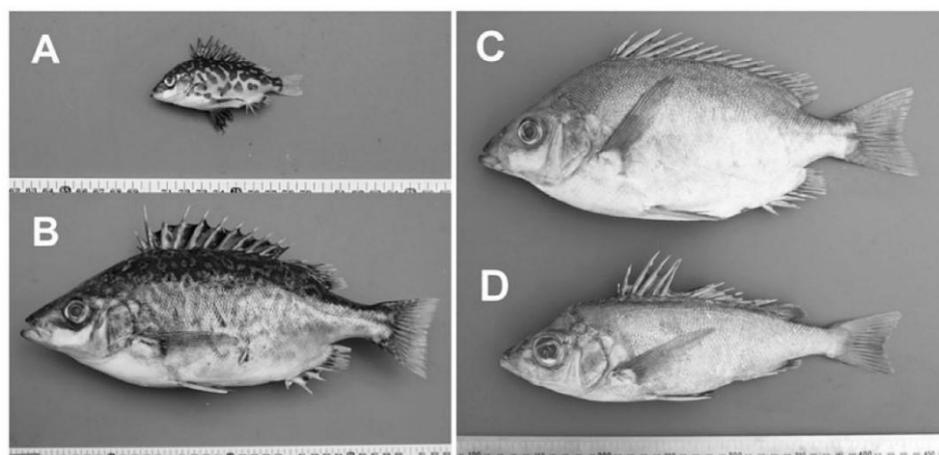feeds on copepods, shifting the targets towards fish and large crustaceans with growth.

Figure 1: Photographs of Pentaceros wheeleri. *A) Pelagic juvenile, B) pelagic subadult, C)
demersal adult (fat type), D) demersal adult (lean type) (from Kiyota et al. 2016)*

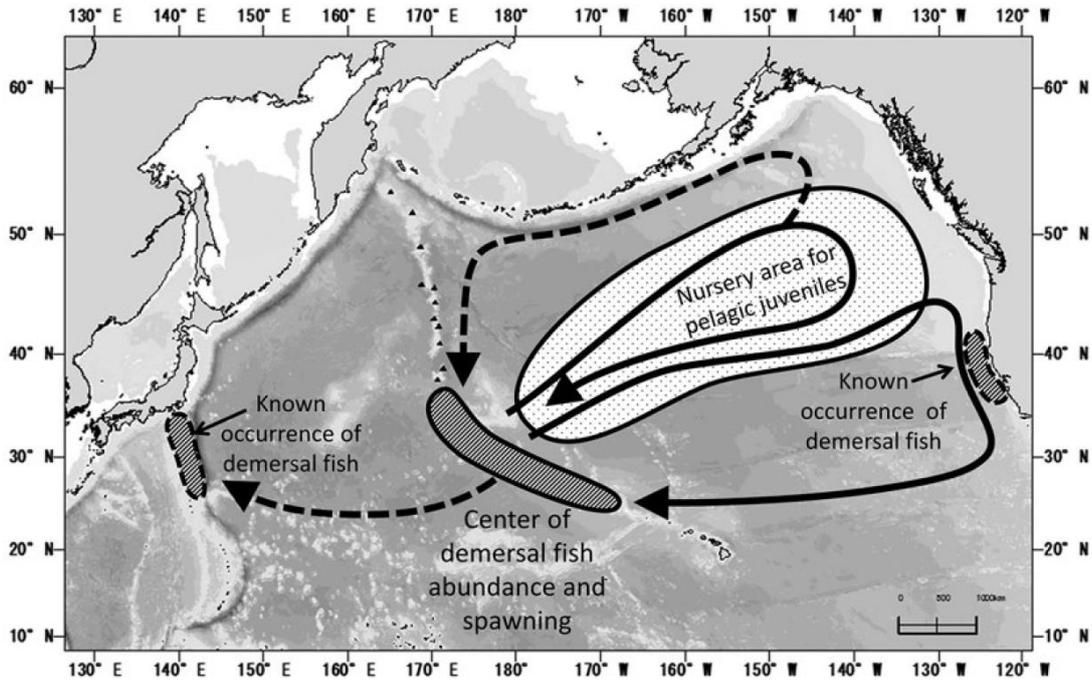*Figure 2: Known demersal habitats and hypothesized pelagic migration routes of Pentaceros wheeleri (Kiyota et al. 2016 Figure 4, modified from Boehlert and Sasaki 1988).*

Fishery

Historical catches by Russia and Japan from the combined Emperor Seamounts were high and reached 100 thousand tons in 1970s, followed by a crash (Figure 3). Currently North Pacific armorhead is caught by Japan and Korea on the Emperor Seamounts using bottom trawls and gillnets. This fishery is a potential source of significant adverse impacts on vulnerable marine ecosystems due to bottom contact gear.
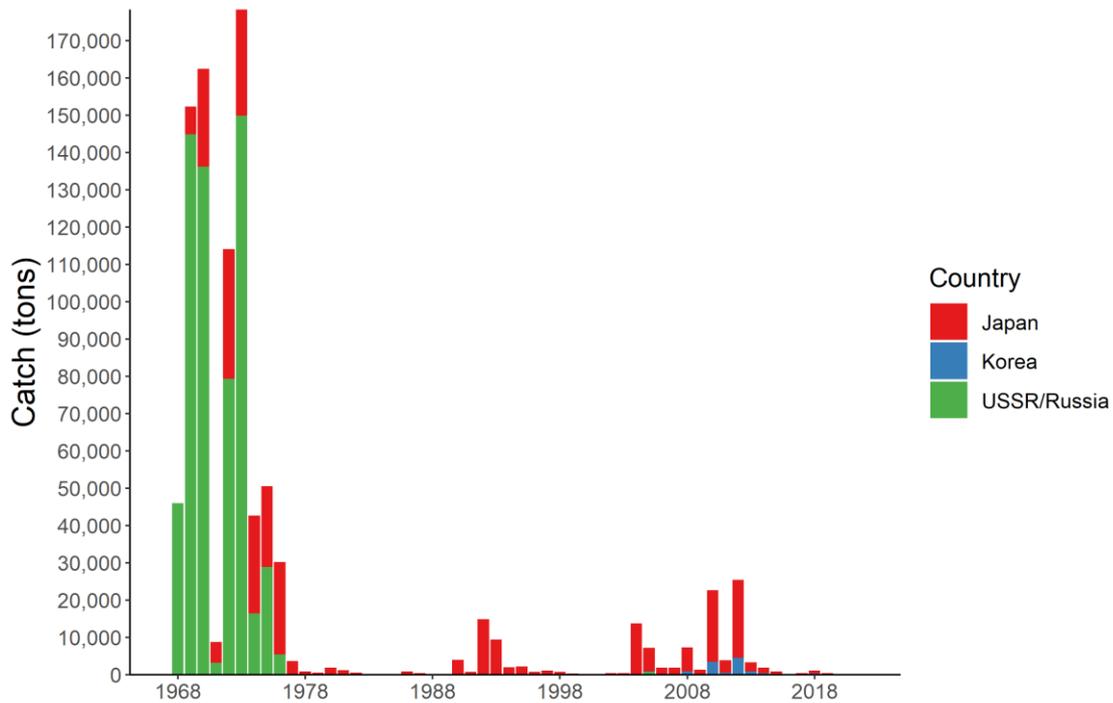
Figure 3: Historical trends of North Pacific armorhead catches in NPFC waters. *The annual amounts of catch by each country are shown by the bar plot.*
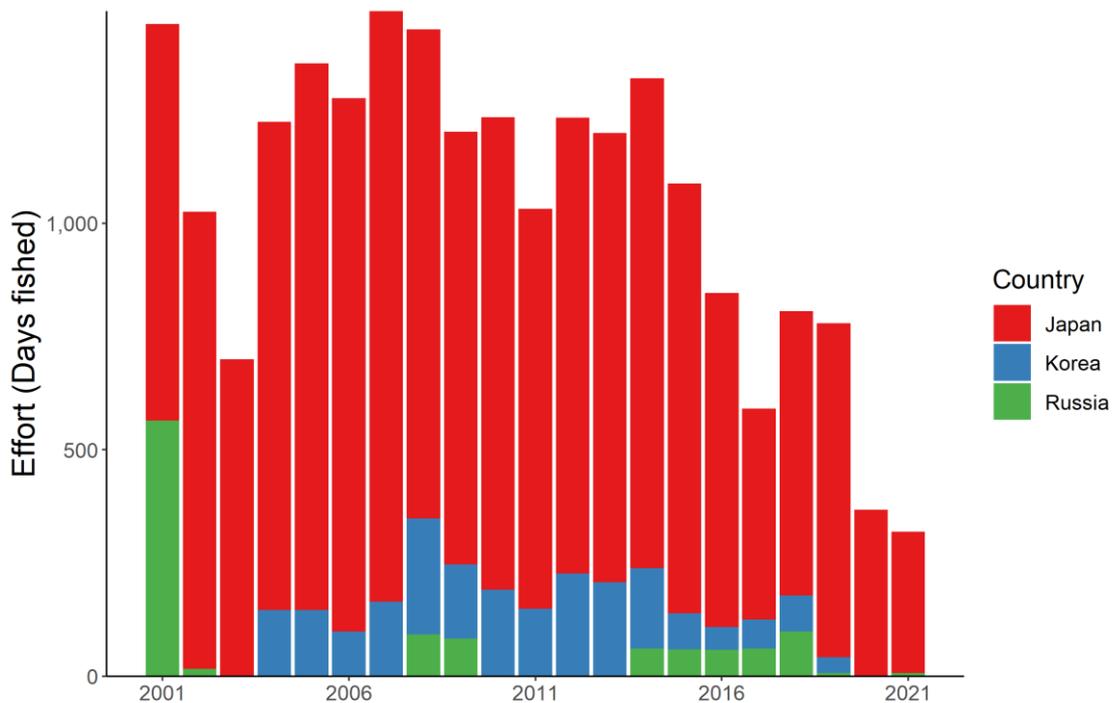

Figure 4. Historical fishing effort for North Pacific armorhead. *The annual fishing efforts by each country are shown by barplot. The efforts are calculated by the total fishing days operated during the year*

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Assessment

There is no current or accepted assessment for North Pacific armorhead.

There are no biomass estimates available for this species in NPFC waters. An age- or length-structured stock assessment is unlikely to be feasible given the life history of North Pacific armorhead. Data limited approaches may be examined in the future.

Management

Active Management Measures

The following NPFC conservation and management measures pertain to this species:

- CMM 2021-05 For Bottom Fisheries and Protection of VMEs in the NW Pacific Ocean

Available from https://www.npfc.int/active-conservation-and-management-measures

Table 1: Current status of management measures

Item	Status	Description
Biological reference point	Not accomplished	Not established
Stock status	Unknown	Status determination criteria not established
Catch limit	Intermediate	Upper limit: 15,000 tons (only for Japan), No operation from November to December, Restriction of trawl mesh size
Harvest control rule	Not accomplished	Catch limit depending on the recruitment strength
Other	Intermediate	No expansion of fishing beyond established areas, No operation in the designated areas, No more increase in the fishing vessels

In 2019, an adaptive management plan was implemented for North Pacific armorhead (NPFC-2019-SSC BF02-WP05, CMM 2019-05). This plan specifies data collection via an annual monitoring survey to be conducted in March-June each year on Koko, Yuryaki, Kammu and/or Colahan Seamounts. If the survey finds evidence of strong recruitment (see CMM 2021-05 and NPFC-2019-SSC BF02-IP01 for details) some areas in the Emperor Seamounts are closed and a 12,000 ton catch limit is encouraged. In low recruitment years, a 700 ton catch limit is encouraged.

Data Availability

Table 2: Catch data

Data	Country	Fishery	Year	Comments
Annual catch	Japan	Trawl	1969-present	
		Gillnet	1990-present	
	Korea	Trawl	2004-2019	
	Russia	Trawl	1970-1987; 1997; 2001-2002; 2005-2006; 2011; 2013	
CPUE	Japan	Trawl	1970-present	Logbook data availabe
		Gillnet	2008-present	Logbook data available
	Korea	Trawl	2013-2019	Logbook data available
	Russia	Trawl	2001-2002; 2005-2006; 2011; 2013	

Table 3: Biological data

Data	Country	Year	Comments
Age	Japan		A preliminary daily ring analysis for ca. 300 fish
	Korea	2013-2019	
	Russia		
Length	Japan	2009-present	Protocol revised (see NPFC-2018-SSC BF01-WP03)
	Korea	2013-2019	
	Russia		
Maturity	Japan	2013-present	
	Korea	2013-2019	
	Russia	1970-1987; 1997; 2011; 2013	

References

Boehlert, G. W., and T. Sasaki. 1988. Pelagic biogeography of the armorhead, *Pseudopentaceros wheeleri*, and recruitment to isolated seamounts in the North Pacific Ocean. Fish. Bull. 86:453–465.

Kiyota M., Nishida K., Murakami C. and Yonezaki S. 2016. History, biology, and conservation of Pacific endemics 2. The North Pacific armorhead, *Pentaceros wheeleri* (Hardy, 1983) (Perciformes, Pentacerotidae). Pacific Science 70(1): 1-20.

Species summary for splendid alfonsino

Splendid alfonsino (*Beryx splendens*)

Common names: Splendid alfonsino (English); 红眼金鲷 (Chinese); キンメダイ (Japanese); 빛금눈돔 (Korean); Низкотелый берикс (Russian)

Biological Information

Global distribution ranges from tropical to temperate oceans. Historical catch records in the Emperor Seamount suggest the distribution from Nintoku (45 °N) to Hancock (30 °N). Settlement occurs following a certain period of the pelagic life stage. Adults show a vertical distribution from 200 to 800 m with diel vertical migration, feeding on crustaceans, cephalopods, and fish during the night. Limited information is available for recruitment and reproduction processes in the Emperor Seamounts, whereas the population in the Japanese coast shows 4–5 years to sexually mature and spawning occurs during summer (Shotton 2016).
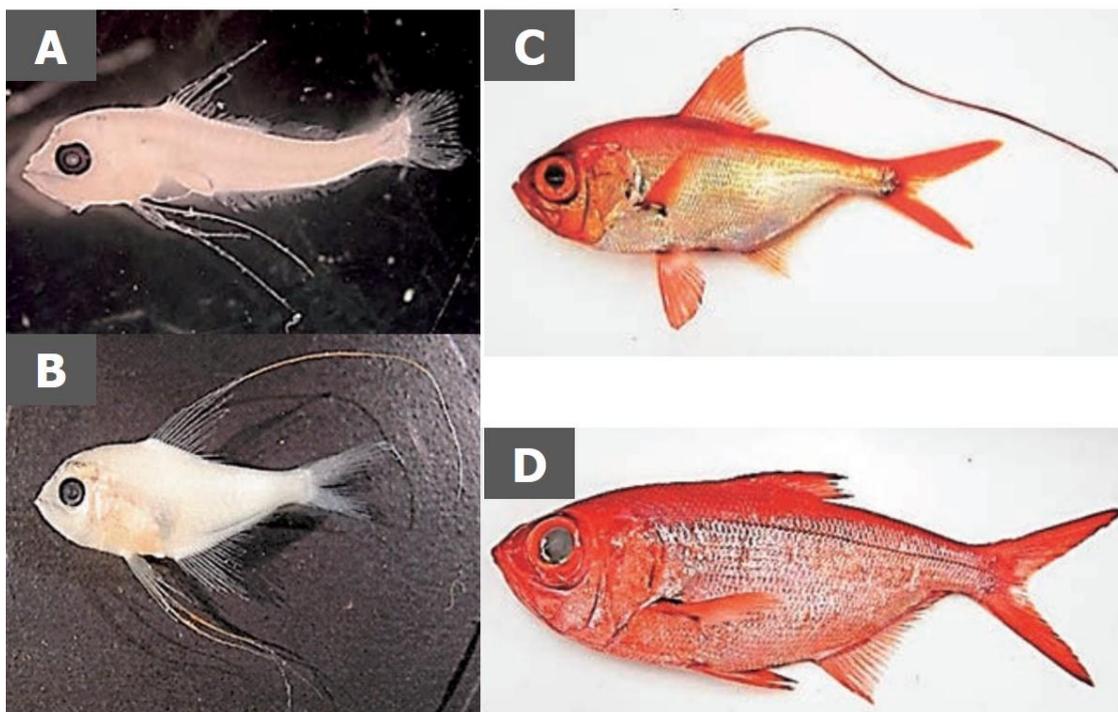

***Figure 1: Photographs of Beryx splendens on different developmental stages** A) postlarva, B) juvenile, C) young, D) adult (from Watari et al. 2017)*
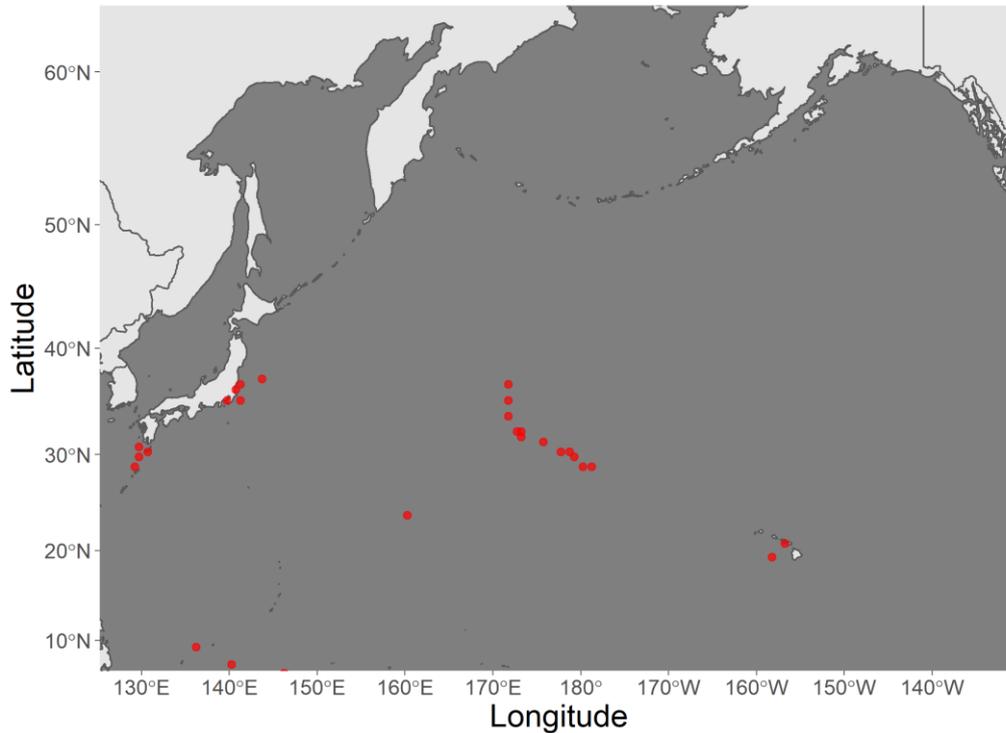
Figure 2: Known distribution of Beryx splendens around NPFC waters. *Points indicate observation data from original sources (AquaMaps 2019, October)*

Fishery

Since the discovery of large populations of North Pacific armorhead in the Emperor Seamount in the late 1960s, Splendid alfonsino has been exploited as an alternative resource to the armorhead due to the large temporal fluctuation of the armorhead population. The main fishing methods are bottom trawls and gillnets.

Historical catch record (Figure 3) shows the highest catch proportion by Japan, followed by Korea and Russia. Russia terminated their fishery nearly a decade ago. Fishing pressure somewhat reflects the recruitment condition of North Pacific armorhead. In 2010 and 2012, when high recruitment of the armorhead occurred, the annual catch decreased below 1,000 tons, whereas it increased up to 4,000 tons ever since then.

Size composition analysis from the catch data by Japanese trawlers suggests the substantial decrease in size of fish in catches over the past decade, raising the concern about growth and recruitment overfishing (Sawada et al. 2018).
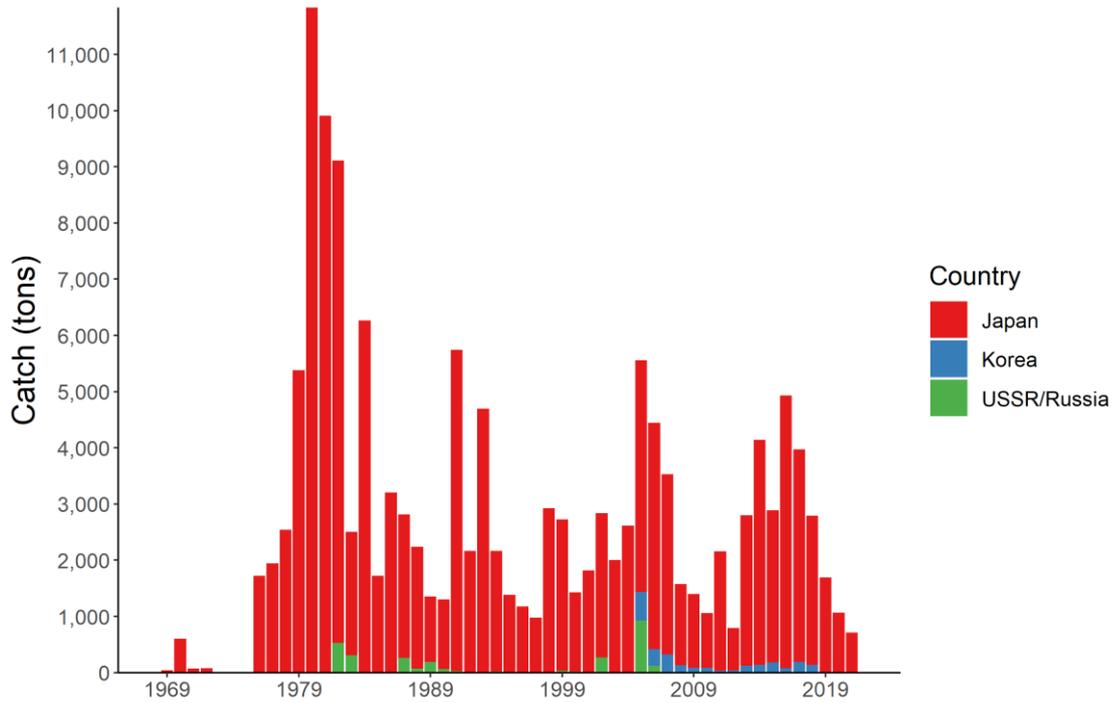
Figure 3: Historical trends of Splendid alfonsino catches in NPFC waters. *The annual amounts of catch by each country are shown by the bar plot.*
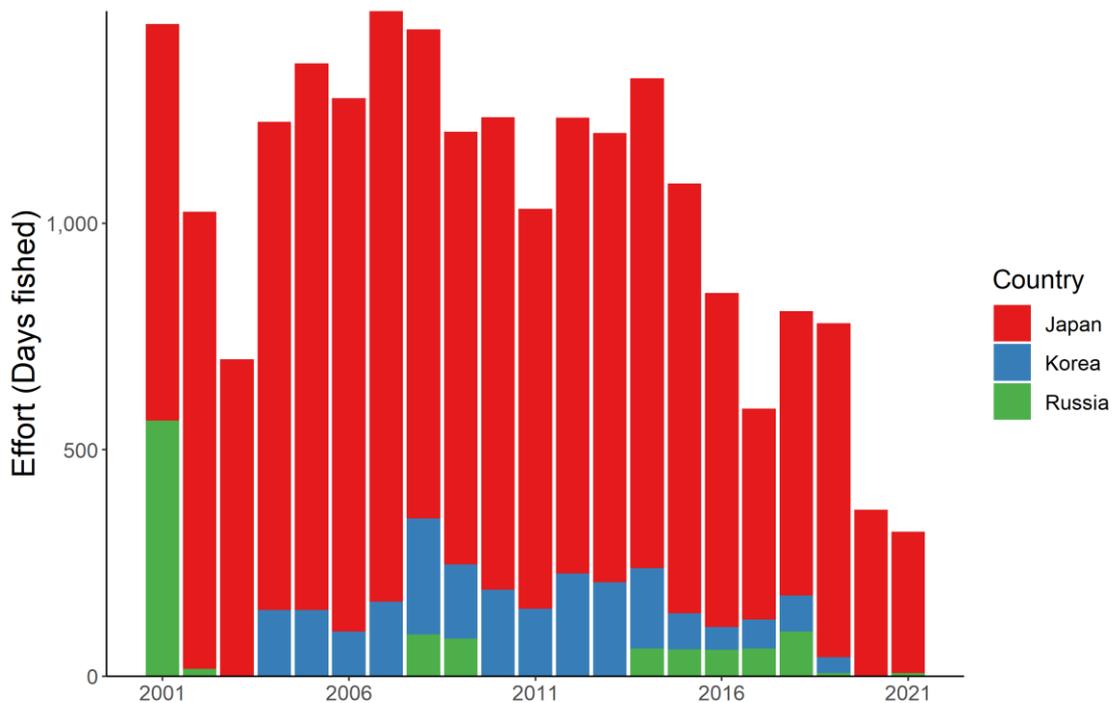

Figure 4. Historical fishing efforts for Splendid alfonsino. *The annual fishing efforts by each country are shown by barplot. The efforts are calculated by the total fishing days operated during the year*

Assessment

There are no biomass estimates available for Splendid alfonsino in NPFC waters.

An age- or length-structured stock assessment may be feasible given the life history of this species. Surplus production models developed by Japan in 2008 showed that the average fishing mortality is 20–28 % higher than the MSY level (Nishimura and Yatsu 2008). This analysis, however, remains unreliable as the estimated CPUE is biased due to target shifts between North Pacific armorhead and Splendid alfonsino and the estimated intrinsic population growth rate parameter was too high for long-lived deep-sea fish.

Data limited approaches, such as YPR or SPR analysis that do not require detailed resource parameters or fishing data, should be explored in the future.

Management

Active Management Measures

The following NPFC conservation and management measures pertain to this species:

- CMM 2021-05 For Bottom Fisheries and Protection of VMEs in the NW Pacific Ocean

Available from https://www.npfc.int/active-conservation-and-management-measures

Table 1: Current status of management measures

Item	Status	Description
Biological reference point	Not accomplished	Not established
Stock status	Unknown	Status determination criteria not established
Catch limit	Intermediate	No operation from November to December, Restriction of trawl mesh size
Harvest control rule	Not accomplished	Not established
Other	Intermediate	No expansion of fishing beyond established areas, No operation in the designated areas, No more increase in the fishing vessels

Currently, there is no accepted harvest control rule for this species.

In 2016, the management measures were implemented, which includes limiting the fishing effort to the 2007's level, prohibiting fisheries from November to December (which corresponds to the spawning season for North Pacific armorhead) and not allowing fisheries in C-H Seamount and the southeastern part of Koko Seamount (for the protection of VMEs)

In 2019, an additional measure was adopted, which includes the regulation of the mesh size (trawl: > 13 cm) to protect juvenile fish of this species. Effectiveness of this measure yet to be clearly demonstrated (Sawada and Ichii 2020).

Data Availability

Table 2: Catch data

Data	Country	Fishery	Year	Comments
Annual catch	Japan	Trawl	1969-present	
		Gillnet	1990-present	
	Korea	Trawl	2004-2019	
	Russia	Trawl	1969-1988; 2002; 2005; 2006; 2010; 2011; 2013; 2019	
CPUE	Japan	Trawl	1970-present	Logbook data available
		Gillnet	2008-present	Logbook data available
	Korea	Trawl	2013-2019	Logbook data available
	Russia	Trawl	1969-1988; 2010; 2019	

Table 3: Biological data

Data	Country	Year	Comments
Age	Japan	2013-present	annual ring analysis
	Korea	2013-2017, 2019	
	Russia		
Length	Japan	2009-present	Protocol revised (see NPFC-2018-SSC BF01-WP03)
	Korea	2013-2019	
	Russia		
Maturity	Japan	2013-present	
	Korea	2013-2017, 2019	
	Russia	1969-1988; 2010; 2011; 2013; 2019	

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Species summary for sablefish

Sablefish (*Anoplopoma fimbria*)

Common names:

Black cod (USA & Canada)

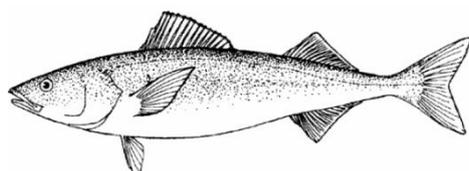ギンダラ, Gindara (Japan)

은대구, Eun-Daegu (Korea)

Figure 1. Sablefish (Anaplopoma fimbria).

Management

Active NPFC Management Measures

The following NPFC conservation and management measures (CMM) pertain to this species:

- CMM 2019-06 For Bottom Fisheries and Protection of VMEs in the NE Pacific Ocean
- CMM 2019-10 For Sablefish in the Northeastern Pacific Ocean

Available from https://www.npfc.int/active-conservation-and-management-measures

Management Summary

The current management measure for sablefish specifies both catch and effort limits. The allowable catch of sablefish in the eastern portion of the Convention Area is based on a long-term mean of historical catches from seamounts by Canada. It allows for 34 mt to be landed each month for the 6 months of the fishing season (April to September). The fishery is also managed through input controls by only allowing a single vessel to fish in each month. The 1-3 Canadian vessels licensed to fish in the NPFC Convention Area are submitted to the NPFC Secretariat annually.

Table 1:Current status of management measures

Convention or Management Principle	Status	Comment or Consideration
Biological reference point(s)	Unknown	Established for USA and Canada assessments
Stock status	Known	Healthy (in USA and Canada assessments)
Catch limit	Known	Allowable catch of 34 mt per month (6 month season)
Harvest control rule	Undefined	Established for USA and Canada assessments
Other	Known	Effort control (single vessel per month)

Assessment

Although genetic and other evidence indicates there is a single stock of sablefish in the eastern North Pacific Ocean (including the NPFC Convention Area), three stock assessments are carried out in the three domestic jurisdictions Alaska (U.S.A.), British Columbia (Canada) and the U.S. West Coast (U.S.A.) where sablefish are harvested.

Canada uses a management strategy evaluation (MSE) process to generate recommended harvest each year. Underlying the MSE is a statistical catch-at-age structured operating model (stock assessment model) that gets updated on a 3 – 5 year cycle (DFO 2016, DFO 2020). A new assessment by Canada is scheduled to be released in early 2023. The USA conducts two stock assessments (one for Alaska and one for the US West Coast). Both are conducted using age-structured models and are routinely updated. The current Alaska assessment (Goethel et al. 2021) and most recent USA West Coast assessment (Haltuch et al. 2019, Kapur et al. 2021) are available online.

No stock assessment is conducted for the portion of the sablefish population found in the NPFC Convention area.

Data

Surveys

Canada has conducted two longline trap surveys in British Columbia waters. From 1990-2009 a standardized trap survey was conducted at set stations annually. From 2003 to the present DFO conducts a stratified random trap survey along the outer shelf and slope of the BC coast. Both of these surveys generate a fishery independent CPUE as well as biological data that is used in the assessment. In Alaska, three survey indices are available for use in assessing the status of the sablefish population. There is a longline survey conducted at standard survey stations that

provides a relative index of abundance. It has been conducted at depths from 200-1000 m annually since 1978 (cooperatively with Japan from 1978-1994). Bottom trawl surveys are conducted annually or biennially in the three main ecosystems in Alaska since 1982. The U.S. West Coast primarily uses fishery independent survey data from the west coast groundfish bottom trawl survey conducted from 2003-2018 over depths of 55 to ~1300 m as an index of sablefish abundance. The bottom trawl survey follows a random-stratified survey design with four vessels (in most years) conducting the survey annually. The trawl survey data is analyzed with the VAST model (Thorson 2019) to produce the index of abundance for sablefish.

There is currently no survey conducted in the eastern NPFC Convention Area that captures or monitors sablefish populations.

Fishery

The Canadian high seas Sablefish fishery typically operates at 1-4 seamounts in the commission area (Cobb, Eickleberg, Warwick and Brown Bear seamounts). Historically other seamounts have been fished for sablefish both inside and outside Canada's EEZ.

Fishing is conducted with longlined traps. Since 2014 a maximum of 3 vessels per year have been allowed to fish in NPFC waters. Historically the number of fishing vessels has averaged <3 per year (since 2008). The number of fishing days is the number of unique calendar days during which gear was set. The number of fishing days has averaged from about 25 to greater than 100, but in most years has averaged between 50 and 75 (Figure 2).

No Canadian vessels have chosen to fish for Sablefish in the Convention Area since 2020. This is likely due to a combination of economics (high fuel prices and the large distance to the seamounts), the availability of quota in the domestic fishery which is easier to access and hesitancy about the requirements under the implementation of the new NPFC AIS policy.

Both Canada and the U.S.A. have large domestic fisheries that target sablefish inside their EEZ's. Sablefish is also captured as bycatch in domestic trawl fisheries in Canada and the U.S.A.
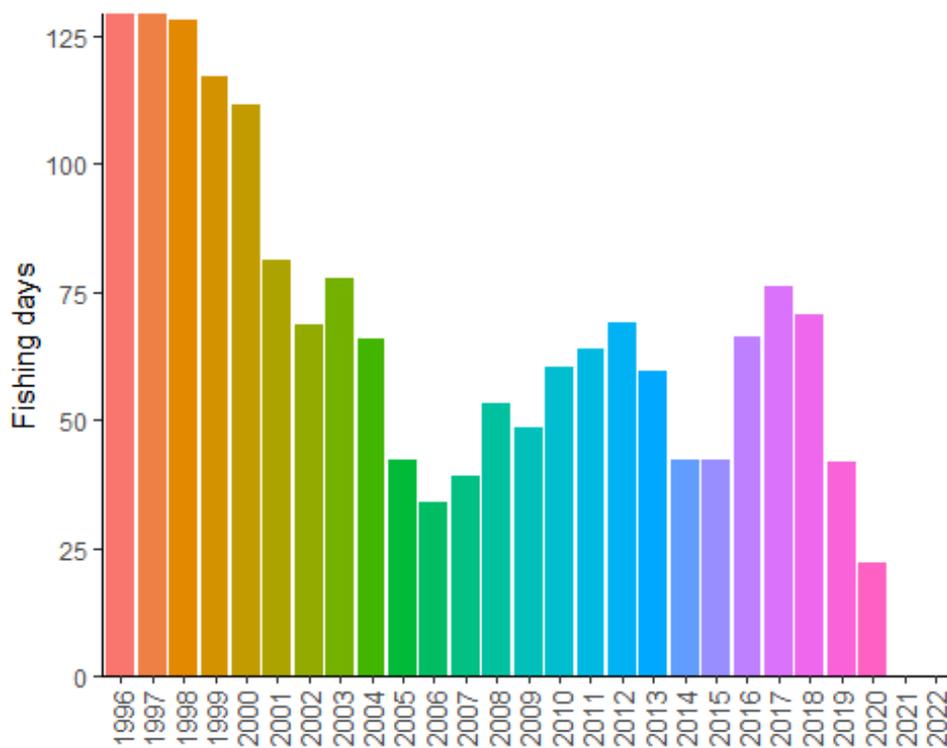
Figure 2. Fishing effort (in number of fishing days) for the Sablefish longline trap fishery conducted in NPFC waters (1996-present). Data are averaged across 3 years to comply with data privacy restrictions.

Output controls limit the amount of fish that can be landed during a trip. Authorized vessels are subject to monthly vessel limits of 34 mt of Sablefish, 2.3 mt of combined Rougheye and Blackspotted rockfish and 0.45 mt of other rockfish, sole and flounder (all in round weight). These measures have been in place since 2011.

Catches of Sablefish from NPFC region seamounts has ranged from an average of about 10 mt per year in 2005-2008 to about 67 mt in 2017 (Figure 3). Average annual catches were relatively low from 2002 to 2016 at NPFC seamounts and then increased in 2017-2018, with a decline to low levels in the last years. This increase in part probably reflects shifting effort due to closures of seamounts within Canada's EEZ. An examination of coastwide shifts in the spatial pattern of fishing effort showed that fishing effort has become concentrated on Cobb Seamount, with increasing effort in shallower waters relative to the past (Figure 4).

There was no fishing effort at seamounts during 2021 or 2022 resulting in no catch.
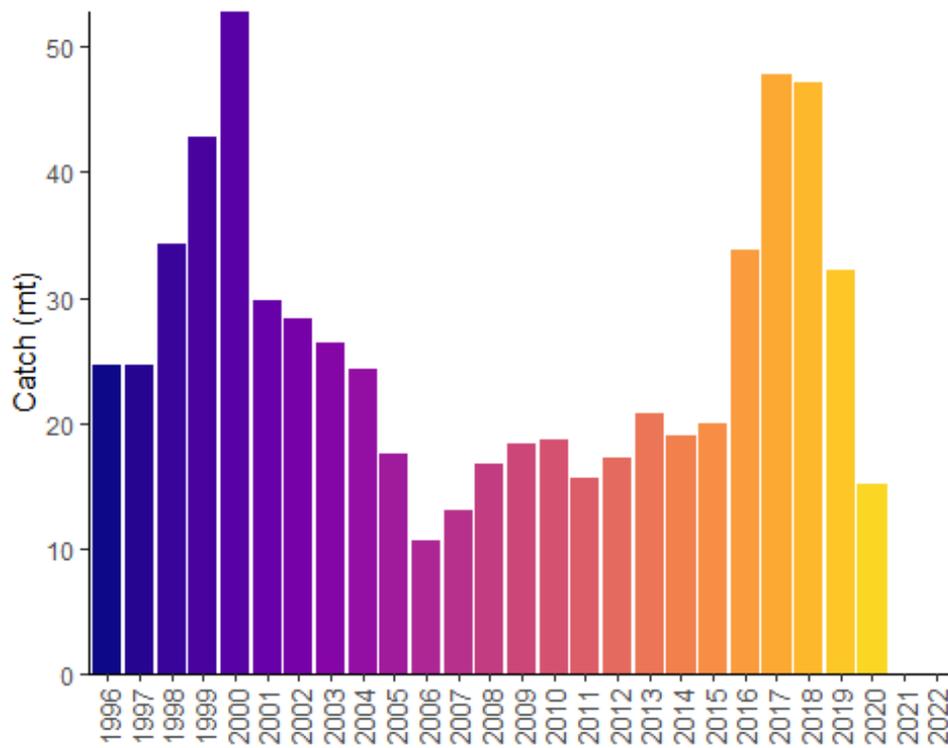
Figure 3. Landings of sablefish in the Canadian Sablefish fishery in NPFC region (1996-present). Data are averaged across 3 years to comply with data privacy restrictions.
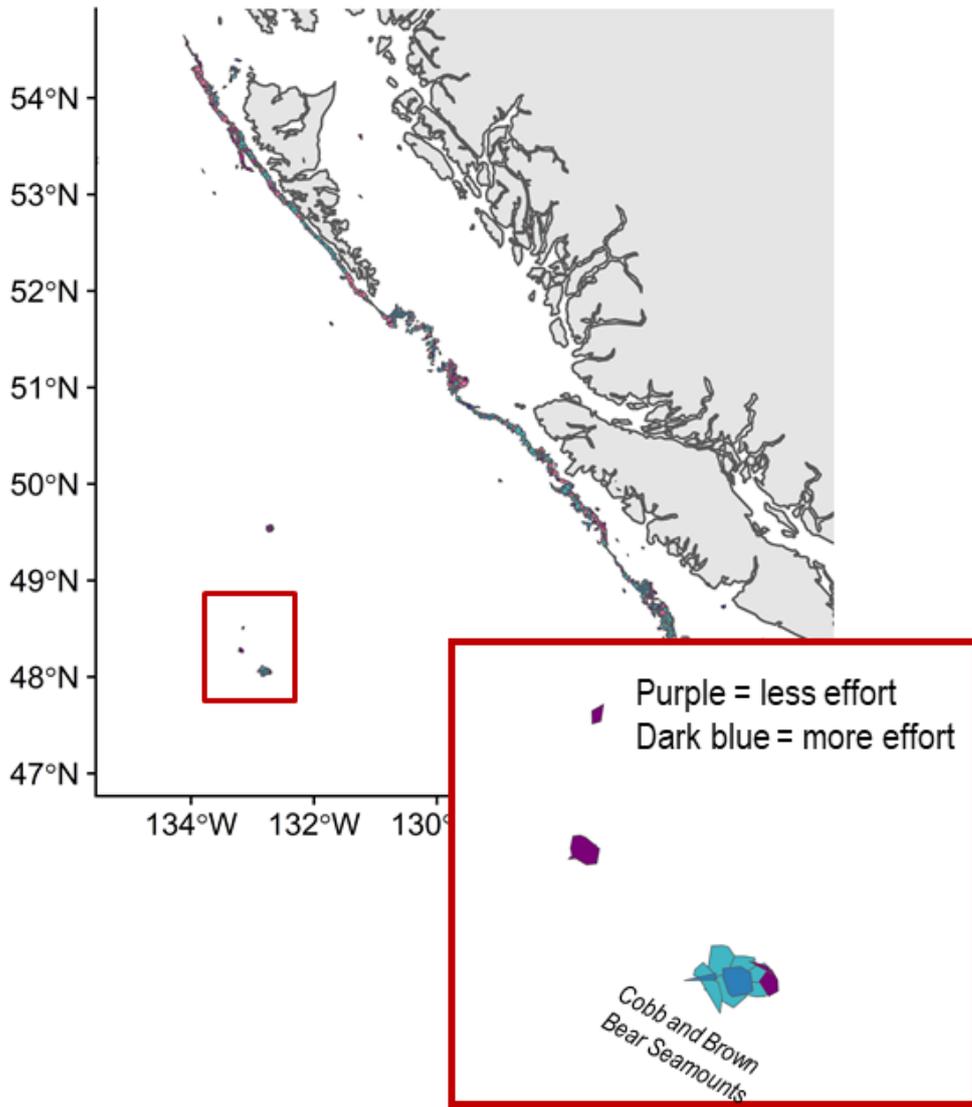
Figure 4. Relative change in spatial distribution of effort for Sablefish trap fishery from 2010-2017 to 2018-2019. Inset shows seamounts in the NPFC Convention Area.

Catch per unit of effort (mt/fishing days) for Sablefish has been increasing over the last 10 years (Figure 5), averaging 0.37 mt/fishing day (CV = 48%). CPUE was not calculated in 2022, but has generally been increasing since 2012.
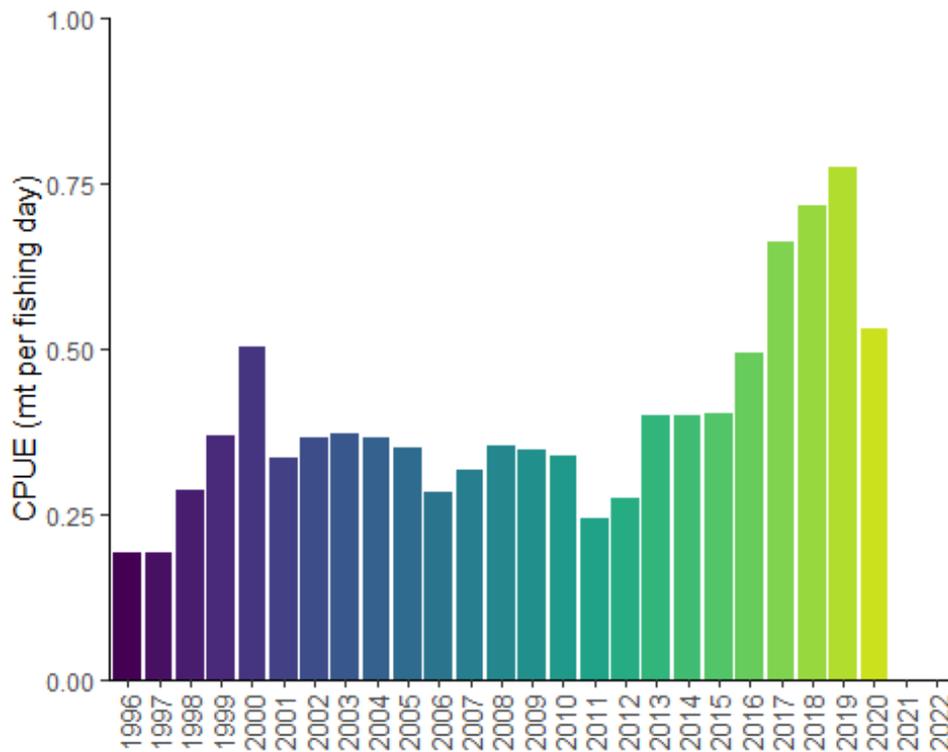
Figure 5. Catch per unit of effort for Canadian Sablefish fishery in NPFC region. Data are averaged across 3 years to comply with data privacy restrictions.

Biological collections

Under the seamount fishing protocol, 5 randomly selected fish per trip are saved by the vessel for sampling when it returns to port. These sablefish are sampled for length, weight and sex. Otoliths are collected for age estimation.

In 2020 due to COVID 19 restrictions, there were no biological samples collected from Sablefish captured in the Convention Area. Historical data will be provided to the NPFC Science Committee, when and as required, in conjunction with the NPFC's Interim Guidance for Management of Scientific Data Used in Stock Assessments.

Domestic fisheries in the U.S.A. and Canada also collect biological data. Data including length, weight and sex are collected from the scientific survey and by observers and dockside samplers from the commercial fisheries. Otoliths for estimating fish ages are also collected from both the surveys and the fisheries.

Table 2:Data availability from Members regarding blackspotted and rougheye rockfishes

Data	Source	Years	Comment
Catch	Canada	1965-present	Catches from national waters and convention area
	USA	~1960-present	Catches in national waters
CPUE	Canada	~1988-present	
	USA	~1988-present	
Survey	Canada	1990-2009	Longline trap standard survey
	Canada	2003-present	Longline trap random survey
	USA	1978-present	Alaska longline survey
	USA	1982-present	Alaska bottom trawl surveys
	USA	2003-present	West Coast bottom trawl survey
Age data	Canada	variable	Commercial and survey catches, including NPFC Convention Area
	USA	variable	Commercial and survey catches
Length data	Canada	variable	Commercial and survey catches, including NPFC Convention Area
	USA	variable	Commercial and survey catches
Maturity/fecundity	Canada	variable	Commercial and survey catches in national waters
	USA	variable	Research cruises in national waters

Special Comments

None

Biological Information

Distribution

Sablefish are widely distributed throughout the Pacific Ocean from northern Mexico to the Gulf of Alaska, westward to the Aleutian, and northward into the Bering Sea (Figure 6; Wolotira et al. 1993). They are also found along the western margin of the Pacific Ocean from southern Japan through the Kamchatka Peninsula and northward into the Bering Sea. Adult sablefish occur along the continental slope, shelf gullies, and in deep fjords, generally at depths greater than 200 m. Juvenile sablefish spend their first two to three years on the continental shelf at shallower depths. Spawning is generally in the winter and spring (October-April) and occurs near the shelf break. Spawning timing generally occurs earlier in the south (October-February in California) and later in the north (January – April in Alaska). Eggs are found at depth and larvae are found in surface waters (Shotwell et al. 2020).

Life history

Larval sablefish feed on zooplankton prey. Juveniles shift from pelagic to benthic prey including fishes and invertebrates. Adults consume mostly benthic fishes and invertebrates. Sablefish mature at 4 to 5 years. In the eastern Pacific, Sablefish have traditionally been thought to form two populations based on differences in growth rate, size at maturity, and tagging studies. The northern population inhabits Alaska and northern British Columbia waters and the southern population inhabits southern British Columbia, Washington, Oregon, and California waters, with mixing of the two populations occurring off southwest Vancouver Island and northwest Washington. However, recent genetic work by Jasonowicz et al. (2017) found no population sub-structure throughout their range along the US West Coast to Alaska, and suggested that observed differences in growth and maturation rates may be due to phenotypic plasticity or are environmentally driven. Tagging evidence suggests that the sablefish inhabiting seamounts in the NPFC Convention Area are not distinct from the coast wide sablefish population.
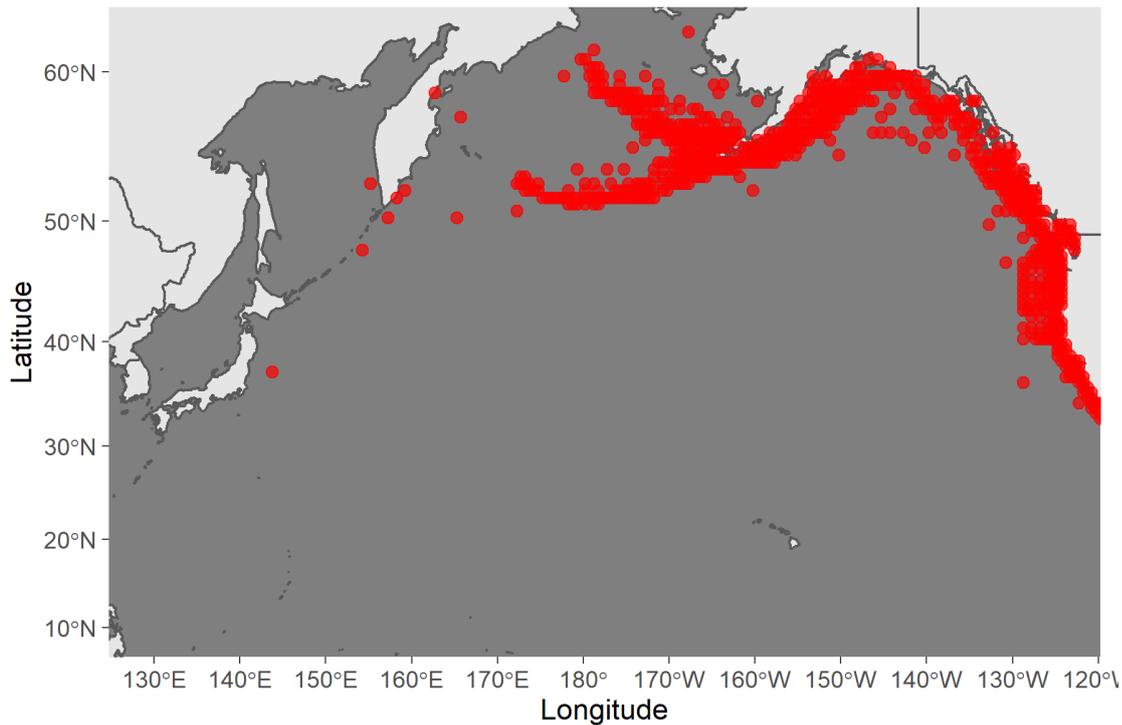
Figure 6. Map of distribution of sablefish in the North Pacific.

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Species summary for blackspotted and rougheye rockfishes

Blackspotted and Rougheye Rockfishes

(*Sebastes melanostictus* and *Sebastes aleutianus*)

Common names:

アラメヌケ, Aramenuke (Japan)

한볼락, Han Bollak (Korea)

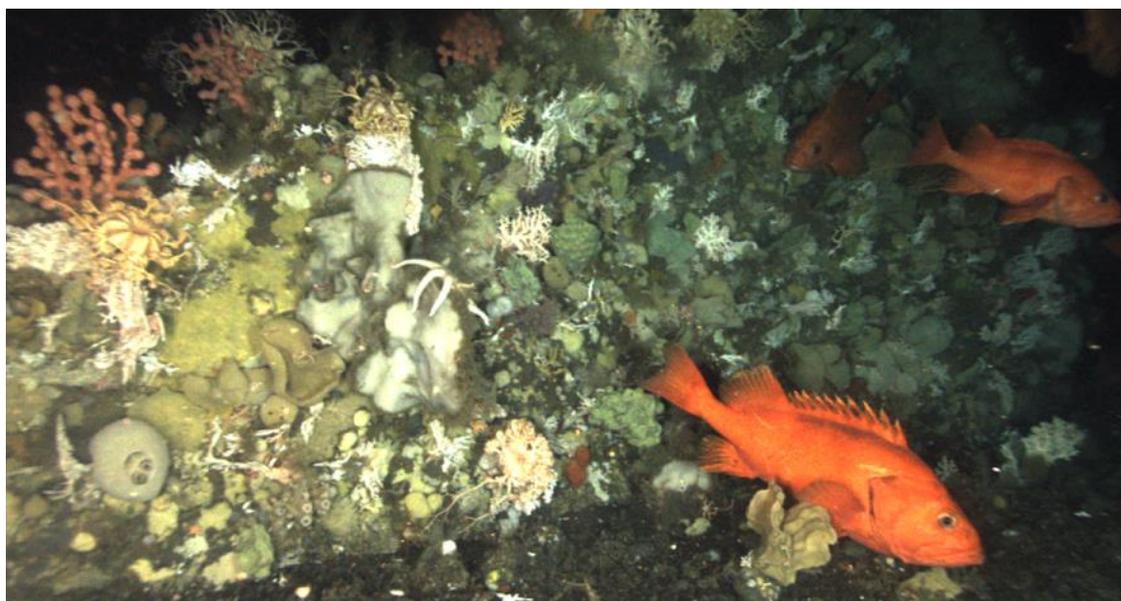*Figure 1. Blackspotted rockfish (Sebastes melanostictus).*

Management

Active NPFC Management Measures

The following NPFC conservation and management measures (CMM) pertain to this species:

- CMM 2019-06 For Bottom Fisheries and Protection of VMEs in the NE Pacific Ocean
- CMM 2019-10 For Sablefish in the Northeastern Pacific Ocean

Available from https://www.npfc.int/active-conservation-and-management-measures

Management Summary

Blackspotted and rougheye rockfishes are captured in the longline trap fishery that targets sablefish (*Anaplopoma fimbria*) at seamounts in the eastern part of the NPFC Convention Area. The current management measure for blackspotted and rougheye rockfishes specifies both catch and effort limits. The allowable catch of blackspotted and rougheye rockfishes in the eastern portion of the Convention Area is based on a long-term mean of historical catches from seamounts by Canada. It allows for 2.3 mt to be landed each month for the 6 months of the fishing season (April to September). The fishery is also managed through input controls by only allowing a single vessel to fish in each month. The 1-3 Canadian vessels licensed to fish in the NPFC Convention Area are submitted to the NPFC Secretariat annually.

Table 3: Current status of management measures

Convention or Management Principle	Status	Comment or Consideration
Biological reference point(s)	Not accomplished	Not established
Stock status	Unknown	Status determination criteria not established
Catch limit	Known	Allowable catch of 2.3 mt per month (6 month season)
Harvest control rule	Not accomplished	Not established
Other	Known	Effort control (single vessel per month)

Assessment

No stock assessment is conducted for blackspotted and rougheye rockfishes in the NPFC Convention area.

It is unclear if the blackspotted and rougheye rockfish population on seamounts in the NPFC Convention Area is distinct from the population on the continental shelf of Canada. There is evidence of population structure in other regions, such as Alaska, where population trends and genetics indicate some structure on the order of ~1000 km (Shotwell and Hanselman 2019, Gharrett et al. 2007, Shotwell et al. 2014). This is about twice the distance from the continental shelf to the fished seamounts in the NPFC Convention Area, however there is potentially a large barrier to dispersal of deepwater between the shelf and the seamounts. There is no available tagging data to indicate whether the blackspotted and rougheye rockfishes at seamounts are

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connected to populations in domestic waters on the continental shelf. It is likely that the seamount populations are distinct stocks with distinct population trajectories.

Domestic stock assessments for blackspotted and rougheye rockfishes conducted in Canada assume there are two populations in domestic waters. These are assessed using a statistical catch at age model (DFO 2020). Assessments are also carried out in Alaska (Shotwell and Hanselman 2019, Spencer et al. 2018).

Data

Surveys

There is currently no survey conducted in the eastern NPFC Convention Area that captures or monitors blackspotted and rougheye rockfish populations.

Fishery

The Canadian high seas sablefish fishery typically operates at 1-4 seamounts in the commission area (Cobb, Eickleberg, Warwick and Brown Bear seamounts). Historically other seamounts have been fished for blackspotted and rougheye rockfishes both inside and outside Canada's EEZ.

Fishing is conducted with longlined traps. Since 2014 a maximum of 3 vessels per year have been allowed to fish in NPFC waters. Historically the number of fishing vessels has averaged <3 per year (since 2008). The number of fishing days is the number of unique calendar days during which gear was set. The number of fishing days has averaged from about 25 to greater than 100, but in most years has averaged between 50 and 75 (Figure 2).

No Canadian vessels have chosen to fish for Sablefish in the Convention Area since 2020. This is likely due to a combination of economics (high fuel prices and the large distance to the seamounts), the availability of quota in the domestic fishery which is easier to access and hesitancy about the requirements under the implementation of the new NPFC AIS policy.

Both Canada and the U.S.A. have domestic fisheries that target blackspotted and rougheye rockfishes inside their EEZ's. Blackspotted and rougheye rockfishes is also targeted in domestic trawl fisheries in Canada and the U.S.A.
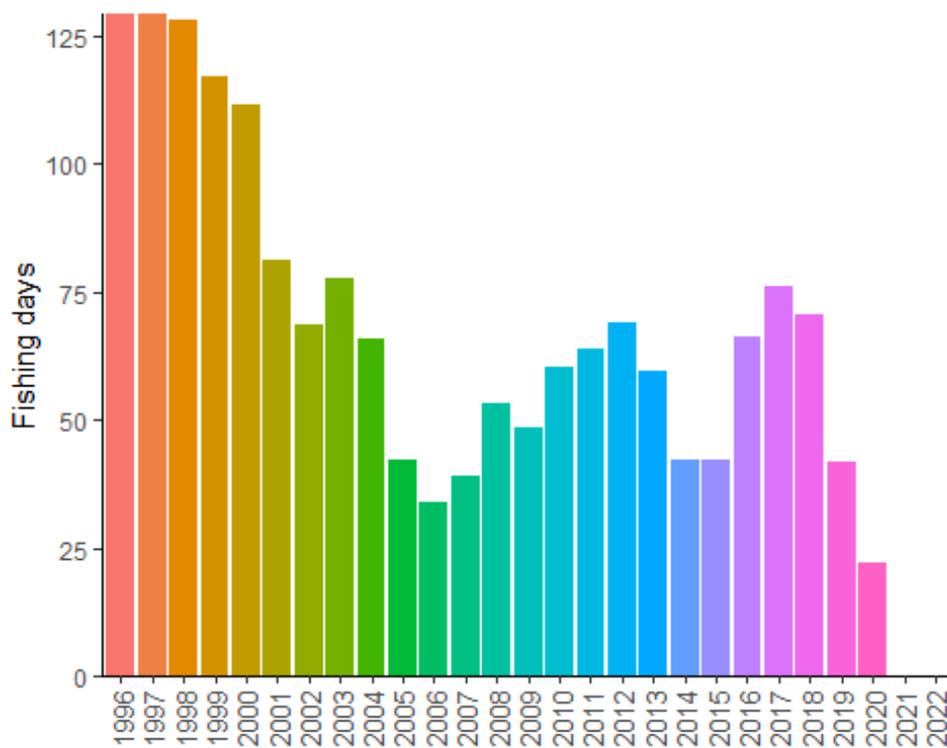
Figure 2. Fishing effort (in number of fishing days) for the Sablefish longline trap fishery conducted in NPFC waters (1996-present). Data are averaged across 3 years to comply with data privacy restrictions.

Output controls limit the landings of combined rougheye and blackspotted rockfish to 2.3 mt (in round weight). These measures have been in place since 2011.

Catches of blackspotted and rougheye rockfishes from NPFC region seamounts has ranged from an average of about 0.5 mt per year in 1996-2014 to about 4 mt in 2017 (Figure 3). Average annual catches were relatively low from 1996 to 2016 at NPFC seamounts and then increased in 2017-2018, with a decline to low levels in the last years. This increase in part probably reflects shifting sablefish effort due to closures of seamounts within Canada's EEZ. An examination of coastwide shifts in the spatial pattern of fishing effort showed that fishing effort has become concentrated on Cobb Seamount, with increasing effort in shallower waters perhaps reflecting increased targeting of blackspotted and rougheye rockfishes relative to the past (Figure 4).

There was no fishing effort at seamounts during 2021 or 2022 resulting in no catch.

Figure 3. Landings of blackspotted and rougheye rockfishes in the Canadian Sablefish fishery in NPFC region (1996-present). Data are averaged across 3 years to comply with data privacy restrictions.
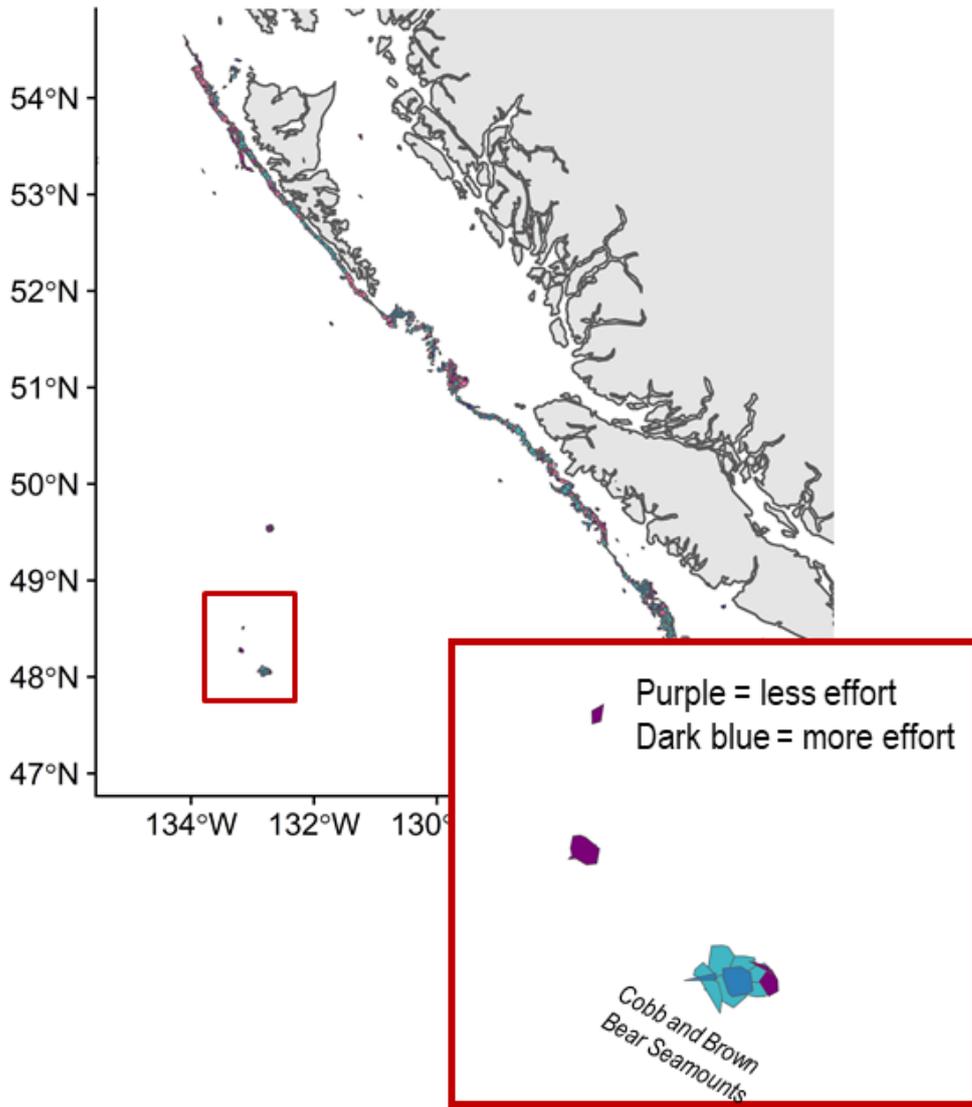
Figure 4. Relative change in spatial distribution of effort for Sablefish trap fishery from 2010-2017 to 2018-2019. Inset shows seamounts in the NPFC Convention Area.

Catch per unit of effort (mt/fishing days) for blackspotted and rougheye rockfishes has been increasing over the last 10 years (Figure 5), averaging 0.01 mt/fishing day (CV = 108%). CPUE was not calculated in 2022 due to the absence of fishing in the Convention Area, but has generally been increasing since 2012.
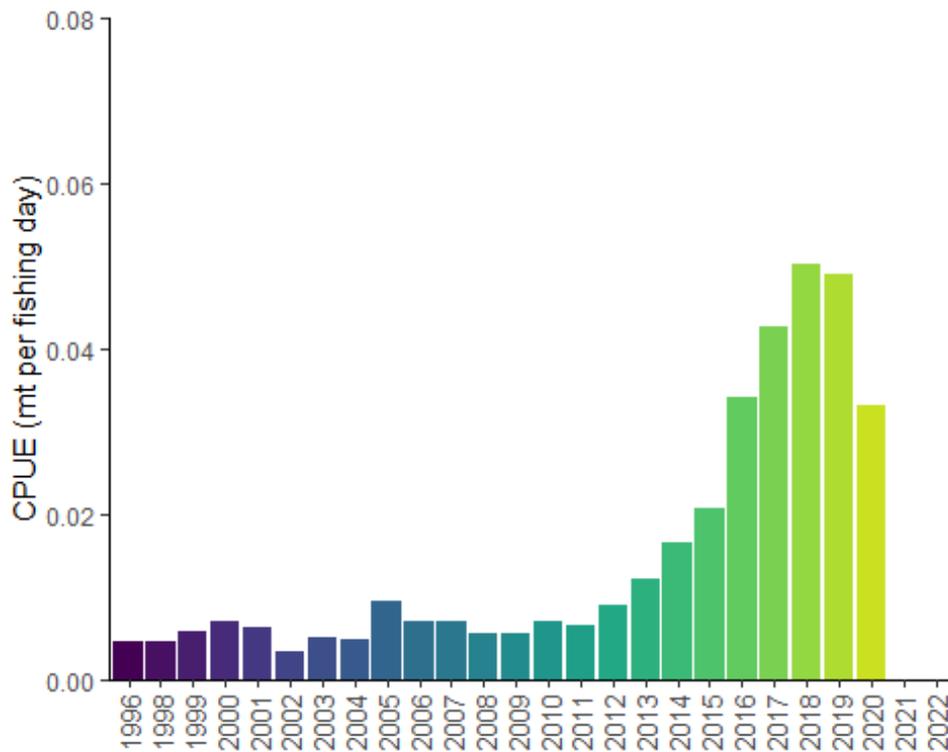
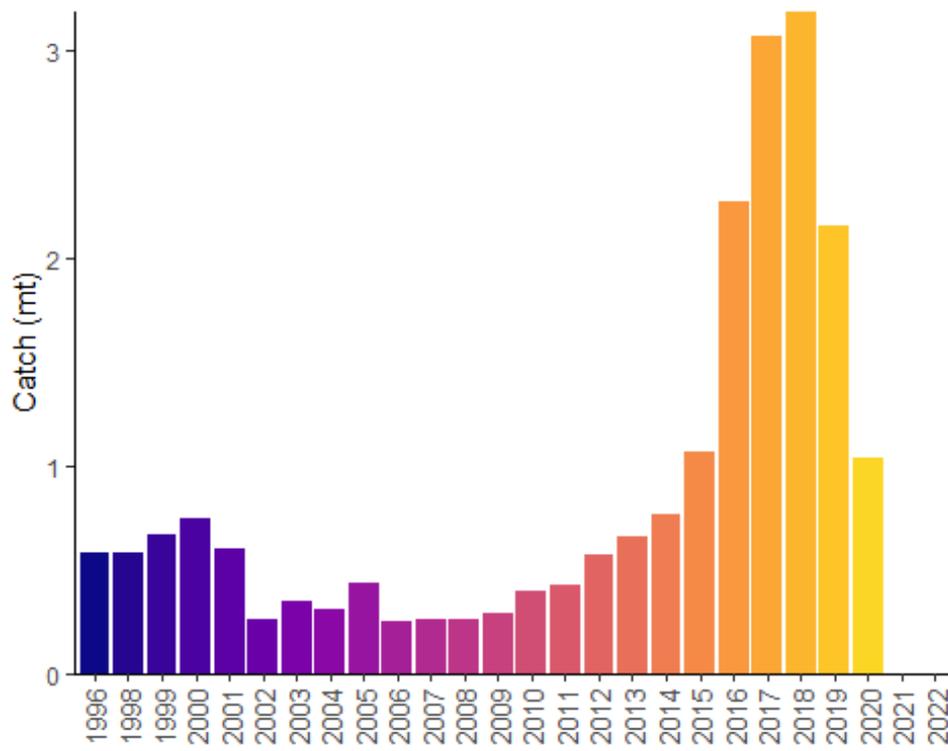*Figure 5. Catch per unit of effort for blackspotted and rougheye rockfishes in the Canadian Sablefish fishery in NPFC region. Data are averaged across 3 years to comply with data privacy restrictions.*

Biological collections

No biological collections are taken from blackspotted and rougheye rockfishes captured in the NPFC Convention Area. Biological data are available from domestic fisheries and surveys in Canada.

Table 4:Data availability from Members regarding blackspotted and rougheye rockfishes

Data	Source	Years	Comment
Catch	Canada	1996-present	Catches from national waters and convention area
CPUE	Canada	1996-present	
Survey	None		Survey data are available from Canada and U.S.A. national waters

Data	Source	Years	Comment
Age data	None		Data available from Canada and U.S.A. domestic fisheries and surveys
Length data	None		Data available from Canada and U.S.A. domestic fisheries and surveys
Maturity/fecundity	None		Data available from Canada and U.S.A. domestic fisheries and surveys

Special Comments

None

Biological Information

Distribution

Blackspotted and rougheye rockfishes are widely distributed throughout the Pacific Ocean from California to the Gulf of Alaska, westward to the Aleutian, and northward into the Bering Sea (Figure 6; Love et al. 2002). They are also found along the western margin of the Pacific Ocean from the Kuril Islands through the Kamchatka Peninsula and northward into the Bering Sea. Adult blackspotted and rougheye rockfishes occur in rocky habitat along the continental slope, shelf gullies, and in deep fjords, generally at depths from 150 to 450 m (Love et al. 2002). Juvenile blackspotted and rougheye rockfishes are found at shallower depths (250-300 m) at the continental shelf break. Until recently, these species were considered a single species (rougheye rockfish; Orr and Hawkins 2008).

Life history

Blackspotted and rougheye rockfishes are extremely long-lived, with maximum ages > 200 years. They mature late at about 20 years of age. These characteristics make them vulnerable to overfishing. The species are live-bearing, extruding larvae generally in the spring (February-June). Blackspotted and rougheye rockfishes are benthic feeders, consuming mostly shrimps, crabs and fishes (Yang and Nelson 2000).
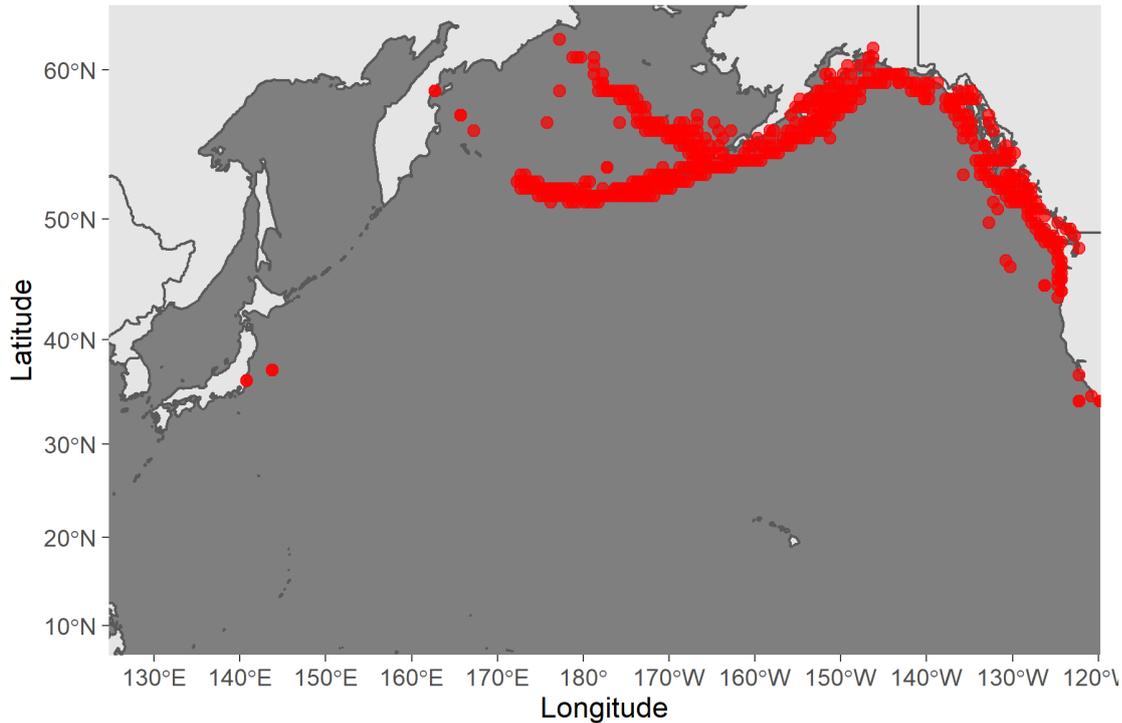
Figure 6. Map of distribution of blackspotted and rougheye rockfishes in the North Pacific.

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Terms of Reference for Data Sharing for Visual Data on the Distribution and Abundance of VME Indicator Taxa

1. To manage the impacts of bottom contact fisheries on Vulnerable Marine Ecosystems (VME) it is important to assess the distribution of VME and areas likely to be VME using observational data on the occurrence of VME indicator taxa.

2. Currently Members have limited visual survey data that includes spatially explicit observations of the presence, absence and/or abundance of VME indicator taxa in the NPFC Convention Area. The amount of data available continues to increase each year as Members conduct additional surveys.

3. All members with visual survey data will contribute any available observations on the presence, absence and/or abundance of VME indicator taxa. Shared data should also include information on the latitude and longitude of observation, and depth and size information (if available) in accordance with the NPFC data sharing protocols and in the format provided in the accompanying tables

4. The SWG VME members will collaborate on any analyses of these data

5. The provided data will be used for the purposes of determining the distribution of VME indicator taxa and will not be shared, distributed or used for other purposes without the consent of the data provider

Template for sharing VME data

Point Data Template

Point_ID	Member	Latitude	Longitude	Depth	Species or taxa group	Presence or absence	Density (if available)

Transect Data Template

Transect ID	Member	Start Latitude	Start Longitude	End Latitude	End Longitude	Depth	Species or taxa group	Presence or absence	Density (if available)

Size Data Template

Transect or point ID	Species or taxa group	Height	Width

Revised CMM 2021-05 - Conservation and Management Measure for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the Northwestern Pacific Ocean

CMM 2021-05
(Entered into force 10 July 2021)

**CONSERVATION AND MANAGEMENT MEASURE
FOR BOTTOM FISHERIES AND PROTECTION OF VULNERABLE MARINE
ECOSYSTEMS IN THE NORTHWESTERN PACIFIC OCEAN**

The North Pacific Fisheries Commission (NPFC),
Strongly supporting protection of vulnerable marine ecosystems (VMEs) and sustainable management of fish stocks based on the best scientific information available;

Recalling the United Nations General Assembly Resolutions (UNGA) on Sustainable Fisheries, particularly paragraphs 66 to 71 of the UNGA59/25 in 2004, paragraphs 69 to 74 of UNGA60/31 in 2005, and paragraphs 69 and 80 to 91 of UNGA61/105 in 2006;

Noting, in particular, paragraphs 66 and 69 of UNGA59/25 that call upon States to take action urgently to address the issue of bottom trawl fisheries on VMEs and to cooperate in the establishment of new regional fisheries management organizations or arrangements;

Recognizing further that fishing activities, including bottom fisheries, are an important contributor to the global food supply and that this must be taken into account when seeking to achieve sustainable fisheries and to protect VMEs;

Recognizing the importance of collecting scientific data to assess the impacts of these fisheries on marine species and VMEs;

Concerned about possible adverse impacts of unregulated expansion of bottom fisheries on marine species and VMEs in the western part of the Convention Area.

Adopts the following Conservation and Management Measure:

1. Scope

    A. Coverage

These Measures are to be applied to all bottom fishing activities throughout the high seas areas of the Northwestern Pacific Ocean, defined, for the purposes of this document, as those occurring in the Convention Area as set out in Article 4 of the Convention text to the west of the line of 175 degrees W longitude (here in after called "the western part of the Convention Area") including all such areas and marine species other than those species already covered by existing international fisheries management instruments, including bilateral agreements and Regional Fisheries Management Organizations or Arrangements.

B. Management target
Bottom fisheries conducted by vessels operating in the western part of the Convention Area.

2. General purpose
Sustainable management of fish stocks and protection of VMEs in the western part of the Convention Area.

The objective of these Measures is to ensure the long-term conservation and sustainable use of the fisheries resources in the Convention Area while protecting the marine ecosystems of the North Pacific Ocean in which these resources occur.

These measures shall set out to prevent significant adverse impacts on VMEs in the Convention Area of the North Pacific Ocean, acknowledging the complex dependency of fishing resources and species belonging to the same ecosystem within VMEs.

The Commission shall re-evaluate, and as appropriate, revise, the definition based on further consideration of the work done through FAO and by NPFC.

3. Principles
The implementation of this CMM shall:
(a) be based on the best scientific information available,
(b) be in accordance with existing international laws and agreements including UNCLOS and other relevant international instruments,
(c) establish appropriate and effective conservation and management measures,
(d) be in accordance with the precautionary approach, and
(e) incorporate an ecosystem approach to fisheries management.

4. Measures
Members of the Commission shall take the following measures in order to achieve sustainable management of fish stocks and protection of VMEs in the western part of the Convention

Area:

A. Limit fishing effort in bottom fisheries on the western part of the Convention Area to the level agreed in February 2007 in terms of the number of fishing vessels and other parameters which reflect the level of fishing effort, fishing capacity or potential impacts on marine ecosystems.

B. Not allow bottom fisheries to expand into the western part of the Convention Area where no such fishing is currently occurring, in particular, by limiting such bottom fisheries to seamounts located south of 45 degrees North Latitude and refrain from bottom fisheries in other areas of the western part of the Convention Area covered by these measures and also not allow bottom fisheries to conduct fishing operation in areas deeper than 1,500m.

C. Notwithstanding subparagraphs A and B above, exceptions to these restrictions may be provided in cases where it can be shown that any fishing activity beyond such limits or in any new areas would not have significant adverse impacts (SAIs) on marine species or any VME.   Such fishing activity is subject to an exploratory fishery protocol (Annex 1).

D. Any determinations pursuant to subparagraph C that any proposed fishing activity will not have SAIs on marine species or any VME are to be in accordance with the Science-based Standards and Criteria (Annex 2), which are consistent with the FAO International Guidelines for the Management of Deepsea Fisheries in the High Seas.

E. Any determinations, by any flag State or pursuant to any subsequent arrangement for the management of the bottom fisheries in the areas covered by these measures, that fishing activity would not have SAIs on marine species or any VMEs, shall be made publicly available through agreed means.

F. Prohibit its vessels from engaging in directed fishing on the following taxa: *Alcyonacea, Antipatharia, Gorgonacea,* and *Scleractinia, the classes of Hexactinellida and Demospongiae in the phylum Porifera* as well as any other indicator species for VMEs as may be identified from time to time by the SC and approved by the Commission.

G. Further, considering accumulated information regarding fishing activities in the western part of the Convention Area, in areas where, in the course of fishing operations, cold water corals more than 50Kg and sponges more than 500 kg are encountered in one gear retrieval, Members of the Commission shall require vessels flying their flag to cease

bottom fishing activities in that location. In such cases, the vessel shall not resume fishing activities until it has relocated a sufficient distance, which shall be no less than 1~~2~~ nautical miles, so that additional encounters with VMEs are unlikely. All such encounters, including the location, gear type, date, time and name and weight of the VME indicator species , shall be reported to the Secretariat, through the Member, within one business day~~.,~~ The Executive Secretary~~who~~ shall, within one business day, ~~immediately~~ notify the other Members of the Commission and at the same time implement a temporary closure in the area to prohibit bottom fishing vessels from contacting the sea floor with their trawl nets.~~so that appropriate measures can be adopted in respect of the relevant site~~. Members shall inform their fleets and enforcement operations within one business day of the receipt of the notification from the Executive Secretary. It is agreed that the VME indicator taxa include cold water corals~~:~~ *Alcyonacea, Antipatharia, Gorgonacea*, and *Scleractinia*,~~-and~~ the classes of *Hexactinellida* and *Demospongiae* in the phylum Porifera.

Gbis Based on all the available data, including data on the VME encounter and distribution received from the fishing vessel(s), research survey data, visual survey data, and/or model results, the Scientific Committee (SC) shall assess and conclude if the area has a VME. If so, the SC shall recommend to the Commission that the temporary closure be made permanent, although the boundary of the closure may be adjusted, or suggest other appropriate measures. Otherwise, the Executive Secretary shall inform the Members that they may reopen the area to their vessels.

H. C-H seamount and Southeastern part of Koko seamount, specifically for the latter seamount, the area South of 34 degrees 57 minutes North, East of the 400m isobaths, East of 171 degrees 54 minutes East, North of 34 degrees 50 minutes North, are closed precautionary for potential VME conservation. Fishing in these areas requires exploratory fishery protocol (Annex 1).

I. Ensure that the distance between the footrope of the gill net and sea floor is greater than 70 cm.

J. Apply a bottom fisheries closure from November to December.

K. Limit annual catch of North Pacific armorhead to 15,000 tons for Japan. In years when strong recruitment of North Pacific armorhead is not detected by the monitoring survey (Annex 6), the Commission encourages Japan to limit their catch of North Pacific armorhead by vessels flying its flag to 500 tons, and encourages Korea to limit their catch of North Pacific armorhead by vessels flying its flag to 200 tons. When a strong

recruitment of North Pacific armorhead is detected by the monitoring survey (Annex 6), the Commission encourages that Japan limit the annual catch of North Pacific armorhead by vessels flying its flag to 10,000 tons, and that Korea limit the annual catch of North Pacific armorhead by vessels flying its flag to 2,000 tons. The Commission encourages that catch overages for any given year be subtracted from the applicable annual catch limit in the following year, and that catch underages during any given year not be added to the applicable annual catch limit during the following year.

L.A. Development of new fishing activity for the North Pacific armorhead and splendid alfonsino in the Convention Area by Members without documented historical catch for North Pacific armorhead and splendid alfonsino in the Convention Area shall be determined in accordance with relevant provisions, including but not limited to Article 3, paragraph (h) and Article 7, subparagraphs 1(g) and (h) of the Convention.

M. In years when strong recruitment of North Pacific armorhead is not detected (Annex 6), the Commission encourages Japan to limit the annual catch of North Pacific armorhead by vessels flying its flag to 500 tons, and encourages Korea to limit the annual catch of North Pacific armorhead by vessels flying its flag to 200 tons. The Commission encourages that catch overages for any given year be subtracted from the applicable annual catch limit in the following year, and that catch underages during any given year not be added to the applicable annual catch limit during the following year.

N.L. Notwithstanding subparagraph K, when a strong recruitment of North Pacific armorhead is detected through the monitoring surveys as specified in Annex 6, the Commission encourages that Japan limit the annual catch of North Pacific armorhead by vessels flying its flag to 10,000 tons, and that Korea limit the annual catch of North Pacific armorhead by vessels flying its flag to 2,000 tons. The Commission encourages that catch overages for any given year be subtracted from the applicable annual catch limit in the following year, and that catch underages during any given year not be added to the applicable annual catch limit during the following year. During a year when high recruitment is detected, bottom fishing with trawl gear shall be prohibited in specific areas in the Emperor seamounts where half of the catch occurred in 2010 and 2012 (Annex 6). Determination of a strong recruitment year and of the specific areas where bottom fishing with trawl gear is prohibited shall be communicated to all Members and Cooperating Non-Contracting Parties following the procedure specified in Annex 6.

O.M. Catch in the monitoring surveys shall not be included in the catch limits specified in paragraphs M and N but shall be reported to the Secretariat.

N. Development of new fishing activity for the North Pacific armorhead and splendid alfonsino in the Convention Area by Members without documented historical catch for North Pacific armorhead and splendid alfonsino in the Convention Area shall be determined in accordance with relevant provisions, including but not limited to Article 3, paragraph (h) and Article 7, subparagraphs 1(g) and (h) of the Convention.

~~P.~~O. Fishing activity for the North Pacific armorhead and splendid alfonsino in the Convention Area by Members with documented historical catch for North Pacific armorhead and splendid alfonsino in the Convention Area is not precluded.

~~Q.~~P. Members shall require vessels flying their flags to use trawl nets with mesh size greater than or equal to 130mm of stretched mesh with 5kg tension in the codend when conducting fishing activities for North Pacific armorhead or splendid alfonsino.

~~R.~~Q. Task the Scientific Committee with reviewing the appropriate methods for establishing catch limits, and the adequacy and practicability of the adaptive management plan described in subparagraphs K, L, M, N, O, P, Q and Annex 6 from time to time and recommending revisions and actions, if necessary.

~~S.~~R. Prohibit its bottom fishing vessels from contacting the sea floor with their trawl nets in the following two sites with VME indicator species.   A Member of the Commission whose fishing vessels entered these areas shall report to the TCC as to how it ensured the compliance of this measure.

Sites with VME indicator species (Areas surrounded by the straight lines linking the 4 geographical points below)

Northwestern part of Koko Seamount	35-44.75 N 171-07.60 E	35-44.75 N 171-07.80 E
	35-43.80 N 171-07.80 E	35-43.80 N 171-08.00 E
Northern Ridge of Colahan Seamount	31-03.85 N 175-53.40 E	31-03.85 N 175-53.65 E
	31-03.5 N 175-53.50 E	31-03.05 N 175-53.85 E

5. Contingent Action

Members of the Commission shall submit to the SC their assessments of the impacts of fishing activity on marine species or any VMEs, including the proposed management measures to prevent such impact. Such submissions shall include all relevant data and information in support of any such assessment. Procedures for such reviews including procedures for the

provision of advice and recommendations from the SC to the submitting Member are attached (Annex 3). Members will only authorize bottom fishing activity pursuant to para 4 (C).

6. Scientific Information

To facilitate the scientific work associated with the implementation of these measures, each Member of the Commission shall undertake:

A. Reporting of information for purposes of defining the footprint

In implementing paragraphs 4A and 4B, the Members of the Commission shall provide for each year, the number of vessels by gear type, size of vessels (tons), number of fishing days or days on the fishing grounds, total catch by species, and areas fished (names of seamounts) to the Secretariat. The Secretariat shall circulate the information received to the other Members consistent with the approved Regulations for Management of Scientific Data and Information. To support assessments of the fisheries and refinement of conservation and management measures, Members of the Commission are to provide updated information on an annual basis.

B. Collection of information

(i) Collection of scientific information from each bottom fishing vessel operating in the western part of the Convention Area.

(a) Catch and effort data

(b) Related information such as time, location, depth, temperature, etc.

(ii) As appropriate, the collection of information from research vessels operating in the western part of the Convention Area.

(a) Physical, chemical, biological, oceanographic, meteorological, etc.

(b) Ecosystem surveys.

(c) Seabed mapping (e.g. multibeam or other echosounder); seafloor images by drop camera, remotely operated underwater vehicle (ROV) and/or autonomous underwater vehicle (AUV).

(iii) Collection of observer data

Duly designated observers from the flag member shall collect information from bottom fishing vessels operating in the western part of the Convention Area. Observers shall collect data in accordance with Annex 5. Each Member of the Commission shall submit the reports to the Secretariat in accordance with Annex 4. The Secretariat shall compile this information on an annual basis and make it available to the Members of the Commission.

7. Control of bottom fishing vessels

To strengthen its control over bottom fishing vessels flying its flag, each Member of the

Commission shall ensure that all such vessels operating in the western part of the Convention Area be equipped with an operational vessel monitoring system.

8. Observers

All vessels authorized to bottom fishing in the western part of the Convention Area shall carry an observer on board.

EXPLORATORY FISHERY PROTOCOL IN THE NORTH PACIFIC OCEAN

1. From 1 January 2009, all bottom fishing activities in new fishing areas and areas where fishing is prohibited in a precautionary manner or with bottom gear not previously used in the existing fishing areas, are to be considered as "exploratory fisheries" and to be conducted in accordance with this protocol.

2. Precautionary conservation and management measures, including catch and effort controls, are essential during the exploratory phase of deep sea fisheries.   Implementation of a precautionary approach to sustainable exploitation of deep sea fisheries shall include the following measures:

    (i) precautionary effort limits, particularly where reliable assessments of sustainable exploitation rates of target and main by-catch species are not available;

    (ii) precautionary measures, including precautionary spatial catch limits where appropriate, to prevent serial depletion of low-productivity stocks;

    (iii) regular review of appropriate indices of stock status and revision downwards of the limits listed above when significant declines are detected;

    (iv) measures to prevent significant adverse impacts on vulnerable marine ecosystems; and

    (v) comprehensive monitoring of all fishing effort, capture of all species and interactions with VMEs.

3. When a member of the Commission would like to conduct exploratory fisheries, it is to follow the following procedure:

    (i) Prior to the commencement of fishing, the member of the Commission is to circulate the information and assessment in Appendix 1.1 to the members of the Scientific Committee (SC) for review and to all members of the Commission for information, together with the impact assessment. Such information is to be provided to the other members at least 30 days in advance of the meeting at which the information shall be reviewed.

    (ii) The assessment in (i) above is to be conducted in accordance with the procedure set forth in "Science-based Standards and Criteria for Identification of VMEs and Assessment of Significant Adverse Impacts on VMEs and Marine Species (Annex 2)", with the understanding that particular care shall be taken in the evaluation of risks of the significant adverse impact on vulnerable marine ecosystems (VMEs), in line with the precautionary approach.

    (iii) The SC is to review the information and the assessment submitted in (i) above in accordance with "SC Assessment Review Procedures for Bottom Fishing Activities (Annex 3)."

    (iv) The exploratory fisheries are to be permitted only where the assessment concludes that they would not have significant adverse impacts (SAIs) on marine species or any VMEs and on the basis of comments and recommendations of SC.   Any determinations, by any Member of the

Commission or the SC, that the exploratory fishing activities would not have SAIs on marine species or any VMEs, shall be made publicly available through the NPFC website.

4. The member of the Commission is to ensure that all vessels flying its flag conducting exploratory fisheries are equipped with a satellite monitoring device and have an observer on board at all times.

5. Within 3 months of the end of the exploratory fishing activities or within 12 months of the commencement of fishing, whichever occurs first, the member of the Commission is to provide a report of the results of such activities to the members of the SC and all members of the Commission. If the SC meets prior to the end of this 12-month period, the member of the Commission is to provide an interim report 30 days in advance of the SC meeting. The information to be included in the report is specified in Appendix 1.2.

6. The SC is to review the report in 5 above and decide whether the exploratory fishing activities had SAIs on marine species or any VME. The SC then is to send its recommendations to the Commission on whether the exploratory fisheries can continue and whether additional management measures shall be required if they are to continue. The Commission is to strive to adopt conservation and management measures to prevent SAIs on marine species or any VMEs. If the Commission is not able to reach consensus on any such measures, each fishing member of the Commission is to adopt measures to avoid any SAIs on VMEs.

7. Members of the Commission shall only authorize continuation of exploratory fishing activity, or commencement of commercial fishing activity, under this protocol on the basis of comments and recommendations of the SC.

7.8. The same encounter protocol should be applied in both fished and unfished areas specified in Annex 2, paragraph 4(1)(a).

Appendix 1.1

Information to be provided before exploratory fisheries start

1. A harvesting plan
  -   Name of vessel
  -   Flag member of vessel
  -   Description of area to be fished (location and depth)
  -   Fishing dates
  -   Anticipated effort

- Target species
- Bottom fishing gear-type used
- Area and effort restrictions to ensure that fisheries occur on a gradual basis in a limited geographical area.

2. A mitigation plan
   - Measures to prevent SAIs to VMEs that may be encountered during the fishery

3. A catch monitoring plan
   - Recording/reporting of all species brought onboard to the lowest possible taxonomic level
   - 100% satellite monitoring
   - 100% observer coverage

4. A data collection plan
   - Data is to be collected in accordance with "Type and Format of Scientific Observer Data to be Collected" (Annex 5)

Appendix 1.2

Information to be included in the report
- Name of vessel
- Flag member of vessel
- Description of area fished (location and depth)
- Fishing dates
- Total effort
- Bottom fishing gear-type used
- List of VME encountered (the amount of VME indicator species for each encounter specifying the location: longitude and latitude)
- Mitigation measures taken in response to the encounter of VME
- List of all organisms brought onboard
- List of VMEs indicator species brought onboard by location: longitude and latitude

SCIENCE-BASED STANDARDS AND CRITERIA FOR IDENTIFICATION OF VMES AND ASSESSMENT OF SIGNIFICANT ADVERSE IMPACTS ON VMES AND MARINE SPECIES

1. Introduction

Members of the Commission have hereby established science-based standards and criteria to guide their implementation of United Nations General Assembly (UNGA) Resolution 61/105 and the measures adopted by the Members in respect of bottom fishing activities in the North Pacific Ocean (NPO).   In this regard, these science-based standards and criteria are to be applied to identify vulnerable marine ecosystems (VMEs) and assess significant adverse impacts (SAIs) of bottom fishing activities on such VMEs or marine species and to promote the long-term sustainability of deep sea fisheries in the Convention Area.   The science-based standards and criteria are consistent with the FAO International Guidelines for the Management of Deep-Sea Fisheries in the High Seas, taking into account the work of other RFMOs implementing management of deep-sea bottom fisheries in accordance with UNGA Resolution 61/105.   The standards and criteria are to be modified from time to time as more data are collected through research activities and monitoring of fishing operations.

2. Purpose

  (1) The purpose of the standards and criteria is to provide guidelines for each member of the Commission in identifying VMEs and assessing SAIs of individual bottom fishing activities[1] on VMEs or marine species in the Convention Area.   Each member of the Commission, using the best information available, is to decide which species or areas are to be categorized as VMEs, identify areas where VMEs are known or likely to occur, and assess whether individual bottom fishing activities would have SAIs on such VMEs or marine species.   The results of these tasks are to be submitted to and reviewed by the Scientific Committee with a view to reaching a common understanding among the members of the Commission.

  (2) For the purpose of applying the standards and criteria, the bottom fisheries are defined as follows:

  (a) The fisheries are conducted in the Convention Area;

  (b) The total catch (everything brought up by the fishing gear) includes species that can

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[1] "individual bottom fishing activities" means fishing activities by each fishing gear.   For example, if ten fishing vessels operate bottom trawl fishing in a certain area, the impacts of the fishing activities of these vessels on the ecosystem are to be assessed as a whole rather than on a vessel-by-vessel basis.   It should be noted that if the total number or capacity of the vessels using the same fishing gear has increased, the impacts of the fishing activities are to be assessed again.

only sustain low exploitation rates; and

(c) The fishing gear is likely to contact the seafloor during the normal course of fishing operations.

3. Definition of VMEs

(1) Although Paragraph 83 of UNGA Resolution 61/105 refers to seamounts, hydrothermal vents and cold-water corals as examples of VMEs, there is no definitive list of specific species or areas that are to be regarded as VMEs.

(2) Vulnerability is related to the likelihood that a population, community or habitat will experience substantial alteration by fishing activities and how much time will be required for its recovery from such alteration. The most vulnerable ecosystems are those that are both easily disturbed and are very slow to recover or may never recover. The vulnerabilities of populations, communities and habitats are to be assessed relative to specific threats. Some features, particularly ones that are physically fragile or inherently rare may be vulnerable to most forms of disturbance, but the vulnerability of some populations, communities and habitats may vary greatly depending on the type of fishing gear used or the kind of disturbance experienced. The risks to a marine ecosystem are determined by its vulnerability, the probability of a threat occurring and the mitigation means applied to the threat. Accordingly, the FAO Guidelines only provide examples of potential vulnerable species groups, communities and habitats as well as features that potentially support them (Annex 2.1).

(3) A marine ecosystem is to be classified as vulnerable based on its characteristics. The following list of characteristics is used as criteria in the identification of VMEs.

(a) Uniqueness or rarity - an area or ecosystem that is unique or that contains rare species whose loss could not be compensated for by other similar areas. These include:
(i) Habitats that contain endemic species;
(ii) Habitats of rare, threatened or endangered species that occur in discrete areas;
(iii)Nurseries or discrete feeding, breeding, or spawning areas.

(b) Functional significance of the habitat – discrete areas or habitats that are necessary for the survival, function, spawning/reproduction or recovery of fish stocks, particular life-history stages (e.g. nursery grounds or rearing areas), or of rare, threatened or endangered marine species.

(c) Fragility – an ecosystem that is highly susceptible to degradation by anthropogenic activities

(d) Life-history traits of component species that make recovery difficult – ecosystems that are characterized by populations or assemblages of species with one or more of the following characteristics:

      (i) Slow growth rates

      (ii) Late age of maturity

      (iii)Low or unpredictable recruitment

      (iv)Long-lived

    (e) Structural complexity – an ecosystem that is characterized by complex physical structures created by significant concentrations of biotic and abiotic features.   In these ecosystems, ecological processes are usually highly dependent on these structured systems.   Further, such ecosystems often have high diversity, which is dependent on the structuring organisms.

(4) Management response may vary, depending on the size of the ecological unit in the Convention Area. Therefore, the spatial extent of the ecological unit is to be decided first. That is, whether the ecological unit is the entire Area, or the current fishing ground, namely, the Emperor Seamount and Northern Hawaiian Ridge area (hereinafter called "the ES-NHR area"), or a group of the seamounts within the ESNHR area, or each seamount in the ES-NHR area, is to be decided using the above criteria.

4. Identification of potential VMEs

(1) Fished seamounts

    (a) Identification of fished seamounts

It is reported that four types of fishing gear are currently used by the members of the Commission in the ES-NHR area, namely, bottom trawl, bottom gillnet, bottom longline and pot.   A fifth type of fishing gear (coral drag) was used in the ES-NHR area from the mid-1960s to the late 1980s and is possibly still used by non-members of the Commission.   These types of fishing gear are usually used on the top or slope of seamounts, which could be considered VMEs.   It is therefore necessary to identify the footprint of the bottom fisheries (fished seamounts) based on the available fishing record.   The following seamounts have been identified as fished seamounts: Suiko, Showa, Youmei, Nintoku, Jingu, Ojin, Northern Koko, Koko, Kinmei, Yuryaku, Kammu, Colahan, and CH.   Since the use of most of these gears in the ES-NHR area dates back to the late 1960s and 1970s, it is important to establish, to the extent practicable, a time series of where and when these gears have been used in order to assess potential long-term effects on any existing VMEs.

Fishing effort may not be evenly distributed on each seamount since fish aggregation may occur only at certain points of the seamount and some parts of the seamount may be physically unsuitable for certain fishing gears.   Thus, it is important to know actual fished areas within the same seamount so as to know the gravity of the impact of fishing activities on the entire seamount.

Due consideration is to be given to the protection of commercial confidentiality when

identifying actual fishing grounds.

(b) Assessment on whether a specific seamount that has been fished is a VME

After identifying the fished seamounts or fished areas of seamounts, it is necessary to assess whether each fished seamount is a VME or contains VMEs in accordance with the criteria in 3 above, individually or in combination using the best available scientific and technical information as well as Annex 2.1.   A variety of data would be required to conduct such assessment, including pictures of seamounts taken by an ROV camera or drop camera, biological samples collected through research activities and observer programs, and detailed bathymetry map. Where site-specific information is lacking, other information that is relevant to inferring the likely presence of VMEs is to be used. The flow chart to identify data that can be used to identify VMEs is attached in Annex 2.3.

(2) New fishing areas

Any place other than the fished seamounts above is to be regarded as a new fishing area. If a member of the Commission is considering fishing in a new fishing area, such a fishing area is to be subject to, in addition to these standards and criteria, an exploratory fishery protocol (Annex 1).

5. Assessment of SAIs on VMEs or marine species

(1) Significant adverse impacts are those that compromise ecosystem integrity (i.e., ecosystem structure or function) in a manner that: (i) impairs the ability of affected populations to replace themselves; (ii) degrades the long-term natural productivity of habitats; or (iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types. Impacts are to be evaluated individually, in combination and cumulatively.

(2) When determining the scale and significance of an impact, the following six factors are to be considered:

(a) The intensity or severity of the impact at the specific site being affected;

(b) The spatial extent of the impact relative to the availability of the habitat type affected;

(c) The sensitivity/vulnerability of the ecosystem to the impact;

(d) The ability of an ecosystem to recover from harm, and the rate of such recovery;

(e) The extent to which ecosystem functions may be altered by the impact; and

(f) The timing and duration of the impact relative to the period in which a species needs the habitat during one or more life-history stages.

(3) Temporary impacts are those that are limited in duration and that allow the particular ecosystem to recover over an acceptable timeframe.   Such timeframes are to be decided on a case-by-case basis and be on the order of 5-20 years, taking into account the specific features of the populations and ecosystems.

(4) In determining whether an impact is temporary, both the duration and the frequency with which an impact is repeated is to be considered. If the interval between the expected disturbances of a habitat is shorter than the recovery time, the impact is to be considered more than temporary.

(5) Each member of the Commission is to conduct assessments to establish if bottom fishing activities are likely to produce SAIs in a given seamount or other VMEs. Such an impact assessment is to address, *inter alia*:

   (a) Type of fishing conducted or contemplated, including vessel and gear types, fishing areas, target and potential bycatch species, fishing effort levels and duration of fishing;

   (b) Best available scientific and technical information on the current state of fishery resources, and baseline information on the ecosystems, habitats and communities in the fishing area, against which future changes are to be compared;

   (c) Identification, description and mapping of VMEs known or likely to occur in the fishing area;

   (d) The data and methods used to identify, describe and assess the impacts of the activity, identification of gaps in knowledge, and an evaluation of uncertainties in the information presented in the assessment;

   (e) Identification, description and evaluation of the occurrence, scale and duration of likely impacts, including cumulative impacts of activities covered by the assessment on VMEs and low-productivity fishery resources in the fishing area;

   (f) Risk assessment of likely impacts by the fishing operations to determine which impacts are likely to be SAIs, particularly impacts on VMEs and low-productivity fishery resources (Risk assessments are to take into account, as appropriate, differing conditions prevailing in areas where fisheries are well established and in areas where fisheries have not taken place or only occur occasionally);

   (g) The proposed mitigation and management measures to be used to prevent SAIs on VMEs and ensure long-term conservation and sustainable utilization of low-productivity fishery resources, and the measures to be used to monitor effects of the fishing operations.

(6) Impact assessments are to consider, as appropriate, the information referred to in these Standards and Criteria, as well as relevant information from similar or related fisheries, species and ecosystems.

(7) Where an assessment concludes that the area does not contain VMEs or that significant adverse impacts on VMEs or marine species are not likely, such assessments are to be repeated when there have been significant changes to the fishery or other activities in the area, or when natural processes are thought to have undergone significant changes.

6. Proposed conservation and management measures to prevent SAIs

As a result of the assessment in 5 above, if it is considered that individual fishing activities are causing or likely to cause SAIs on VMEs or marine species, the member of the Commission is to adopt appropriate conservation and management measures to prevent such SAIs.   The member of the Commission is to clearly indicate how such impacts are expected to be prevented or mitigated by the measures.

7. Precautionary approach

If after assessing all available scientific and technical information, the presence of VMEs or the likelihood that individual bottom fishing activities would cause SAIs on VMEs or marine species cannot be adequately determined, members of the Commission are only to authorize individual bottom fishing activities to proceed in accordance with:

 (a) Precautionary, conservation and management measures to prevent SAIs;

 (b) Measures to address unexpected encounters with VMEs in the course of fishing operations;

 (c) Measures, including ongoing scientific research, monitoring and data collection, to reduce the uncertainty; and

 (d) Measures to ensure long-term sustainability of deep sea fisheries.

8. Template for assessment report

Annex 2.2 is a template for individual member of the Commission to formulate reports on identification of VMEs and impact assessment.

Annex 2.1

Examples of potential vulnerable species groups, communities and habitats as well as features that potentially support them

The following examples of species groups, communities, habitats and features often display characteristics consistent with possible VMEs.   Merely detecting the presence of an element itself is not sufficient to identify a VME.   That identification is to be made on a case-by-case basis through application of relevant provisions of the Standards and Criteria, particularly Sections 3, 4 and 5.

Examples of species groups, communities and habitat forming species that are documented or considered sensitive and potentially vulnerable to deep-sea fisheries in the high-seas, and which may contribute to forming VMEs:	
a.	certain cold-water corals, e.g., reef builders and coral forest including: stony corals (scleractinia), alcyonaceans and gorgonians (octocorallia), black corals (antipatharia),

	and hydrocorals (stylasteridae),
b.	Some types of sponge dominated communities,
c.	communities composed of dense emergent fauna where large sessile protozoans (xenophyophores) and invertebrates (e.g., hydroids and bryozoans) form an important structural component of habitat, and
d.	seep and vent communities comprised of invertebrate and microbial species found nowhere else (i.e., endemic).

Examples of topographical, hydrophysical or geological features, including fragile geological structures, that potentially support the species groups or communities referred to above:

a. submerged edges and slopes (e.g., corals and sponges)

b. summits and flanks of seamounts, guyots, banks, knolls, and hills (e.g., corals, sponges and xenophyphores)

c. canyons and trenches (e.g., burrowed clay outcrops, corals),

d. hydrothermal vents (e.g., microbial communities and endemic invertebrates), and

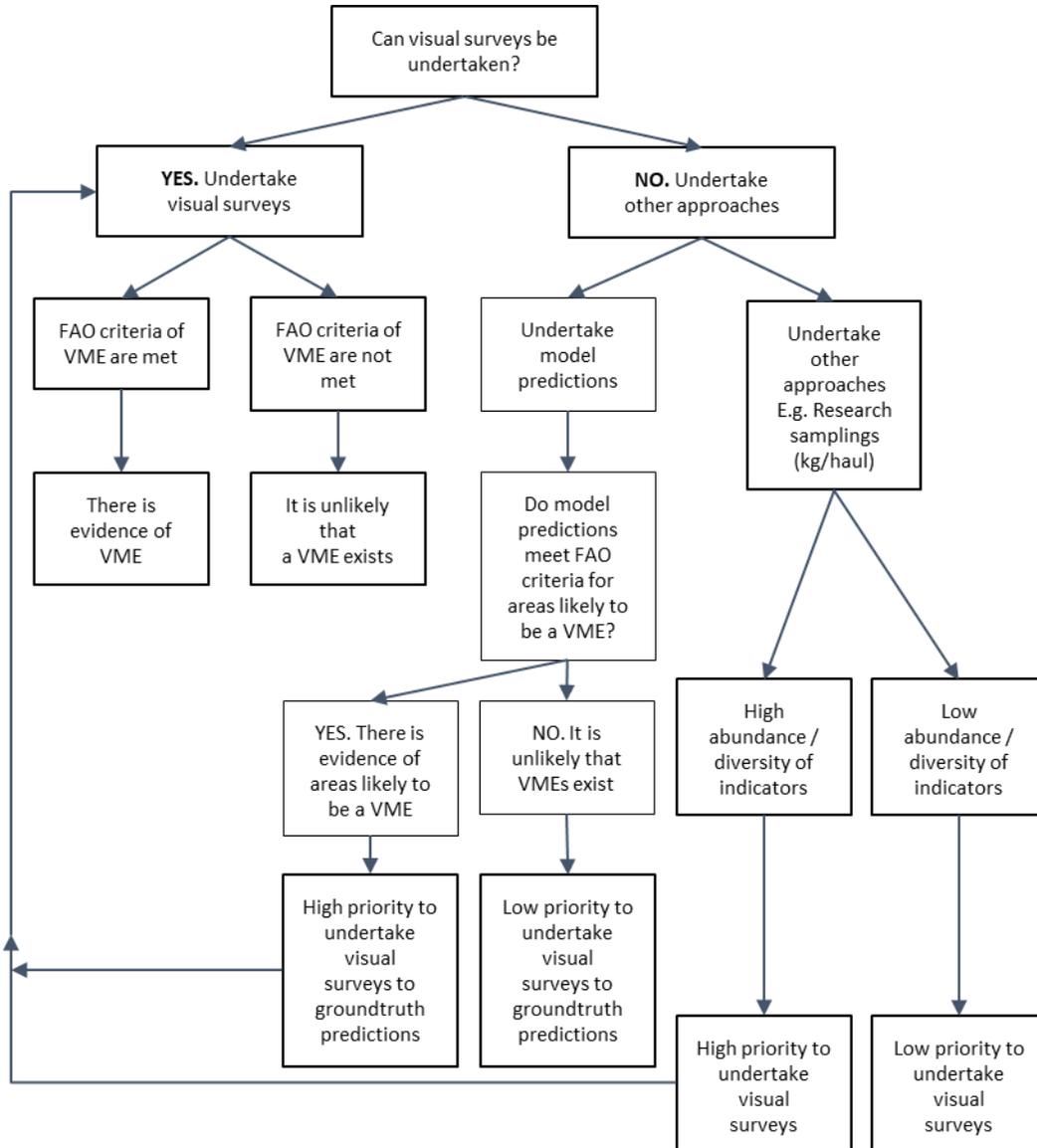e. cold seeps (e.g., mud volcanoes, microbes, hard substrates for sessile invertebrates).

Annex 2.2

Template for reports on identification of VMEs and assessment of impacts caused by individual fishing activities on VMEs or marine species

1. Name of the member of the Commission

2. Name of the fishery (e.g., bottom trawl, bottom gillnet, bottom longline, pot)

3. Status of the fishery (existing fishery or exploratory fishery)

4. Target species

5. Bycatch species

6. Recent level of fishing effort (every year at least since 2002)

   (1) Number of fishing vessels

   (2) Tonnage of each fishing vessel

   (3) Number of fishing days or days on the fishing ground

   (4) Fishing effort (total operating hours for trawl, # of hooks per day for long-line, # of pots per day for pot, total length of net per day for gillnet)

   (5) Total catch by species

   (6) Names of seamounts fished or to be fished

7. Fishing period

8. Analysis of status of fishery resources
    (1) Data and methods used for analysis
    (2) Results of analysis
    (3) Identification of uncertainties in data and methods, and measures to overcome such uncertainties
9. Analysis of status of bycatch species resources
    (1) Data and methods used for analysis
    (2) Results of analysis
    (3) Identification of uncertainties in data and methods, and measures to overcome such uncertainties
10. Analysis of existence of VMEs in the fishing ground
    (1) Data and methods used for analysis
    (2) Results of analysis
    (3) Identification of uncertainties in data and methods, and measures to overcome such uncertainties
11. Impact assessment of fishing activities on VMEs or marine species including cumulative impacts, and identification of SAIs on VMEs or marine species, as detailed in Section 5 above, Assessment of SAIs on VMEs or marine species
12. Other points to be addressed
13. Conclusion (whether to continue or start fishing with what measures, or stop fishing).

Flow chart to identify data that can be used to identify VMEs in the NPFC Convention Area

SCIENTIFIC COMMITTEE ASSESSMENT REVIEW PROCEDURES FOR BOTTOM FISHING ACTIVITIES

1. The Scientific Committee (SC) is to review identifications of vulnerable marine ecosystems (VMEs) and assessments of significant adverse impact on VMEs, including proposed management measures intended to prevent such impacts submitted by individual Members.

2. Members of the Commission shall submit their identifications and assessments to members of the SC at least 21 days prior to the SC meeting at which the review is to take place.   Such submissions shall include all relevant data and information in support of such determinations.

3. The SC will review the data and information in each assessment in accordance with the Science-based Standards and Criteria for Identification of VMEs and Assessment of Significant Adverse Impacts on VMEs and Marine Species (Annex 2), previous decisions of the Commission, and the FAO Technical Guidelines for the Management of Deep Sea Fisheries in the High Seas, paying special attention to the assessment process and criteria specified in paragraphs 47-49 of the Guidelines.

4. In conducting the review above, the SC will give particular attention to whether the deep-sea bottom fishing activity would have a significant adverse impact on VMEs and marine species and, if so, whether the proposed management measures would prevent such impacts.

5. Based on the above review, the SC will provide advice and recommendations to the submitting Members on the extent to which the assessments and related determinations are consistent with the procedures and criteria established in the documents identified above; and whether additional management measures will be required to prevent SAIs on VMEs.

6. Such recommendations will be reflected in the report of the SC meeting at which the assessments are considered.

**FORMAT OF NATIONAL REPORT SECTIONS ON DEVELOPMENT AND
IMPLEMENTATION OF SCIENTIFIC OBSERVER PROGRAMMES**

Report Components

Annual Observer Programme implementation reports should form a component of annual National Reports submitted by members to the Scientific Committee.   These reports should provide a brief overview of observer programmes conducted in the NPFC Convention Area.   Observer programme reports should include the following sections:

A. Observer Training

An overview of observer training conducted, including:

• Overview of training programme provided to scientific observers.

• Number of observers trained.

B. Scientific Observer Programme Design and Coverage

Details of the design of the observer programme, including:

• Which fleets, fleet components or fishery components were covered by the programme.

• How vessels were selected to carry observers within the above fleets or components.

• How was observer coverage stratified: by fleets, fisheries components, vessel types, vessel sizes, vessel ages, fishing areas and seasons.

Details of observer coverage of the above fleets, including:

• Components, areas, seasons and proportion of total catches of target species, specifying units used to determine coverage.

• Total number of observer employment days, and number of actual days deployed on observation work.

C. Observer Data Collected

List of observer data collected against the agreed range of data set out in Annex 5, including:

• Effort Data: Amount of effort observed (vessel days, net panels, hooks, etc), by area and season and % observed out of total by area and seasons

• Catch Data: Amount of catch observed of target and by-catch species, by area and season, and % observed out of total estimated catch by species, area and seasons

• Length Frequency Data: Number of fish measured per species, by area and season.

• Biological Data: Type and quantity of other biological data or samples (otoliths, sex, maturity, etc.) collected per species.

• The size of length-frequency and biological sub-samples relative to unobserved quantities.

D. Detection of Fishing in Association with Vulnerable Marine Ecosystems
  • Information about VME encounters (species and quantity in accordance with Annex 5, H, 2).

E. Tag Return Monitoring

  • Number of tags returns observed, by fish size class and area.

F. Problems Experienced
  • Summary of problems encountered by observers and observer managers that could affect the NPFC Observer Programme Standards and/or each member's national observer programme developed under the NPFC standards.

NPFC BOTTOM FISHERIES OBSERVER PROGRAMME STANDARDS: SCIENTIFIC COMPONENT

TYPE AND FORMAT OF SCIENTIFIC OBSERVER DATA TO BE COLLECTED

A. Vessel & Observer Data to be collected for Each Trip

1. Vessel and observer details are to be recorded only once for each observed trip.
2. The following observer data are to be collected for each observed trip:
   (a) NPFC vessel ID.
   (b) Observer's name.
   (c) Observer's organisation.
   (d) Date observer embarked (UTC date).
   (e) Port of embarkation.
   (f) Date observer disembarked (UTC date).
   (g) Port of disembarkation.

B. Catch & Effort Data to be collected for Trawl Fishing Activity

1. Data are to be collected on an un-aggregated (tow by tow) basis for all observed trawls.
2. The following data are to be collected for each observed trawl tow:
   (a) Tow start date (UTC).
   (b) Tow start time (UTC).
   (c) Tow end date (UTC).
   (d) Tow end time (UTC).
   (e) Tow start position (Lat/Lon, 1 minute resolution).
   (f) Tow end position (Lat/Lon, 1 minute resolution).
   (g) Type of trawl, bottom or mid-water.
   (h) Type of trawl, single, double or triple.
   (i) Height of net opening (m).
   (j) Width of net opening (m).
   (k) Mesh size of the cod-end net (stretched mesh, mm) and mesh type (diamond, square, etc).
   (l) Gear depth (of footrope) at start of fishing (m).
   (m) Bottom (seabed) depth at start of fishing (m).
   (n) Gear depth (of footrope) at end of fishing (m).
   (o) Bottom (seabed) depth at end of fishing (m).

(p) Status of the trawl operation (no damage, lightly damaged*, heavily damaged*, other (specify)).

*Degree may be evaluated by time for repairing (<=1hr or >1hr).

(q) Duration of estimated period of seabed contact (minute)

(r) Intended target species.

(s) Catch of all species retained on board, split by species, in weight (to the nearest kg).

(t) Estimate of the amount (weight or volume) of all living marine resources discarded, split by species.

(u) Record of the numbers by species of all marine mammals, seabirds or reptiles caught.

C. Catch & Effort Data to be collected for Bottom Gillnet Fishing Activity

1. Data are to be collected on an un-aggregated (set by set) basis for all observed bottom gillnet sets.
2. The following data are to be collected for each observed bottom gillnet set:
   (a) Set start date (UTC).
   (b) Set start time (UTC).
   (c) Set end date (UTC).
   (d) Set end time (UTC).
   (e) Set start position (Lat/Lon, 1 minute resolution).
   (f) Set end position (Lat/Lon, 1 minute resolution).
   (g) Net panel ("tan") length (m).
   (h) Net panel ("tan") height (m).
   (i) Net mesh size (stretched mesh, mm) and mesh type (diamond, square, etc)
   (j) Bottom depth at start of setting (m).
   (k) Bottom depth at end of setting (m).
   (l) Number of net panels for the set.
   (m) Number of net panels retrieved.
   (n) Number of net panels actually observed during the haul.
   (o) Actually observed catch of all species retained on board, split by species, in weight (to the nearest kg).
   (p) An estimation of the amount (numbers or weight) of marine resources discarded, split by species, during the actual observation.
   (q) Record of the actually observed numbers by species of all marine mammals, seabirds or reptiles caught.
   (r) Intended target species.
   (s) Catch of all species retained on board, split by species, in weight (to the nearest kg).

(t) Estimate of the amount (weight or volume) of all marine resources discarded* and dropped off, split by species. * Including those retained for scientific samples.

(u) Record of the numbers by species of all marine mammals, seabirds or reptiles caught (including those discarded and dropped-off).

D. Catch & Effort Data to be collected for Bottom Long Line Fishing Activity

1. Data are to be collected on an un-aggregated (set by set) basis for all observed longline sets.

2. The following fields of data are to be collected for each set:

(a) Set start date (UTC).

(b) Set start time (UTC).

(c) Set end date (UTC).

(d) Set end time (UTC).

(e) Set start position (Lat/Lon, 1 minute resolution).

(f) Set end position (Lat/Lon, 1 minute resolution).

(g) Total length of longline set (m).

(h) Number of hooks or traps for the set.

(i) Bottom (seabed) depth at start of set.

(j) Bottom (seabed) depth at end of set.

(k) Number of hooks or traps actually observed during the haul.

(l) Intended target species.

(m) Actually observed catch of all species retained on board, split by species, in weight (to the nearest kg).

(n) An estimation of the amount (numbers or weight) of marine resources discarded* or dropped-off, split by species, during the actual observation. * Including those retained for scientific samples.

(o) Record of the actually observed numbers by species of all marine mammals, seabirds or reptiles caught (including those discarded and dropped-off).

E. Length-Frequency Data to Be Collected

1. Representative and randomly distributed length-frequency data (to the nearest mm, with record of the type of length measurement taken) are to be collected for representative samples of the target species and other main by-catch species.   Total weight of length-frequency samples should be recorded, and observers may be required to also determine sex of measured fish to generate length-frequency data stratified by sex. The length-frequency data may be used as potential indicators of ecosystem changes (for example, see: Gislason, H. et al. (2000. ICES J Mar Sci 57: 468-475), Yamane et al. (2005. ICES J Mar Sci, 62: 374-379), and Shin, Y-J. et al. (2005. ICES J Mar Sci, 62: 384-396)).

2. The numbers of fish to be measured for each species and distribution of samples across area and month strata should be determined, to ensure that samples are properly representative of species distributions and size ranges.

F. Biological sampling to be conducted (optional for gillnet and long line fisheries)

1. The following biological data are to be collected for representative samples of the main target species and, time permitting, for other main by-catch species contributing to the catch:
   (a) Species
   (b) Length (to the nearest mm), with record of the type of length measurement used.
   (c) Length and depth in case of North Pacific armorhead.
   (d) Sex (male, female, indeterminate, not examined)
   (e) Maturity stage (immature, mature, ripe, ripe-running, spent)

2. Representative stratified samples of otoliths are to be collected from the main target species and, time permitting, from other main by-catch species regularly occurring in catches. All otoliths to be collected are to be labelled with the information listed in 1 above, as well as the date, vessel name, observer name and catch position.

3. Where specific trophic relationship projects are being conducted, observers may be requested to also collect stomach samples from certain species. Any such samples collected are also to be labelled with the information listed in 1 above, as well as the date, vessel name, observer name and catch position.

4. Observers may also be required to collect tissue samples as part of specific genetic research programmes implemented by the SC.

5. Observers are to be briefed and provided with written length-frequency and biological sampling protocols and priorities for the above sampling specific to each observer trip.

G. Data to be collected on Incidental Captures of Protected Species

1. Flag members operating observer programs are to develop, in cooperation with the SC, lists and identification guides of protected species or species of concern (seabirds, marine mammals or marine reptiles) to be monitored by observers.

2. The following data are to be collected for all protected species caught in fishing operations:
   (a) Species (identified as far as possible, or accompanied by photographs if identification is difficult).
   (b) Count of the number caught per tow or set.
   (c) Life status (vigorous, alive, lethargic, dead) upon release.
   (d) Whole specimens (where possible) for onshore identification. Where this is not possible, observers may be required to collect sub-samples of identifying parts, as specified in biological sampling protocols.

H. Detection of Fishing in Association with Vulnerable Marine Ecosystems

1. The SC is to develop a guideline, species list and identification guide for benthic species (e.g. sponges, sea fans, corals) whose presence in a catch will indicate that fishing occurred in association with a vulnerable marine ecosystem (VME). All observers on vessels are to be provided with copies of this guideline, species list and ID guide.

2. For each observed fishing operation, the following data are to be collected for all species caught, which appear on the list of vulnerable benthic species:

    (a) Species (identified as far as possible or accompanied by a photograph where identification is difficult).

    (b) An estimate of the quantity (weight (kg) or volume (m^3)) of each listed benthic species caught in the fishing operation.

    (c) An overall estimate of the total quantity (weight (kg) or volume (m^3)) of all invertebrate benthic species caught in the fishing operation.

    (d) Where possible, and particularly for new or scarce benthic species which do not appear in ID guides, whole samples should be collected and suitable preserved for identification on shore.

I. Data to be collected for all Tag Recoveries

1. The following data are to be collected for all recovered fish, seabird, mammal or reptile tags:

    (a) Observer name.

    (b) Vessel name.

    (c) Vessel call sign.

    (d) Vessel flag.

    (e) Collect, label (with all details below) and store the actual tags for later return to the tagging agency.

    (f) Species from which tag recovered.

    (g) Tag colour and type (spaghetti, archival).

    (h) Tag numbers (The tag number is to be provided for all tags when multiple tags were attached to one fish. If only one tag was recorded, a statement is required that specifies whether or not the other tag was missing)

    (i) Date and time of capture (UTC).

    (j) Location of capture (Lat/Lon, to the nearest 1 minute)

    (k) Animal length / size (to the nearest cm) with description of what measurement was taken (such as total length, fork length, etc).

    (l) Sex (F=female, M=male, I=indeterminate, D=not examined)

    (m) Whether the tags were found during a period of fishing that was being observed (Y/N)

    (n) Reward information (e.g. name and address where to send reward)

(It is recognised that some of the data recorded here duplicates data that already exists in the previous categories of information. This is necessary because tag recovery information may be sent separately to other observer data.)

J. Hierarchies for Observer Data Collection

1. Trip-specific or programme-specific observer task priorities may be developed in response to specific research programme requirements, in which case such priorities should be followed by observers.

2. In the absence of trip- or programme-specific priorities, the following generalised priorities should be followed by observers:

   (a) Fishing Operation Information
   - All vessel and tow / set / effort information.

   (b) Monitoring of Catches
   - Record time, proportion of catch (e.g. proportion of trawl landing) or effort (e.g. number of hooks), and total numbers of each species caught.
   - Record numbers or proportions of each species retained or discarded.

   (c) Biological Sampling
   - Length-frequency data for target species.
   - Length-frequency data for main by-catch species.
   - Identification and counts of protected species.
   - Basic biological data (sex, maturity) for target species.
   - Check for presence of tags.
   - Otoliths (and stomach samples, if being collected) for target species.
   - Basic biological data for by-catch species.
   - Biological samples of by-catch species (if being collected)
   - Photos

3. The monitoring of catches and biological sampling procedures should be prioritised among species groups as follows:

Species	Priority (1 highest)
Primary target species (such as North Pacific armorhead and splendid alfonsino)	1
Other species typically within top 10 in the fishery (such as mirror dory, and oreos)	2
Protected species	3
All other species	4

The allocation of observer effort among these activities will depend on the type of operation and setting. The size of sub-samples relative to unobserved quantities (e.g. number of hooks/panels examined for species composition relative to the number of hooks/panels retrieved) should be explicitly recorded under the guidance of member country observer programmes.

K. Coding Specifications to be used for Recording Observer Data

1. Unless otherwise specified for specific data types, observer data are to be collected in accordance with the same coding specifications as specified in this Annex.
2. Coordinated Universal Time (UTC) is to be used to describe times.
3. Degrees and minutes are to be used to describe locations.
4. The following coding schemes are to be used:
   (a) Species are to be described using the FAO 3 letter species codes or, if species do not have a FAO code, using scientific names.
   (b) Fishing methods are to be described using the International Standard Classification of Fishing Gear (ISSCFG - 29 July 1980) codes.
   (c) Types of fishing vessel are to be described using the International Standard Classification of Fishery Vessels (ISSCFV) codes.
5. Metric units of measure are to be used, specifically:
   (a) Kilograms are to be used to describe catch weight.
   (b) Metres are to be used to describe height, width, depth, beam or length.
   (c) Cubic metres are to be used to describe volume.
   (d) Kilowatts are to be used to describe engine power.

**Implementation of the Adaptive Management for North Pacific armorhead**
(in 2021)

1. Monitoring survey for the detection of strong recruitment of North Pacific armorhead

(1) Location of monitoring surveys

Monitoring surveys for the detection of strong recruitment of North Pacific armorhead will be conducted by trawl fishing vessels in the pre-determined four (24) monitoring blocks of Koko (South eastern), Yuryaku, Kammu (North western) and/or Colahan seamounts.
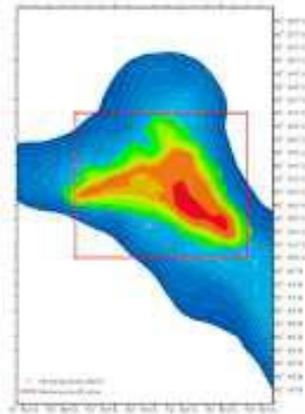
Monitoring blocks

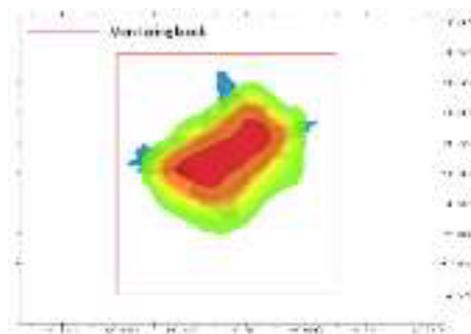(1) Koko seamount (34°51' –35°04'N, 171°49' –172°00' E)
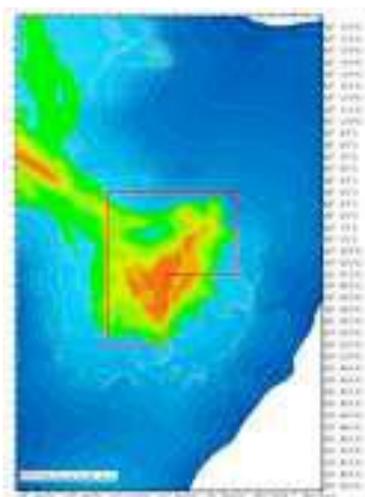
(2) Yuryaku seamount (32°35' –32°45'N, 172°10' –172°24'E)
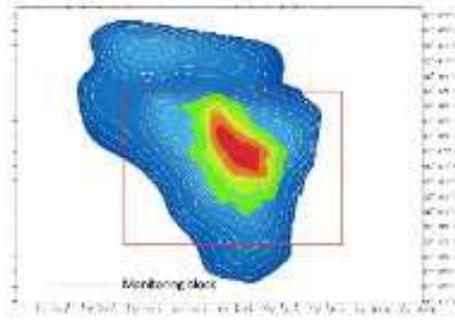
(3) Kammu seamount (32°10'–32°21'N, 172°44'–172°57'E)

(4) Colahan seamount (30°57'–31°05'N, 175°50'–175°57'E)

(2) Schedule for monitoring surveys

Monitoring surveys will be conducted from March 1st to June 30th each year, with at least a one

week interval between monitoring surveys. For each survey, a trawl fishing vessel will conduct a monitoring survey in one of the four monitoring blocks that is the nearest from the location of the trawl fishing vessel at the time of prior notification in (4) below. The base schedule for monitoring surveys will be notified to the Executive Secretary by the end of February of each year. The base schedule may be revised during the year subject to prior notification to the Executive Secretary.

(3) Data to be collected during monitoring surveys

For each monitoring survey, a trawl net will be towed for one hour. A scientific observer onboard the trawl fishing vessel will calculate nominal-CPUE (kg/hour) of North Pacific armorhead. The scientific observer will also calculate fat index* (FI) of randomly sampled 100 individuals of North Pacific armorhead by measuring fork length (FL) and body height (BH) of each individual. (*fat index (FI) = body height (BH) / fork length (FL))

(4) Prior notifications and survey results

At least three (3) days before each survey, a prior notification with monitoring date/time, location and trawl fishing vessel name will be provided by the flag state of the trawl fishing vessel to the Executive Secretary.

No later than three (3) days after each survey, the survey result including date/time, location, catch, nominal-CPUE (kg/hour) and percentage of fish with fat index (FI)>0.3 will be provided by the flag state to the Executive Secretary.

The Executive Secretary will circulate these prior notifications and survey results to all Members of the Commission without delay.

1. Areas where bottom fishing with trawl gear is prohibited when high recruitment is detected

(1) Criteria for a high recruitment

It is considered that high recruitment has occurred if the following criteria are met in four (4) consecutive monitoring surveys.
 - Nominal CPUE > 10t/h
 - Individuals of fat index (FI)> 0.3 account for 80% or more

(2) Areas where bottom fishing with trawl gear is prohibited

Bottom fishing with trawl gear shall be prohibited in the following two (2) seamount areas (*) during the year when high recruitment is detected. In such a case, all monitoring surveys scheduled during the year will be cancelled.

- Northern part of Kammu seamount (north of 32°10.0′ N)
- Yuryaku seamount

(*) The catch of North Pacific armorhead in the above two seamounts accounts for a half of the total catch in the entire Emperor Seamounts area based on the catch records in 2010 and 2012.

(3) Notification by the Secretariat

When the criteria for high recruitment are met as defined in 2(1) above, the Executive Secretary will notify all Members of the Commission of the fact with a defined date/time from which bottom fishing with trawl gear is prohibited in the areas as defined in 2(2) above until the end of the year.

Revised CMM 2019-06 - Conservation and Management Measure for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the Northeastern Pacific Ocean

CMM 2019-06

(Entered into force 29 November 2019)

CONSERVATION AND MANAGEMENT MEASURE
FOR BOTTOM FISHERIES AND PROTECTION OF VULNERABLE MARINE
ECOSYSTEMS IN THE NORTHEASTERN PACIFIC OCEAN

The North Pacific Fisheries Commission (NPFC):

Seeking to ensure the long term conservation and sustainable use of the fishery resources of the Northeastern Pacific Ocean and, in so doing, protect the vulnerable marine ecosystems that occur there, in accordance with the Sustainable Fisheries Resolutions adopted by the United Nations General Assembly (UNGA) including, in particular, paragraphs 66 to 71 of the UNGA59/25 in 2004, paragraphs 69 to 74 of UNGA60/31 in 2005, paragraphs 69 and 80 to 91 of UNGA61/105 in 2006, and paragraphs 113 to 124 of UNGA64/72 in 2009;

Recalling that paragraph 85 of UNGA 61/105 calls upon participants in negotiations to establish regional fisheries management organizations or arrangements with the competence to regulate bottom fisheries to adopt permanent measures in respect of the area of application of the instruments under negotiation;

Noting that North Pacific Fisheries Commission has previously adopted interim measures for the Northeastern Pacific Ocean;

Conscious of the need to adopt permanent measures for the Northeastern Pacific Ocean to ensure that this area is not left as the only major area of the Pacific Ocean where no such measures are in place;

Hereby adopt the following Conservation and Management Measure (CMM) for bottom fisheries of the Northeastern Pacific Ocean while working to develop and implement other permanent management arrangements to govern these and other fisheries in the North Pacific Ocean.

Scope
1. These Measures are to be applied to all bottom fishing activities throughout the high seas areas of the Northeastern Pacific Ocean, defined, for the purposes of this document, as those occurring in the Convention Area as set out in Article 4 of the Convention text to the east of the

line of 175 degrees W longitude (here in after called "the eastern part of the Convention Area") including all such areas and marine species other than those species already covered by existing international fisheries management instruments, including bilateral agreements and Regional Fisheries Management Organizations or Arrangements.

For the purpose of these Measures, the term vulnerable marine ecosystems is to be interpreted and applied in a manner consistent with the International Guidelines on the Management of Deep Sea Fisheries on the High Seas adopted by the FAO on 29 August 2008 (see Annex 2 for further details).

2. The implementation of these Measures shall:
    a. be based on the best scientific information available in accordance with existing international laws and agreements including UNCLOS and other relevant international instruments,
    b. establish appropriate and effective conservation and management measures,
    c. be in accordance with the precautionary approach, and
    d. incorporate an ecosystem approach to fisheries management.

3. Actions by Members of the Commission
    Members of the Commission will take the following actions in respect of vessels operating under its Flag or authority in the area covered by these Measures:
    a. Conduct the assessments called for in paragraph 83(a) of UNGA Resolution 61/105, in a manner consistent with the FAO Guidelines and the Standards and Criteria included in Annex 2;
    b. Submit to the SC their assessments conducted pursuant to subparagraph (a) of this paragraph, including all relevant data and information in support of any such assessment, and receive advice and recommendations from the SC, in accordance with the procedures in Annex 3;
    c. Taking into account all advice and recommendations received from the SC, determine whether the fishing activity or operations of the vessel in question are likely to have a significant adverse impact on any vulnerable marine ecosystem;
    d. If it is determined that the fishing activity or operations of the vessel or vessels in question would have a significant adverse impact on vulnerable marine ecosystems, adopt conservation and management measures to prevent such impacts on the basis of advice and recommendations of the SC, which are subject to adoption by the Commission;
    e. Ensure that if any vessels are already engaged in bottom fishing, that such assessments have been carried out in accordance with paragraph 119(a)/UNGA RES 2009, the determination called for in subparagraph (c) of this paragraph has been rendered and, where appropriate, managements measures have been implemented in accordance with the advice and

recommendations of the SC, which are subject to adoption by the Commission;

f. Further ensure that they will only authorize fishing activities on the basis of such assessments and any comments and recommendations from the SC;

g. Prohibit its vessels from engaging in directed fishing on the following orders: *Alcyonacea, Antipatharia, Gorgonacea,* and *Scleractinia*, the classes of *Hexactinellida* and *Demospongiae* in the phylum *Porifera* as well as any other indicator species for vulnerable marine ecosystems as may be identified from time to time by the SC and approved by the Commission;

h. In respect of areas where vulnerable marine ecosystems are known to occur or are likely to occur, based on the best available scientific information, ensure that bottom fishing activities do not proceed unless conservation and management measures have been established to prevent significant adverse impacts on vulnerable marine ecosystems;

i. Limit fishing effort in bottom fisheries on the Eastern part of the Convention Area to the level of a historical average (baseline to be determined through consensus in the SC based on information to be provided by Members) in terms of the number of fishing vessels and other parameters which reflect the level of fishing effort, fishing capacity or potential impacts on marine ecosystems dependent on new SC advice;

j. Further, considering accumulated information regarding fishing activities in the Eastern part of the Convention Area, in areas where, in the course of fishing operations, cold water corals or other indicator species as identified by the SC that exceed 50Kg and 500 kg of *Hexactinellida* and *Demospongiae* are encountered in one gear retrieval, Members of the Commission shall require vessels flying their flag to cease bottom fishing activities in that location. In such cases, the vessel shall not resume fishing activities until it has relocated a sufficient distance, which shall be no less than 12 nautical miles, so that additional encounters with VMEs are unlikely. All such encounters, including the location, gear type, date, time and name and weight of the VME indicator species in question, shall be reported to the Secretariat, through the Member, within one business day. as soon as possible, The Executive Secretary who shall notify the other Members of the Commission and at the same time implement a temporary closure in the area to prohibit its bottom fishing vessels from contacting the sea floor with their trawl nets. so that appropriate measures can be adopted in respect of the relevant site. Members shall inform their fleets and enforcement operations within one business day of the receipt of the notification from the Executive Secretary. It is agreed that the VME indicator taxa include cold water corals include: *Alcyonacea, Antipatharia, Gorgonacea*, and *Scleractinia,* and the classes of *Hexactinellida* and *Demospongiae* in the phylum Porifera. as well as any other indicator species for vulnerable marine ecosystems as may be identified from time to time by the SC and approved by the Commission.

j.k. Based on all the available data, including data on the VME encounter and distribution

received from the fishing vessel(s), research survey data, visual survey data, and/or model results, the Scientific Committee (SC) shall assess and conclude if the area has a VME. If so, the SC shall recommend to the Commission that the temporary closure be made permanent, although the boundary of the closure may be adjusted, or suggest other appropriate measures. Otherwise, the Executive Secretary shall inform the Members that they may reopen the area to their vessels.

4. All assessments and determinations by any Member as to whether fishing activity would have significant adverse impacts on vulnerable marine ecosystems, as well as measures adopted in order to prevent such impacts, will be made publicly available through agreed means.

Control of Bottom Fishing Vessels

5. Members will exercise full and effective control over each of their bottom fishing vessels operating in the high seas of the Northeastern Pacific Ocean, including by means of fishing licenses, authorizations or permits, and maintenance of a record of these vessels as outlined in the Convention and applicable CMM.

6. New and exploratory fishing will be subject to the exploratory fishery protocol included as Annex 1.

Scientific Committee (SC)

7. Scientific Committee will provide scientific support for the implementation of these CMMs.

Scientific Information

8. The Members shall provide all available information as required by the Commission for any current or historical fishing activity by their flag vessels, including the number of vessels by gear type, size of vessels (tons), number of fishing days or days on the fishing grounds, total catch by species, areas fished (names or coordinates of seamounts), and information from scientific observer programmes (see Annexes 4 and 5) to the NPFC Secretariat as soon as possible and no later than one month prior to SC meeting. The Secretariat will make such information available to SC.

9. Scientific research activities for stock assessment purposes are to be conducted in accordance with a research plan that has been provided to SC prior to the commencement of such activities.

EXPLORATORY FISHERY PROTOCOL IN THE NORTH PACIFIC OCEAN

1. From 1 January 2009, all bottom fishing activities in new fishing areas and areas where fishing is prohibited in a precautionary manner or with bottom gear not previously used in the existing fishing areas, are to be considered as "exploratory fisheries" and to be conducted in accordance with this protocol.

2. Precautionary conservation and management measures, including catch and effort controls, are essential during the exploratory phase of deep sea fisheries. Implementation of a precautionary approach to sustainable exploitation of deep sea fisheries shall include the following measures:
   i.   precautionary effort limits, particularly where reliable assessments of sustainable exploitation rates of target and main by-catch species are not available;
   ii. precautionary measures, including precautionary spatial catch limits where appropriate, to prevent serial depletion of low-productivity stocks;
   iii. regular review of appropriate indices of stock status and revision downwards of the limits listed above when significant declines are detected;
   iv. measures to prevent significant adverse impacts on vulnerable marine ecosystems; and
   v.   comprehensive monitoring of all fishing effort, capture of all species and interactions with VMEs.

3. When a member of the Commission would like to conduct exploratory fisheries, it is to follow the following procedure:

(1) Prior to the commencement of fishing, the member of the Commission is to circulate the information and assessment in Appendix 1.1 to the members of the Scientific Committee (SC) for review and to all members of the Commission for information, together with the impact assessment. Such information is to be provided to the other members at least 30 days in advance of the meeting at which the information shall be reviewed.

(2) The assessment in (1) above is to be conducted in accordance with the procedure set forth in "Science-based Standards and Criteria for Identification of VMEs and Assessment of Significant Adverse Impacts on VMEs and Marine Species (Annex 2)", with the understanding that particular care shall be taken in the evaluation of risks of the significant adverse impact on vulnerable marine ecosystems (VMEs), in line with the precautionary approach.

(3) The SC is to review the information and the assessment submitted in (1) above in accordance

with "SC Assessment Review Procedures for Bottom Fishing Activities (Annex 3)."

(4) The exploratory fisheries are to be permitted only where the assessment concludes that they would not have significant adverse impacts (SAIs) on marine species or any VMEs and on the basis of comments and recommendations of SC.   Any determinations, by any Member of the Commission or the SC, that the exploratory fishing activities would not have SAIs on marine species or any VMEs, shall be made publicly available through the NPFC website.

4. The member of the Commission is to ensure that all vessels flying its flag conducting exploratory fisheries are equipped with a satellite monitoring device and have an observer on board at all times.

5. Within 3 months of the end of the exploratory fishing activities or within 12 months of the commencement of fishing, whichever occurs first, the member of the Commission is to provide a report of the results of such activities to the members of the SC and all members of the Commission. If the SC meets prior to the end of this 12-month period, the member of the Commission is to provide an interim report 30 days in advance of the SC meeting. The information to be included in the report is specified in Appendix 1.2.

6. The SC is to review the report in 5 above and decide whether the exploratory fishing activities had SAIs on marine species or any VME.   The SC then is to send its recommendations to the Commission on whether the exploratory fisheries can continue and whether additional management measures shall be required if they are to continue. The Commission is to strive to adopt conservation and management measures to prevent SAIs on marine species or any VMEs. If the Commission is not able to reach consensus on any such measures, each fishing member of the Commission is to adopt measures to avoid any SAIs on VMEs.

7. Members of the Commission shall only authorize continuation of exploratory fishing activity, or commencement of commercial fishing activity, under this protocol on the basis of comments and recommendations of the SC.

8. The same encounter protocol should be applied in both fished and unfished areas specified in Annex 2, paragraph 4(1)(a).

Appendix 1.1

Information to be provided before exploratory fisheries start
1. A harvesting plan
  - Name of vessel

- Flag member of vessel
- Description of area to be fished (location and depth)
- Fishing dates
- Anticipated effort
- Target species
- Bottom fishing gear-type used
- Area and effort restrictions to ensure that fisheries occur on a gradual basis in a limited geographical area.

2. A mitigation plan
  - Measures to prevent SAIs to VMEs that may be encountered during the fishery

3. A catch monitoring plan
  - Recording/reporting of all species brought onboard to the lowest possible taxonomic level
  - 100% satellite monitoring
  - 100% observer coverage

4. A data collection plan
  - Data is to be collected in accordance with "Type and Format of Scientific Observer Data to be Collected" (Annex 5)

Appendix 1.2

Information to be included in the report
- Name of vessel
- Flag member of vessel
- Description of area fished (location and depth)
- Fishing dates
- Total effort
- Bottom fishing gear-type used
- List of VME encountered (the amount of VME indicator species for each encounter specifying the location: longitude and latitude)
- Mitigation measures taken in response to the encounter of VME
- List of all organisms brought onboard
- List of VMEs indicator species brought onboard by location: longitude and latitude

SCIENCE-BASED STANDARDS AND CRITERIA FOR IDENTIFICATION OF VMES AND ASSESSMENT OF SIGNIFICANT ADVERSE IMPACTS ON VMES AND MARINE SPECIES

1. Introduction

Members of the Commission have hereby established science-based standards and criteria to guide their implementation of United Nations General Assembly (UNGA) Resolution 61/105 and the measures adopted by the Members in respect of bottom fishing activities in the North Pacific Ocean (NPO).   In this regard, these science-based standards and criteria are to be applied to identify vulnerable marine ecosystems (VMEs) and assess significant adverse impacts (SAIs) of bottom fishing activities on such VMEs or marine species and to promote the long-term sustainability of deep sea fisheries in the Convention Area.   The science-based standards and criteria are consistent with the FAO International Guidelines for the Management of Deep-Sea Fisheries in the High Seas, taking into account the work of other RFMOs implementing management of deep-sea bottom fisheries in accordance with UNGA Resolution 61/105.   The standards and criteria are to be modified from time to time as more data are collected through research activities and monitoring of fishing operations.

2. Purpose

(1) The purpose of the standards and criteria is to provide guidelines for each member of the Commission in identifying VMEs and assessing SAIs of individual bottom fishing activities[2] on VMEs or marine species in the Convention Area.   Each member of the Commission, using the best information available, is to decide which species or areas are to be categorized as VMEs, identify areas where VMEs are known or likely to occur, and assess whether individual bottom fishing activities would have SAIs on such VMEs or marine species.   The results of these tasks are to be submitted to and reviewed by the Scientific Committee with a view to reaching a common understanding among the members of the Commission.

(2) For the purpose of applying the standards and criteria, the bottom fisheries are defined as follows:

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[2] "individual bottom fishing activities" means fishing activities by each fishing gear.   For example, if ten fishing vessels operate bottom trawl fishing in a certain area, the impacts of the fishing activities of these vessels on the ecosystem are to be assessed as a whole rather than on a vessel-by-vessel basis.   It should be noted that if the total number or capacity of the vessels using the same fishing gear has increased, the impacts of the fishing activities are to be assessed again.

(a) The fisheries are conducted in the Convention Area;

(b) The total catch (everything brought up by the fishing gear) includes species that can only sustain low exploitation rates; and

(c) The fishing gear is likely to contact the seafloor during the normal course of fishing operations

3. Definition of VMEs

(1) Although Paragraph 83 of UNGA Resolution 61/105 refers to seamounts, hydrothermal vents and cold water corals as examples of VMEs, there is no definitive list of specific species or areas that are to be regarded as VMEs.

(2) Vulnerability is related to the likelihood that a population, community or habitat will experience substantial alteration by fishing activities and how much time will be required for its recovery from such alteration.   The most vulnerable ecosystems are those that are both easily disturbed and are very slow to recover, or may never recover.   The vulnerabilities of populations, communities and habitats are to be assessed relative to specific threats.   Some features, particularly ones that are physically fragile or inherently rare may be vulnerable to most forms of disturbance, but the vulnerability of some populations, communities and habitats may vary greatly depending on the type of fishing gear used or the kind of disturbance experienced. The risks to a marine ecosystem are determined by its vulnerability, the probability of a threat occurring and the mitigation means applied to the threat.   Accordingly, the FAO Guidelines only provide examples of potential vulnerable species groups, communities and habitats as well as features that potentially support them (Annex 2.1).

(3) A marine ecosystem is to be classified as vulnerable based on its characteristics.   The following list of characteristics is used as criteria in the identification of VMEs.

    (a) Uniqueness or rarity - an area or ecosystem that is unique or that contains rare species whose loss could not be compensated for by other similar areas.   These include:

        (i) Habitats that contain endemic species;

        (ii) Habitats of rare, threatened or endangered species that occur in discrete areas;

        (iii) Nurseries or discrete feeding, breeding, or spawning areas

    (b) Functional significance of the habitat – discrete areas or habitats that are necessary for the survival, function, spawning/reproduction or recovery of fish stocks, particular life-history stages (e.g. nursery grounds or rearing areas), or of rare, threatened or endangered marine species.

    (c) Fragility – an ecosystem that is highly susceptible to degradation by anthropogenic activities

(d) Life-history traits of component species that make recovery difficult – ecosystems that are characterized by populations or assemblages of species with one or more of the following characteristics:

       (i) Slow growth rates

       (ii) Late age of maturity

       (iii) Low or unpredictable recruitment

       (iv) Long-lived

(e) Structural complexity – an ecosystem that is characterized by complex physical structures created by significant concentrations of biotic and abiotic features. In these ecosystems, ecological processes are usually highly dependent on these structured systems. Further, such ecosystems often have high diversity, which is dependent on the structuring organisms.

(4) Management response may vary, depending on the size of the ecological unit in the Convention Area. Therefore, the spatial extent of the ecological unit is to be decided first. For example, whether the ecological unit is a group of seamounts, or an individual seamount in the Convention Area, is to be decided using the above criteria.

4. Identification of potential VMEs

(1) Fished seamounts

    (a) Identification of fished seamounts

It is reported that two types of fishing gear are currently used by members of the Commission in the NE area, namely long-line hook and long-line trap. The footprint of the bottom fisheries (fished seamounts) is identified based on the available fishing record. The following seamounts have been identified as fished seamounts at some point in the past: Brown Bear, Cobb, Warwick, Eickelberg, Pathfinder, Miller, Murray, Cowie, Surveyor, Pratt, and Durgin. It is important to establish, to the extent practicable, a time series of where and when these gears have been used in order to assess potential long-term effects on any existing VMEs.

Fishing effort may not be evenly distributed on each seamount since fish aggregation may occur only at certain points of the seamount and some parts of the seamount may be physically unsuitable for certain fishing gears. Thus, it is important to know actual fished areas within the same seamount so as to know the gravity of the impact of fishing activities on the entire seamount.

Due consideration is to be given to the protection of commercial confidentiality when identifying actual fishing grounds.

(b) Assessment on whether a specific seamount that has been fished is a VME

After identifying the fished seamounts or fished areas of seamounts, it is necessary to assess whether each fished seamount is a VME or contains VMEs in accordance with the criteria in 3 above, individually or in combination using the best available scientific and technical information as well as Annex 2.1.   A variety of data would be required to conduct such assessment, including pictures of seamounts taken by an ROV camera or drop camera, biological samples collected through research activities and observer programs, and detailed bathymetry map. Where site-specific information is lacking, other information that is relevant to inferring the likely presence of VMEs is to be used. The flow chart to identify data that can be used to identify VMEs is attached in Annex 2.3.

(2) New fishing areas

Any place other than the fished seamounts above is to be regarded as a new fishing area.   If a member of the Commission is considering fishing in a new fishing area, such a fishing area is to be subject to, in addition to these standards and criteria, an exploratory fishery protocol (Annex 1).

5. Assessment of SAIs on VMEs or marine species

(1) Significant adverse impacts are those that compromise ecosystem integrity (i.e., ecosystem structure or function) in a manner that: (i) impairs the ability of affected populations to replace themselves; (ii) degrades the long-term natural productivity of habitats; or (iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types. Impacts are to be evaluated individually, in combination and cumulatively.

(2) When determining the scale and significance of an impact, the following six factors are to be considered:
    (a) The intensity or severity of the impact at the specific site being affected;
    (b) The spatial extent of the impact relative to the availability of the habitat type affected;
    (c) The sensitivity/vulnerability of the ecosystem to the impact;
    (d) The ability of an ecosystem to recover from harm, and the rate of such recovery;
    (e) The extent to which ecosystem functions may be altered by the impact; and
    (f) The timing and duration of the impact relative to the period in which a species needs the habitat during one or more life-history stages.

(3) Temporary impacts are those that are limited in duration and that allow the particular ecosystem to recover over an acceptable timeframe.   Such timeframes are to be decided on a case-by-case basis and be on the order of 5-20 years, taking into account the specific features

of the populations and ecosystems.

(4) In determining whether an impact is temporary, both the duration and the frequency with which an impact is repeated is to be considered. If the interval between the expected disturbances of a habitat is shorter than the recovery time, the impact is to be considered more than temporary.

(5) Each member of the Commission is to conduct assessments to establish if bottom fishing activities are likely to produce SAIs in a given seamount or other VMEs. Such an impact assessment is to address, *inter alia*:

(a) Type of fishing conducted or contemplated, including vessel and gear types, fishing areas, target and potential bycatch species, fishing effort levels and duration of fishing;

(b) Best available scientific and technical information on the current state of fishery resources, and baseline information on the ecosystems, habitats and communities in the fishing area, against which future changes are to be compared;

(c) Identification, description and mapping of VMEs known or likely to occur in the fishing area;

(d) The data and methods used to identify, describe and assess the impacts of the activity, identification of gaps in knowledge, and an evaluation of uncertainties in the information presented in the assessment

(e) Identification, description and evaluation of the occurrence, scale and duration of likely impacts, including cumulative impacts of activities covered by the assessment on VMEs and low-productivity fishery resources in the fishing area;

(f) Risk assessment of likely impacts by the fishing operations to determine which impacts are likely to be SAIs, particularly impacts on VMEs and low-productivity fishery resources (Risk assessments are to take into account, as appropriate, differing conditions prevailing in areas where fisheries are well established and in areas where fisheries have not taken place or only occur occasionally);

(g) The proposed mitigation and management measures to be used to prevent SAIs on VMEs and ensure long-term conservation and sustainable utilization of low-productivity fishery resources, and the measures to be used to monitor effects of the fishing operations.

(6) Impact assessments are to consider, as appropriate, the information referred to in these Standards and Criteria, as well as relevant information from similar or related fisheries, species and ecosystems.

(7) Where an assessment concludes that the area does not contain VMEs or that significant adverse impacts on VMEs or marine species are not likely, such assessments are to be repeated

when there have been significant changes to the fishery or other activities in the area, or when natural processes are thought to have undergone significant changes.

6. Proposed conservation and management measures to prevent SAIs

As a result of the assessment in 5 above, if it is considered that individual fishing activities are causing or likely to cause SAIs on VMEs or marine species, the member of the Commission is to adopt appropriate conservation and management measures to prevent such SAIs.   The member of the Commission is to clearly indicate how such impacts are expected to be prevented or mitigated by the measures.

7. Precautionary approach

If after assessing all available scientific and technical information, the presence of VMEs or the likelihood that individual bottom fishing activities would cause SAIs on VMEs or marine species cannot be adequately determined, members of the Commission are only to authorize individual bottom fishing activities to proceed in accordance with:

(a) Precautionary, conservation and management measures to prevent SAIs;

(b) Measures to address unexpected encounters with VMEs in the course of fishing operations;

(c) Measures, including ongoing scientific research, monitoring and data collection, to reduce the uncertainty; and

(d) Measures to ensure long-term sustainability of deep sea fisheries.

8. Template for assessment report

Annex 2.2 is a template for individual member of the Commission to formulate reports on identification of VMEs and impact assessment.

ANNEX 2.1

EXAMPLES OF POTENTIAL VULNERABLE SPECIES GROUPS, COMMUNITIES AND HABITATS AS WELL AS FEATURES THAT POTENTIALLY SUPPORT THEM

The following examples of species groups, communities, habitats and features often display characteristics consistent with possible VMEs.   Merely detecting the presence of an element itself is not sufficient to identify a VME.   That identification is to be made on a case-by-case basis through application of relevant provisions of the Standards and Criteria, particularly Sections 3, 4 and 5.

Examples of species groups, communities and habitat forming species that are documented or considered sensitive and potentially vulnerable to deep-sea fisheries in the high-seas, and which

may contribute to forming VMEs:	
a.	certain coldwater corals, e.g., reef builders and coral forest including: stony corals (scleractinia), alcyonaceans and gorgonians (octocorallia), black corals (antipatharia), and hydrocorals (stylasteridae),
b.	Some types of sponge dominated communities,
c.	communities composed of dense emergent fauna where large sessile protozoans (xenophyophores) and invertebrates (e.g., hydroids and bryozoans) form an important structural component of habitat, and
d.	seep and vent communities comprised of invertebrate and microbial species found nowhere else (i.e., endemic).

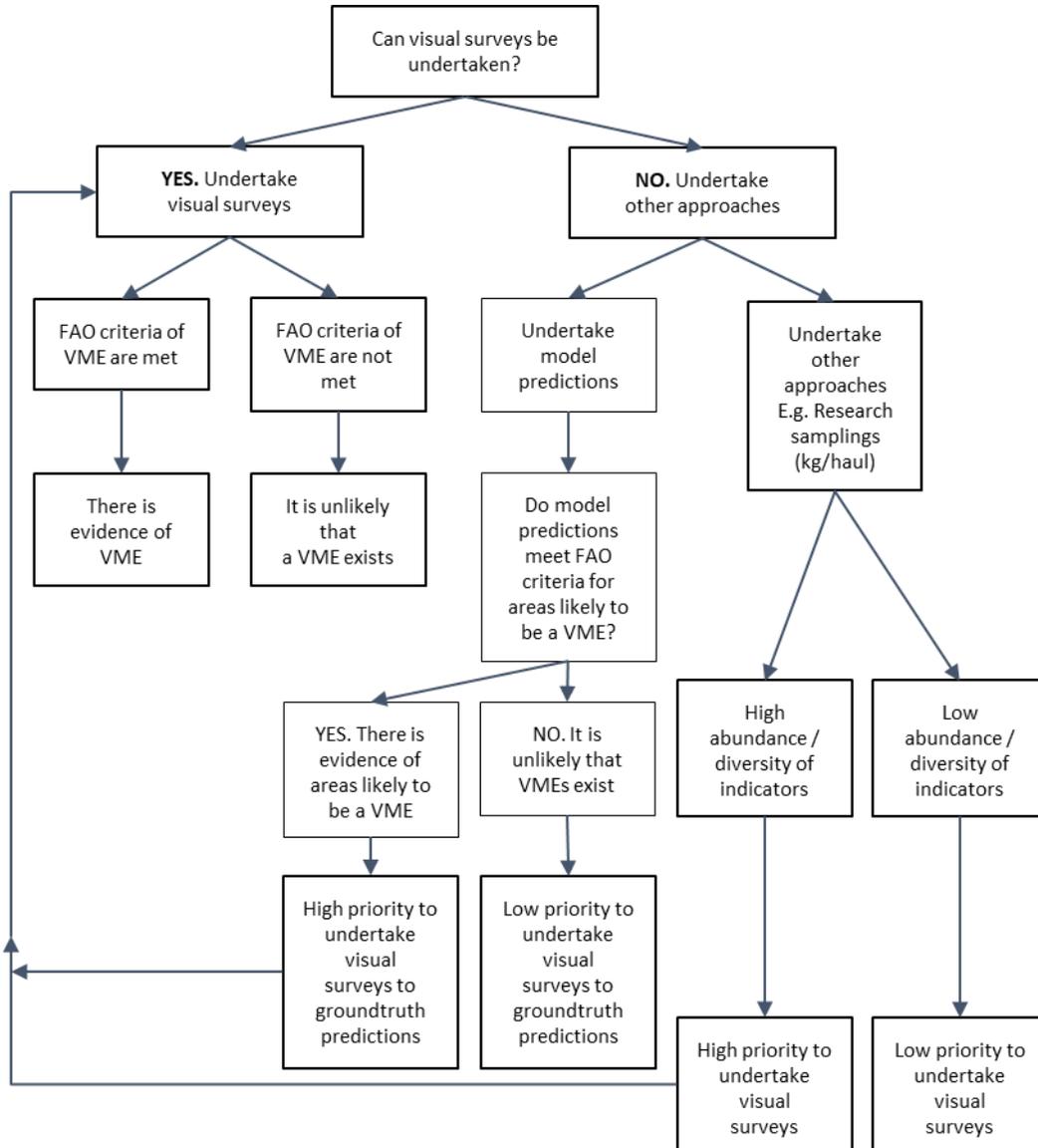|	
Examples of topographical, hydrophysical or geological features, including fragile geological structures, that potentially support the species groups or communities, referred to above:	
a.	submerged edges and slopes (e.g., corals and sponges),
b.	summits and flanks of seamounts, guyots, banks, knolls, and hills (e.g., corals, sponges, xenophyphores),
c.	canyons and trenches (e.g., burrowed clay outcrops, corals),
d.	hydrothermal vents (e.g., microbial communities and endemic invertebrates), and
e.	cold seeps (e.g., mud volcanoes, microbes, hard substrates for sessile invertebrates).

ANNEX 2.2

TEMPLATE FOR REPORTS ON IDENTIFICATION OF VMEs AND ASSESSMENT OF IMPACTS CAUSED BY INDIVIDUAL FISHING ACTIVITIES ON VMEs OR MARINE SPECIES

1. Name of the member of the Commission
2. Name of the fishery (e.g., bottom trawl, bottom gillnet, bottom longline, pot)
3. Status of the fishery (existing fishery or exploratory fishery)
4. Target species
5. Bycatch species
6. Recent level of fishing effort (every year at least since 2002)
   (1) Number of fishing vessels
   (2) Tonnage of each fishing vessel
   (3) Number of fishing days or days on the fishing ground
   (4) Fishing effort (total operating hours for trawl, # of hooks per day for long-line, # of pots per day for pot, total length of net per day for gillnet)

(5) Total catch by species

(6) Names of seamounts fished or to be fished

7. Fishing period

8. Analysis of status of fishery resources

(1) Data and methods used for analysis

(2) Results of analysis

(3) Identification of uncertainties in data and methods, and measures to overcome such uncertainties

9. Analysis of status of bycatch species resources

(1) Data and methods used for analysis

(2) Results of analysis

(3) Identification of uncertainties in data and methods, and measures to overcome such uncertainties

10. Analysis of existence of VMEs in the fishing ground

(1) Data and methods used for analysis

(2) Results of analysis

(3) Identification of uncertainties in data and methods, and measures to overcome such uncertainties

11. Impact assessment of fishing activities on VMEs or marine species including cumulative impacts, and identification of SAIs on VMEs or marine species, as detailed in Section 5 above, Assessment of SAIs on VMEs or marine species

12. Other points to be addressed

13. Conclusion (whether to continue or start fishing with what measures, or stop fishing).

Flow chart to identify data that can be used to identify VMEs in the NPFC Convention Area

SCIENTIFIC COMMITTEE ASSESSMENT REVIEW PROCEDURES FOR BOTTOM FISHING ACTIVITIES

1. The Scientific Committee (SC) is to review identifications of vulnerable marine ecosystems (VMEs) and assessments of significant adverse impact on VMEs, including proposed management measures intended to prevent such impacts submitted by individual Members.

2. Members of the Commission shall submit their identifications and assessments to members of the SC at least 21 days prior to the SC meeting at which the review is to take place. Such submissions shall include all relevant data and information in support of such determinations.

3. The SC will review the data and information in each assessment in accordance with the Science-based Standards and Criteria for Identification of VMEs and Assessment of Significant Adverse Impacts on VMEs and Marine Species (Annex 2), previous decisions of the Commission, and the FAO Technical Guidelines for the Management of Deep Sea Fisheries in the High Seas, paying special attention to the assessment process and criteria specified in paragraphs 47-49 of the Guidelines.

4. In conducting the review above, the SC will give particular attention to whether the deep-sea bottom fishing activity would have a significant adverse impact on VMEs and marine species and, if so, whether the proposed management measures would prevent such impacts.

5. Based on the above review, the SC will provide advice and recommendations to the submitting Members on the extent to which the assessments and related determinations are consistent with the procedures and criteria established in the documents identified above; and whether additional management measures will be required to prevent SAIs on VMEs.

6. Such recommendations will be reflected in the report of the SC meeting at which the assessments are considered.

FORMAT OF NATIONAL REPORT SECTIONS ON DEVELOPMENT AND IMPLEMENTATION OF SCIENTIFIC OBSERVER PROGRAMMES

Report Components

Annual Observer Programme implementation reports should form a component of annual National Reports submitted by members to the Scientific Committee.   These reports should provide a brief overview of observer programmes conducted in the NPFC Convention Area.   Observer programme reports should include the following sections:

A.   Observer Training

An overview of observer training conducted, including:
- Overview of training programme provided to scientific observers.
- Number of observers trained.

B.   Scientific Observer Programme Design and Coverage

Details of the design of the observer programme, including:
- Which fleets, fleet components or fishery components were covered by the programme.
- How vessels were selected to carry observers within the above fleets or components.
- How was observer coverage stratified: by fleets, fisheries components, vessel types, vessel sizes, vessel ages, fishing areas and seasons.

Details of observer coverage of the above fleets, including:
- Components, areas, seasons and proportion of total catches of target species, specifying units used to determine coverage.
- Total number of observer employment days, and number of actual days deployed on observation work.

C.   Observer Data Collected

List of observer data collected against the agreed range of data set out in Annex 5, including:
- Effort Data: Amount of effort observed (vessel days, net panels, hooks, etc), by area and season and % observed out of total by area and seasons

- Catch Data: Amount of catch observed of target and by-catch species, by area and season, and % observed out of total estimated catch by species, area and seasons
- Length Frequency Data: Number of fish measured per species, by area and season.
- Biological Data: Type and quantity of other biological data or samples (otoliths, sex, maturity, etc) collected per species.
- The size of length-frequency and biological sub-samples relative to unobserved quantities.

D. Detection of Fishing in Association with Vulnerable Marine Ecosystems
- Information about VME encounters (species and quantity in accordance with Annex 5, H, 2).

E.   Tag Return Monitoring
- Number of tags returns observed, by fish size class and area.

F.   Problems Experienced
- Summary of problems encountered by observers and observer managers that could affect the NPFC Observer Programme Standards and/or each member's national observer programme developed under the NPFC standards.

NPFC BOTTOM FISHERIES
OBSERVER PROGRAMME STANDARDS: SCIENTIFIC COMPONENT

TYPE AND FORMAT OF SCIENTIFIC OBSERVER DATA TO BE COLLECTED

A. Vessel & Observer Data to be collected for Each Trip

1. Vessel and observer details are to be recorded only once for each observed trip.

2. The following observer data are to be collected for each observed trip:
    a) NPFC vessel ID
    b) Observer's name.
    c) Observer's organisation.
    d) Date observer embarked (UTC date).
    e) Port of embarkation.
    f) Date observer disembarked (UTC date).
    g) Port of disembarkation.

B. Catch & Effort Data to be collected for Trawl Fishing Activity

1. Data are to be collected on an un-aggregated (tow by tow) basis for all observed trawls.

2. The following data are to be collected for each observed trawl tow:
    a) Tow start date (UTC).
    b) Tow start time (UTC).
    c) Tow end date (UTC).
    d) Tow end time (UTC).
    e) Tow start position (Lat/Lon, 1 minute resolution).
    f) Tow end position (Lat/Lon, 1 minute resolution).
    g) Type of trawl, bottom or mid-water.
    h) Type of trawl, single, double or triple.
    i) Height of net opening (m).
    j) Width of net opening (m).
    k) Mesh size of the cod-end net (stretched mesh, mm) and mesh type (diamond, square, etc).
    l) Gear depth (of footrope) at start of fishing (m).
    m)Bottom (seabed) depth at start of fishing (m).

n) Gear depth (of footrope) at end of fishing (m).

o) Bottom (seabed) depth at end of fishing (m).

p) Status of the trawl operation (no damage, lightly damaged*, heavily damaged*, other (specify)). *Degree may be evaluated by time for repairing (<=1hr or >1hr)

q) Duration of estimated period of seabed contact (minute)

r) Intended target species.

s) Catch of all species retained on board, split by species, in weight (to the nearest kg).

t) Estimate of the amount (weight or volume) of all living marine resources discarded, split by species.

u) Record of the numbers by species of all marine mammals, seabirds or reptiles caught.

C. Catch & Effort Data to be collected for Bottom Gillnet Fishing Activity

1. Data are to be collected on an un-aggregated (set by set) basis for all observed bottom gillnet sets.

2. The following data are to be collected for each observed bottom gillnet set:
   a) Set start date (UTC).
   b) Set start time (UTC).
   c) Set end date (UTC).
   d) Set end time (UTC).
   e) Set start position (Lat/Lon, 1 minute resolution).
   f) Set end position (Lat/Lon, 1 minute resolution).
   g) Net panel ("tan") length (m).
   h) Net panel ("tan") height (m).
   i) Net mesh size (stretched mesh, mm) and mesh type (diamond, square, etc)
   j) Bottom depth at start of setting (m).
   k) Bottom depth at end of setting (m).
   l) Number of net panels for the set.
   m) Number of net panels retrieved.
   n) Number of net panels actually observed during the haul.
   o) Actually observed catch of all species retained on board, split by species, in weight (to the nearest kg).
   p) An estimation of the amount (numbers or weight) of marine resources discarded, split by species, during the actual observation.
   q) Record of the actually observed numbers by species of all marine mammals, seabirds or reptiles caught.

r) Intended target species.

s) Catch of all species retained on board, split by species, in weight (to the nearest kg).

t) Estimate of the amount (weight or volume) of all marine resources discarded* and dropped-off, split by species. * Including those retained for scientific samples.

u) Record of the numbers by species of all marine mammals, seabirds or reptiles caught (including those discarded and dropped-off).

D. Catch & Effort Data to be collected for Bottom Long Line Fishing Activity

1. Data are to be collected on an un-aggregated (set by set) basis for all observed longline sets.

2. The following fields of data are to be collected for each set:
   a) Set start date (UTC).
   b) Set start time (UTC).
   c) Set end date (UTC).
   d) Set end time (UTC).
   e) Set start position (Lat/Lon, 1 minute resolution).
   f) Set end position (Lat/Lon, 1 minute resolution).
   g) Total length of longline set (m).
   h) Number of hooks or traps for the set.
   i) Bottom (seabed) depth at start of set.
   j) Bottom (seabed) depth at end of set.
   k) Number of hooks or traps actually observed during the haul.
   l) Intended target species.
   m) Actually observed catch of all species retained on board, split by species, in weight (to the nearest kg).
   n) An estimation of the amount (numbers or weight) of marine resources discarded* or dropped-off, split by species, during the actual observation. * Including those retained for scientific samples.
   o) Record of the actually observed numbers by species of all marine mammals, seabirds or reptiles caught (including those discarded and dropped-off).

E. Length-Frequency Data to Be Collected

1. Representative and randomly distributed length-frequency data (to the nearest mm, with record of the type of length measurement taken) are to be collected for representative samples of the target species and other main by-catch species.   Total weight of length-frequency samples should be recorded, and observers may be required to also determine sex of measured fish to

generate length-frequency data stratified by sex. The length-frequency data may be used as potential indicators of ecosystem changes (for example, see: Gislason, H. et al. (2000. ICES J Mar Sci 57: 468-475), Yamane et al. (2005. ICES J Mar Sci, 62: 374-379), and Shin, Y-J. et al. (2005. ICES J Mar Sci, 62: 384-396)).

2. The numbers of fish to be measured for each species and distribution of samples across area and month strata should be determined, to ensure that samples are properly representative of species distributions and size ranges.

F.   Biological sampling to be conducted (optional for gillnet and long line fisheries)

1. The following biological data are to be collected for representative samples of the main target species and, time permitting, for other main by-catch species contributing to the catch:
   a) Species
   b) Length (to the nearest mm), with record of the type of length measurement used.
   c) Length and depth in case of North Pacific armorhead.
   d) Sex (male, female, indeterminate, not examined)
   e) Maturity stage (immature, mature, ripe, ripe-running, spent)

2. Representative stratified samples of otoliths are to be collected from the main target species and, time permitting, from other main by-catch species regularly occurring in catches.   All otoliths to be collected are to be labelled with the information listed in 1 above, as well as the date, vessel name, observer name and catch position.

3. Where specific trophic relationship projects are being conducted, observers may be requested to also collect stomach samples from certain species.   Any such samples collected are also to be labelled with the information listed in 1 above, as well as the date, vessel name, observer name and catch position.

4. Observers may also be required to collect tissue samples as part of specific genetic research programmes implemented by the SC.

5. Observers are to be briefed and provided with written length-frequency and biological sampling protocols and priorities for the above sampling specific to each observer trip.

G.   Data to be collected on Incidental Captures of Protected Species

1. Flag members operating observer programs are to develop, in cooperation with the SC, lists and identification guides of protected species or species of concern (seabirds, marine mammals or marine reptiles) to be monitored by observers.

2. The following data are to be collected for all protected species caught in fishing operations:
    a) Species (identified as far as possible, or accompanied by photographs if identification is difficult).
    b) Count of the number caught per tow or set.
    c) Life status (vigorous, alive, lethargic, dead) upon release.
    d) Whole specimens (where possible) for onshore identification.   Where this is not possible, observers may be required to collect sub-samples of identifying parts, as specified in biological sampling protocols.

H.   Detection of Fishing in Association with Vulnerable Marine Ecosystems

1. The SC is to develop a guideline, species list and identification guide for benthic species (e.g. sponges, sea fans, corals) whose presence in a catch will indicate that fishing occurred in association with a vulnerable marine ecosystem (VME).   All observers on vessels are to be provided with copies of this guideline, species list and ID guide.

2. For each observed fishing operation, the following data are to be collected for all species caught, which appear on the list of vulnerable benthic species:
    a) Species (identified as far as possible, or accompanied by a photograph where identification is difficult).
    b) An estimate of the quantity (weight (kg) or volume (m^3)) of each listed benthic species caught in the fishing operation.
    c) An overall estimate of the total quantity (weight (kg) or volume (m^3)) of all invertebrate benthic species caught in the fishing operation.
    d) Where possible, and particularly for new or scarce benthic species which do not appear in ID guides, whole samples should be collected and suitable preserved for identification on shore.

I.   Data to be collected for all Tag Recoveries

1. The following data are to be collected for all recovered fish, seabird, mammal or reptile tags:
    a) Observer name.
    b) Vessel name.
    c) Vessel call sign.

d) Vessel flag.

e) Collect, label (with all details below) and store the actual tags for later return to the tagging agency.

f) Species from which tag recovered.

g) Tag colour and type (spaghetti, archival).

h) Tag numbers (The tag number is to be provided for all tags when multiple tags were attached to one fish. If only one tag was recorded, a statement is required that specifies whether or not the other tag was missing)

i) Date and time of capture (UTC).

j) Location of capture (Lat/Lon, to the nearest 1 minute)

k) Animal length / size (to the nearest cm) with description of what measurement was taken (such as total length, fork length, etc).

l) Sex (F=female, M=male, I=indeterminate, D=not examined)

m) Whether the tags were found during a period of fishing that was being observed (Y/N)

n) Reward information (e.g. name and address where to send reward)

(It is recognised that some of the data recorded here duplicates data that already exists in the previous categories of information. This is necessary because tag recovery information may be sent separately to other observer data.)

J.   Hierarchies for Observer Data Collection

2. Trip-specific or programme-specific observer task priorities may be developed in response to specific research programme requirements, in which case such priorities should be followed by observers.

3. In the absence of trip- or programme-specific priorities, the following generalised priorities should be followed by observers:

a) Fishing Operation Information
   - All vessel and tow / set / effort information.

b) Monitoring of Catches
   - Record time, proportion of catch (e.g. proportion of trawl landing) or effort (e.g. number of hooks), and total numbers of each species caught.
   - Record numbers or proportions of each species retained or discarded.

c) Biological Sampling

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- Length-frequency data for target species.
- Length-frequency data for main by-catch species.
- Identification and counts of protected species.
- Basic biological data (sex, maturity) for target species.
- Check for presence of tags.
- Otoliths (and stomach samples, if being collected) for target species.
- Basic biological data for by-catch species.
- Biological samples of by-catch species (if being collected)
- Photos

4. The monitoring of catches and biological sampling procedures should be prioritised among species groups as follows:

Species	Priority (1 highest)
Primary target species (such as North Pacific armorhead and splendid alfonsino)	1
Other species typically within top 10 in the fishery (such as mirror dory, and oreos)	2
Protected species	3
All other species	4

The allocation of observer effort among these activities will depend on the type of operation and setting. The size of sub-samples relative to unobserved quantities (e.g. number of hooks/panels examined for species composition relative to the number of hooks/panels retrieved) should be explicitly recorded under the guidance of member country observer programmes.

K. Coding Specifications to be used for Recording Observer Data

1. Unless otherwise specified for specific data types, observer data are to be collected in accordance with the same coding specifications as specified in this Annex.

2. Coordinated Universal Time (UTC) is to be used to describe times.

3. Degrees and minutes are to be used to describe locations.

4. The following coding schemes are to be used:

a. Species are to be described using the FAO 3 letter species codes or, if species do not have a FAO code, using scientific names.

b. Fishing methods are to be described using the International Standard Classification of Fishing Gear (ISSCFG - 29 July 1980) codes.

c. Types of fishing vessel are to be described using the International Standard Classification of Fishery Vessels (ISSCFV) codes.

5. Metric units of measure are to be used, specifically:

a. Kilograms are to be used to describe catch weight.

b. Metres are to be used to describe height, width, depth, beam or length.

c. Cubic metres are to be used to describe volume.

d. Kilowatts are to be used to describe engine power.