North Pacific Fisheries Commission

NPFC-2023-SC08-Final Report

North Pacific Fisheries Commission
8th Meeting of the Scientific Committee

15-16, 18-19 December 2023

Nanaimo, British Columbia, Canada (Hybrid)

DRAFT REPORT

Agenda Item 1. Opening of the Meeting

1.1 Welcome Address and Introductions

1. The 8th Meeting of the Scientific Committee (SC) was held in a hybrid format, with participants attending in-person in Nanaimo, British Columbia, Canada, or online via WebEx, on 15-16, 18-19 December 2023. The meeting was attended by Members from Canada, China, the European Union (EU), Japan, the Republic of Korea, the Russian Federation, Chinese Taipei, the United States of America (USA) and Vanuatu. The Deep Sea Conservation Coalition (DSCC), the United Nations Food and Agriculture Organization (FAO), the North Pacific Anadromous Fish Commission (NPAFC), the North Pacific Marine Science Organization (PICES), and the Pew Charitable Trusts (Pew) attended as observers.

2. The meeting was opened by Dr. Janelle Curtis (Canada), who served as the SC Chair. She thanked the participants for attending the meeting and wished them happiness and good health. The Chair acknowledged the strong and historic presence of the Snuneymuxw First Nation in Nanaimo, recognized its role as past, present and future custodians of the local lands and waters, and expressed her appreciation to be able to hold the meeting in the traditional and unceded territory of the Snuneymuxw First Nation.

3. Elder Stephanie Thomas of the Snuneymuxw First Nation welcomed the participants to the Snuneymuxw First Nation's territory. She emphasized the importance of the ocean and its resources, noted the need to work as one to protect the ocean and conserve its resources, and wished the participants a successful meeting.

4. Dr. John Holmes, Division Manager, Stock Assessment and Research Division, Science Branch, Fisheries and Oceans Canada, welcomed the participants to Nanaimo. He noted that Canada has been a Member of the NPFC since its inception and expressed Canada's honour to be hosting an NPFC meeting for the first time. Dr. Holmes highlighted the protection of marine

2nd Floor Hakuyo Hall,
Tokyo University of Marine Science and Technology,
4-5-7 Konan, Minato-ku, Tokyo
108-8477, JAPAN

TEL +81-3-5479-8717
FAX +81-3-5479-8718
Email secretariat@npfc.int
Web www.npfc.int

ecosystems as being of particular importance to Canada and expressed his belief that advancing measures to protect marine ecosystems through the Commission would also benefit individual Members and their fisheries. He noted that a new challenge for fisheries scientists, including those of the NPFC, is how to incorporate climate change and ecosystem considerations when providing advice to fisheries managers and emphasized the importance of sharing practices and experiences. Lastly, Dr. Holmes expressed his hope that the meeting would yield fruitful and productive discussions.

5. The Executive Secretary, Dr. Robert Day, welcomed the participants to the meeting. Speaking on behalf of the Commission and its Chair, Mr. Shingo Ota, he thanked Elder Thomas for her welcome and Fisheries and Oceans Canada for hosting the meeting. The Executive Secretary also noted with pleasure that this would be the first in-person SC meeting since the COVID-19 pandemic. Finally, he expressed his hope that the SC would continue to advance its important work and support the continued progress of the NPFC in the lead-up to its 10th anniversary.

1.2 Appointment of Rapporteur

6. Mr. Alex Meyer was selected as rapporteur.

1.3 Meeting Arrangements

7. The Science Manager, Dr. Aleksandr Zavolokin, outlined the meeting arrangements.

Agenda Item 2. Adoption of Agenda

8. The agenda was adopted without revision (Annex A). The List of Documents and List of Participants are attached (Annexes B, C).

Agenda Item 3. Review of the NPFC Performance Review (NPFC PR) Panel Recommendations

3.1 Overview of key recommendations for SC over short term (next 1-5 years)

9. The SC reviewed the NPFC Performance Review recommendations that concern the SC and its subsidiary bodies and compiled a table with a summary of its comments and the comments of its subsidiary bodies on each recommendation (NPFC-2023-SC08-WP04 (Rev. 1)).

10. In reviewing NPFC Performance Review Recommendations 3.1.8, 3.4.3 and 4.2.4, the SC noted the need for a clear definition of what constitutes “bycatch” and recommended that the Commission develop such a definition.

Agenda Item 4. Review of reports and recommendations from the Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA) and the Small Scientific Committees (SSC BF-

ME and SSC PS)

4.1 Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA)

11. The TWG CMSA Chair, Dr. Kazuhiro Oshima (Japan), summarized the outcomes and recommendations of the 7th TWG CMSA meeting (NPFC-2023-TWG CMSA07-Final Report).

12. The SC reviewed the recommendations of the TWG CMSA and endorsed the following recommendations:
    (a) Adopt the Work Plan of the TWG CMSA (NPFC-2023-TWG CMSA07-WP01 (Rev. 1)).
    (b) Endorse the TWG CMSA meeting schedule for 2023-2024 financial years: TWG CMSA08 on 22–25 January 2024 and TWG CMSA09 in 2024.
    (c) Hire an invited expert to support the TWG CMSA in the future stock assessment project.
    (d) Develop general protocols and guidelines for using git repositories for joint data analysis projects.

13. The SC noted that the TWG CMSA will use SAM as the chub mackerel stock assessment model and complete the first assessment in 2024.

14. The SC endorsed the report provided by the TWG CMSA Chair.

4.2 SSC on Bottom Fish and Marine Ecosystems

15. The Chair of the SSC on Bottom Fish and Marine Ecosystems (SSC BF-ME), Dr. Chris Rooper (Canada), summarized the outcomes and recommendations of the 4th SSC BF-ME meeting (NPFC-2023-SSC BFME04-Final Report).

16. The SC reviewed the recommendations of the SSC BF-ME and endorsed the following recommendations:
    (a) Adopt the updated species summaries of North Pacific armorhead (NPA; Annex D), splendid alfonsino (SA; Annex E), sablefish (Annex F), and blackspotted and rougheye rockfishes (Annex G).
    (b) Adopt the Terms of Reference (TOR) for Data Sharing of Catch and Effort Data for Depletion Analysis of North Pacific Armorhead (Annex N) and template for data sharing (Annex O).
    (c) Communicate to the Commission that:
        i. although NPA catch was slightly higher in 2022 than 2021, the catch remains at low levels relative to historical values.
        ii. there are some indications that Japanese fishers have been avoiding catching NPA

since the voluntary catch limit was introduced in 2019.

iii. there has been no indication of high recruitment of NPA detected in the monitoring survey.

iv. SA catch has been about 1/2 of the mean for the last 10 years, but nominal CPUE is only slightly lower than the 10 year average.

(d) Endorse the method proposed by Japan (NPFC-2019-SSC VME04-WP02) as one framework for identifying vulnerable marine ecosystems (VMEs), noting that the density thresholds should be further explored.

(e) Endorse the updated 2023-2027 SSC BF-ME 5-Year Rolling Work Plan (NPFC-2023-SSC BFME04-WP01 (Rev. 1)).

(f) Consider the SSC BF-ME's comments on the NPFC Performance Review recommendations that concern bottom fishing and marine ecosystems (NPFC-2023-SSC BFME04-WP19).

(g) Hire an external expert to support the work of the Small Working Group on North Pacific Armorhead and Splendid Alfonsino (SWG NPA-SA).

(h) Recommend that the Commission close two new areas as VME protection sites on Cobb Seamount as described in NPFC-2023-SSC BFME04-WP13.

(i) Endorse a new interim encounter threshold for sponges of 350 kg.

(j) Endorse encounter thresholds for pot gear of 2 kg for corals and 5 kg for Hexactinellida and Demospongiae in the NE Pacific.

(k) Endorse pennatulaceans as a VME indicator taxa and include pennatulaceans in the encounter threshold of 50 kg for corals.

(l) Endorse the revised CMM 2023-05 (Annex P).

(m) Endorse the revised CMM 2023-06 (Annex Q).

(n) Consider, in cooperation with TCC and the Commission, amending CMM 2023-05 to address the ambiguity around the referenced effort limits agreed in February 2007 in Paragraph 4A and amending CMM 2023-06 to determine the level of a historical average in Paragraph 3, i.

(o) Look for opportunities for collaboration with other organizations such as the FAO ABNJ Deep-sea Fisheries Project, PICES or NPAFC to collect new data (such as biomass estimates from fishery-independent surveys or biological data collections) that would help with stock assessments for bottom fisheries and outstanding issues on VME such as VME recovery.

17. The SC noted the request from the SSC BF-ME to amend the SSC BF-ME's TOR to specifically mention the review and proposal of amendments to CMMs. The SC agreed to revise the TOR as described in Annex R.

18. The SC noted that the SSC BF-ME plans to assess the status of SA in 2024.

19. Based on the most recent stock assessments from the USA and Canada, the SC noted that the sablefish spawning stock biomass has been increasing since about 2018, supported by a large coastwide recruitment in around 2016.

20. The SC endorsed the report provided by the SSC BF-ME Chair.

4.3 SSC on Pacific Saury

21. The Chair of the SSC on Pacific Saury (SSC PS), Dr. Toshihide Kitakado (Japan), summarized the outcomes and recommendations of the 11th and 12th SSC PS meetings (NPFC-2023-SSC PS11-Final Report, NPFC-2023-SSC PS12-Final Report).

22. The SC reviewed the recommendations of the SSC PS and endorsed the following recommendations:
    (a) Endorse the revised TOR of the SSC PS (Annex S).
    (b) Endorse the revised Stock Assessment Protocol (Annex T).
    (c) Endorse the stock assessment report (Annex U).
    (d) Endorse the SSC PS Work Plan (NPFC-2023-SSC PS12-WP01 (Rev. 1)).
    (e) Allocate funds for the participation of an invited expert in the next SSC PS and Working Group on New Stock Assessment Models (WG NSAM) meetings.
    (f) Consider the SSC PS's comments on the NPFC Performance Review recommendations that concern Pacific saury (NPFC-2023-SSC PS12-WP10).
    (g) Consider and endorse the following rationale and approach in its scientific advice to the Commission:
        i. The current biomass is much lower than B_{MSY} and the total allowable catch (TAC) for 2023-2024 may not reduce fishing mortality (F) in those years. A harvest control rule (HCR) that reduces F when biomass is low may increase the probability of achieving long-term sustainable use of Pacific saury (i.e. higher long-term catch closer to MSY of around 396,570 tons). A reduction to the TAC for 2023-2024 would increase the probability of higher long-term biomass and catch levels in the Pacific saury stock.
        ii. Recommend that the Commission, at its 8th meeting, in accordance with its schedule, adopt an interim HCR from the list to be provided by the SWG MSE PS. In case the Commission cannot adopt an interim HCR, the following management recommendation is provided.
        iii. An HCR that reduces the target harvest rate and TAC when biomass falls below its

target level may be appropriate for Pacific saury. This type of HCR is used in managing many fisheries around the world. For example, if an HCR that reduces F linearly when biomass is below B_{MSY} is applied, the TAC calculated based on such an HCR (B_{2023}*F_{MSY}*(B_{2023}/B_{MSY}) = 73,490 tons could be smaller than the current catch. Note, the above HCR is currently being evaluated for management.

iv. The SSC PS noted that a possible TAC catch limit in 2024 calculated by B_{2023}*F_{MSY}*(B_{2023}/B_{MSY}) based on the 2023 assessment would be lower relative to that based on the 2022 assessment, even though biomass in 2023 itself is higher than that in 2022. The SSC PS discussed why this was the case and agreed that the main reason is an overall reduction of scales in biomass estimates in the 2023 assessment relative to that in 2022 because of slight changes in model configurations, use of new abundance indices, and time lag between fishery-independent and dependent abundance indices, particularly that the most recent CPUE data (2023) are not included in the model used to set the current limit in 2024.

v. There is a two-year lag between the collection of fishery data and stock assessment work. There is a one-year lag between the survey and stock assessment work. The condition of the stock may change substantially between collection of data and management so that management measures are less effective or less appropriate. Approaches to reducing the delay should be considered. Such approaches were considered in HCR analysis but were dropped due to time constraints.

23. The SC endorsed the reports provided by the SSC PS Chair.

Agenda Item 5. Report and recommendations from the Joint SC-TCC-COM Small Working Group on Management Strategy Evaluation for Pacific Saury (SWG MSE PS)

24. The co-Chair of the joint SC-TCC-COM Small Working Group on Management Strategy Evaluation for Pacific saury (SWG MSE PS), Dr. Toshihide Kitakado (Japan), informed participants about progress of the SWG MSE PS including the outcomes and recommendations of its 3rd and 4th meetings (NPFC-2023-SWG MSE PS03-Final Report, NPFC-2023-SWG MSE PS04-Final Report).

25. The SC Chair stressed the importance of having management perspectives at the upcoming SWG MSE PS meeting and strongly encouraged Members to have their managers attend the meeting.

Agenda Item 6. Priority species

6.1 Summary of progress on the remaining four priority species

26. The Leads of the Small Working Groups (SWGs) on neon flying squid (NFS), Japanese sardine (JS), Japanese flying squid (JFS), and blue mackerel (BM) reported on the SWGs' intersessional activities, including the relevant outcomes of the 1st and 2nd joint virtual meetings of these SWGs in 2023, in the respective sections below (6.1.1 – 6.1.4). Detailed summaries of the joint SWG meetings are available in NPFC-2023-SC08-WP16 (1st meeting) and NPFC-2023-SC08-WP17 (2nd meeting).

6.1.1 Neon flying squid

27. The SWG NFS Lead, Dr. Luoliang Xu (China), reported on the SWG NFS' intersessional activities. The SWG NFS has met twice intersessionally (as part of the joint meetings of the SWGs on NFS, JFS, JS, and BM). It shared and reviewed Members' catch and effort data; discussed stock assessment model candidates and data requirements, focusing on the surplus production model, depletion model and State space Assessment Model Used for IKA (SAMUIKA); calculated and discussed Members' nominal catch per unit effort (CPUE) and preliminary CPUE standardization work; shared and reviewed spatial information on catch and effort; and reviewed Japan's fishery-independent survey.

6.1.2 Japanese sardine

28. The SWG JS Lead, Dr. Chris Rooper (Canada), reported on the intersessional activities of the SWG JS (NPFC-2023-SC08-WP05). The SWG JS has met twice intersessionally (as part of the joint meetings of the SWGs on NFS, JFS, JS, and BM). It updated and reviewed Members' catch and effort data, discussed catch distribution, reviewed Japan's domestic assessment, prepared an updated species summary, calculated and discussed nominal CPUE using Members' shared data, and discussed the sharing of the code for the Japanese domestic stock assessment within the SWG.

29. The SC noted that Japan and China have shared their length frequency data and length-weight relationship data and requested Russia to also share these data, so that these data can be used to further improve the domestic Japanese sardine stock assessment updated annually by Japan and assist the NPFC in determining the status of this species in the Convention Area.

6.1.3 Japanese flying squid

30. The SWG JFS Lead, Dr. Hajime Matsui (Japan), reported on the SWG JFS' intersessional activities. The SWG JFS has met twice intersessionally (as part of the joint meetings of the SWGs on NFS, JFS, JS, and BM). It updated and reviewed Members' catch and effort data, reviewed Japan's domestic stock assessment models and results, discussed data needs to improve Japan's stock assessment, reviewed the distribution of the winter and autumn

spawning cohorts of JFS, and updated the species summary.

6.1.4 Blue mackerel

31. The SWG BM Lead, Dr. Shota Nishijima (Japan), reported on the SWG BM's intersessional activities. The SWG BM has met twice intersessionally (as part of the joint meetings of the SWGs on NFS, JFS, JS, and BM). It updated the species summary, updated Members' estimated catch and effort, reviewed the feasibility of calculating the proportion of BM and chub mackerel catch by gear, shared and reviewed data on BM fork length and age, reviewed methods for distinguishing BM and chub mackerel, reviewed historical catch and updated the estimate of the proportion of BM and chub mackerel, reviewed Japan's domestic stock assessment, and shared and reviewed BM length frequency data and length-weight relationship data.

32. The SC recommended that the Commission amend CMM 2023-11 For Japanese Sardine, Neon Flying Squid and Japanese Flying Squid to change "spotted mackerel" to "blue mackerel".

33. The SC discussed whether or not it is worthwhile assessing and managing chub and blue mackerel separately. The SC noted that the chub and blue mackerel fisheries are very similar as they are conducted with the same fishing gear and have the same fishing season, and that it is very difficult for fishers to distinguish between the two species. Therefore, from a management perspective, it could be possible to have joint management measures for the two fisheries. On the other hand, the SC also noted that there are differences in the catch distribution of chub and blue mackerels. The mackerel catch can be separated into each species with the ratio of blue mackerel provided from Members in the NPFC stock assessment. Therefore, from a scientific perspective, the two mackerel species should be assessed separately. The SC agreed that this matter could be discussed further when the results of the chub mackerel stock assessment are available.

6.2 Species summaries

6.2.1 Review of priority species summaries

34. The SWG NFS Lead presented the updated species summary document for NFS (NPFC-2023-SC08-WP14 (Rev. 1)).

35. The SC reviewed, further revised, and endorsed the updated species summary document for NFS (Annex H).

36. The SWG JS Lead presented the updated species summary document for JS (NPFC-2023-

SC08-WP06).

37. Regarding the figure on historical JS catch, Japan explained the reason for the large difference in the historical FAO data and the recent data. The historical FAO data contain data from two JS stocks (Tsushima Warm Current stock and Pacific stock), whereas the recent data, which are the data reported by Japan to the NPFC, only contain data on the Pacific stock. Japan suggested that, for consistency, the figure should only include data on the Pacific stock, which is the stock distributed in the Convention Area, and it offered to share these data after the meeting. The SC agreed to Japan's suggestion.

38. The SC reviewed, further revised, and endorsed the updated species summary document for JS (Annex I).

39. The SWG JFS Lead presented the updated species summary document for JFS (NPFC-2023-SC08-WP08).

40. The SC reviewed, further revised, and endorsed the updated species summary document for JFS (Annex J).

41. When reviewing the species summary documents for NFS, JS, and JFS, the SC noted that paragraphs 1 and 2 of CMM 2023-11 for Japanese Sardine, Neon Flying Squid and Japanese Flying Squid do not define the historical existing level of the number of fishing vessels. The SC noted that the TCC and the SWG Planning and Development (SWG PD) are assessing all CMMs to provide greater clarity, including on these paragraphs (and similar paragraphs for other species), while reviewing the Compliance Monitoring Scheme, and the SC expressed its support for these efforts to clarify CMMs.

42. The SWG BM Lead presented the updated species summary document for BM (NPFC-2023-SC08-WP07).

43. The SC reviewed and endorsed the updated species summary document for BM (Annex K).

44. The SC agreed that, like the SSC PS and the TWG CMSA, the subsidiary bodies for NFS, JS, JFS, and BM should include ecosystem considerations and the potential impacts of climate change in future discussions and work.

45. The SC Chair presented the species summary document for Pacific saury (NPFC-2023-SC08-

WP09 (Rev. 2)).

46. The SC reviewed, revised, and endorsed the updated species summary document for Pacific saury (Annex L).

47. The SC requested that the Secretariat create a standalone section on the NPFC website for stock assessment reports so that they can be more easily found and accessed.

48. The TWG CMSA Chair presented the species summary document for chub mackerel (NPFC-2023-SC08-WP15 (Rev. 1)).

49. The SC reviewed and endorsed the species summary document for chub mackerel (Annex M).

6.3 Changes to common and scientific species names

50. The Chair informed the SC that she had consulted a variety of parties on developing a potential process to change the common and scientific names of species used by the NPFC. Based on her consultations, she determined that it would be very challenging to develop a process that would encompass all proposals and circumstances for changing a common and/or scientific species name used by the NPFC.

51. The SC agreed to consider proposed changes to common and scientific species names used by the NPFC on a case by case basis.

6.4 Domestic stock assessments of NFS, JFS, JS, and BM

52. The Chair reminded the SC that, at the 2nd joint meeting of the SWGs on NFS, JFS, JS, and BM in 2023, participants agreed that the results of the domestic stock assessments of JFS, JS and BM conducted by Japan would be observed at SC08, incorporated in the species summary documents, and submitted to the Commission.

53. China presented its preliminary domestic stock assessment of NFS (NPFC-2023-SC08-IP10). China found that El Niño-Southern Oscillation (ENSO) events (Niño indices) heavily affect the distribution and the local and global abundance of NFS in three spatiotemporal models. Thus, Niño indices and related environmental factors should be strongly incorporated in the stock assessment models. The results of China's preliminary stock assessment showed that the status of NFS stock is healthy, although annual fluctuation in biomass has occurred. The projections showed that climate change seems to be beneficial for the NFS, but the biomass would decrease in the traditional fishing ground, increasing the difficulty of fishing in the future.

China also informed the SC that China will mandate the use of electronic logbooks for the NFS fishery from 1 January 2024 and that it will update its related NFS work accordingly.

54. Japan was concerned that CPUE might have been standardized using annual measures of environmental variables related to the productivity of NFS, which has a one-year longevity, and requested China to prepare a paper explaining the details of its CPUE standardization work, including the variables considered, and submit it to the next meeting of the new Small Scientific Committee on Neon Flying Squid (SSC NFS), which SC agreed to establish under Agenda Item 6.6.1.

55. China intends to present a paper explaining the details of its CPUE standardization for NFS at the SSC NFS meeting next year.

56. Russia suggested that China consider incorporating oceanographic conditions in its future NFS stock assessment work.

57. The SC noted that China's preliminary stock assessment indicated that the status of the NFS stock is healthy.

58. Japan presented its domestic stock assessment of JFS (NPFC-2023-SC08-IP06). The estimated total biomass of the winter spawning stock decreased largely from 2015 to 2016 and has remained low since then. The maximum sustainable yield (MSY) based reference points were estimated from the stochastic simulation with the Beverton Holt stock-recruitment (SR) relationship. In 2022, the estimated total biomass was 141,000 MT and spawning stock biomass (SSB) was 49,000 MT. SSB is lower than SSB_{MSY}, and F is lower than F_{MSY} in 2021. In the current stock assessment method, there are uncertainties such as the absolute value of stock abundance estimates.

59. Based on the latest Japanese domestic stock assessment for JFS, the SC noted that the estimated total biomass of the winter spawning stock decreased largely from 2015 to 2016 and has remained low since then, that SSB was lower than SSB_{MSY} and F was lower than F_{MSY} in 2021, and that the estimated total biomass was 141,000 MT and SSB was 49,000 MT in 2022.

60. Japan presented its domestic stock assessment of JS (NPFC-2023-SC08-IP04). Japan conducts its JS stock assessment by the tuned Virtual Population Analysis (VPA) with ridge penalty. The MSY-based reference points were estimated from the stochastic simulation from the normal regime SR relationship of the hockey stick function. In 2022, estimated total biomass

was 4.91 million MT and spawning stock biomass (SSB) was 2.41 million MT, which exceeded SSB_{MSY} (1.19 million MT). The current F (F2020–2022) exceeded F_{MSY}. As future issues, it is necessary to reflect actual age composition for fishes captured outside the Japanese exclusive economic zone (EEZ). Greater consideration of how to treat regimes for future projection and biological reference points (BRPs) is also needed. Furthermore, CPUE standardization should be conducted.

61. China noted that JS may be landed as either targeted catch or bycatch and encouraged Japan to consider how to account for this in its future CPUE standardization work.

62. Based on the latest Japanese domestic stock assessment for JS, the SC noted that SSB exceeded SSB_{MSY} and current F (F2020–2022) exceeded F_{MSY}.

63. Japan presented its domestic stock assessment of BM (NPFC-2023-SC08-IP05). Japan conducts its BM stock assessment by the tuned VPA. The MSY-based reference points were estimated from the stochastic simulation from the Ricker SR relationship. Biomass and SSB have been decreasing since 2011, and recruitment has been much lower than the expectation from the SR relationship. The status in 2021 is that overfishing ($F > F_{MSY}$) is occurring and the stock is overfished ($SSB < SSB_{MSY}$). For future assessments, it is necessary to reflect actual age composition of fishery catch outside the Japanese EEZ. The development and standardization of abundance indices should also be conducted.

64. Based on the latest Japanese domestic stock assessment for BM, the SC noted that biomass and SSB have been decreasing since 2011 and that the status in 2021 is that overfishing ($F > F_{MSY}$) is occurring and the stock is overfished ($SSB < SSB_{MSY}$).

65. The SC noted the usefulness of having information from Members' domestic stock assessments for NFS, JFS, JS, and BM. The SC requested that Japan submit English summaries of its updated domestic stock assessments for JFS, JS, and BM to SC09. The SC agreed that China's updated domestic stock assessment will be reviewed at the SSC NFS.

66. Japan presented a comparison of length-weight relationships (LWR) and catch numbers by size and age between China and Japan for JS and BM (NPFC-2023-SC08-WP11 (Rev. 1)). Japan compared the LWR and catch numbers by size and age between China and Japan, and found that JS caught by the Chinese fishery may be fatter than those caught by the Japanese fishery in 2021 and 2022, while the degree of obesity for BM did not differ much between China and Japan. It also found that fish caught by the Chinese fishery were smaller and probably younger

than those caught by the Japanese fishery for both JS and BM. These differences may reflect size-dependent spatial distributions of JS and BM: large and old fish may be distributed mainly along the Pacific coast of Japan, while only small and young fish may be distributed as far as the NPFC Convention Area. The current domestic stock assessment for the Pacific stocks of JS and BM in Japan assumed that the age composition of foreign catches was identical to that of the northern purse seine fishery in Japan. However, according to the current results, this assumption would be invalid and risky because the Chinese JS and BM fisheries are composed of smaller and younger fish, and the Chinese catch weight and number of JS and BM have been increasing. Continued sharing of data on length-weight relationships and size and age composition in Members' fisheries will be important for accurate estimates of stock abundance and fishery impacts through Japanese domestic stock assessment on those species.

67. Russia noted that its catch of JS has increased in recent years and suggested that it could share its gear-specific length and weight data from its fisheries, length and weight data from its surveys in the Northwestern Pacific Ocean, and, if needed, age data calculated using the Japanese age-length key (ALK).

68. The SC welcomed Russia's input and agreed that these data can be used to further improve the Japanese sardine stock assessment and assist the NPFC in determining the status of this species in the Convention Area.

6.5 Key milestones to achieve for NPFC stock assessments and provision of management advice

69. Canada presented a summary of the current assessment status for NPFC priority species and species that are targeted but not on the priority species list (sablefish, skilfish, rougheye and blackspotted rockfishes) as well as a draft set of standardized activities or milestones to achieve for conducting stock assessments and providing management advice on these species (NPFC-2023-SC08-IP12). Canada also suggested streamlining reporting to Commission from the SC with statements of status for each species, time series of catch and effort for all species, and standardized CPUE or biomass where available; establishing a cycle of an independent review of stock assessments every 5–10 years; and considering collecting fishery catch data through a regional observer program.

70. The summary of the current assessment status for NPFC priority species and sablefish, skilfish, and rougheye and blackspotted rockfishes, and the draft set of standardized activities or milestones to achieve for conducting stock assessments and providing management advice on these species are included as Annex V.

71. The EU and Canada developed and shared draft biological data provision templates for age, ALKs, length, and maturity at age (NPFC-2023-SC08-IP13).

72. The SC requested Members to test the biological data provision templates when submitting data to the SC's subsidiary bodies. The SC tasked its subsidiary bodies to evaluate the templates and present feedback to SC09, as well as to discuss the appropriateness of having a standardized approach for sharing data and present the outcomes of their discussions to SC09.

73. The SC agreed to establish a Small Working Group on Milestones and tasked it to further develop milestones for conducting stock assessments and providing management advice, discuss the potential use of the biological data provision templates, and present the outcomes at SC09.

74. The SC acknowledged that it may be difficult to develop a uniform set of milestones due to the differences among the NPFC priority species and encouraged the Small Working Group on Milestones to endeavor to identify common key steps to work towards to the extent possible.

6.6 Future roles and activities of the SWG NFS, SWG JFS, SWG JS, and SWG BM

75. The SC developed a table of future tasks for the SWG JFS, the SWG JS, the SWG BM and the Small Scientific Committee on Neon Flying Squid, which will supersede the SWG NFS as described in Agenda Item 6.6.1 below (Annex W).

6.6.1 Potential establishment of a new formal SC subsidiary body to focus on NFS

76. The SC agreed to establish a Small Scientific Committee on Neon Flying Squid (SSC NFS) to supersede the SWG NFS.

77. The SC agreed to appoint Dr. Luoliang Xu (China) as the SSC NFS Chair and Dr. Bungo Nishizawa (Japan) as the SSC NFS Vice-Chair.

6.6.2 Scientific project(s) to support CPUE standardization and assessment of NFS

78. The SC agreed that it would be worthwhile hiring a contractor to support the work of the SSC NFS.

6.6.3 Virtual or in-person meetings

79. The SC agreed to hold an initial virtual meeting of the SSC NFS in the intersessional period (in August or September 2024) to develop its TOR and Work Plan.

80. The SC agreed to hold joint virtual meetings of the SWG JFS, SWG JS, and SWG BM in the intersessional period.

Agenda Item 7. Climate change

7.1 Climate change effects on NPFC's priority species and associated ecosystems

81. The Science Manager presented an overview of the NPFC's Resolution on Climate Change and, for reference, potential scientific tasks that Members of South Pacific Regional Fisheries Management Organisation (SPRFMO) have identified in relation to climate change (NPFC-2023-SC08-IP08).

82. Dr. Tony Thompson (FAO) introduced the climate change-related aspects of the Areas Beyond National Jurisdiction (ABNJ) Deep Sea Fisheries (DSF) Project (NPFC-2023-SC08-OP02). The DSF Project would like to fund a consultancy and work with the NPFC on climate change. The consultancy would be guided by NPFC needs and focus on scientific aspects. The DSF Project aims to conduct similar consultancies with a number of regional fisheries management organizations (RFMOs) and eventually support a global workshop to further develop guidance for climate change among RFMOs. The consultancy would aim to summarize potential climate change impacts on managed stocks, non-target species and associated ecosystem; study climate change-related distribution shifts; review the most recent Intergovernmental Panel on Climate Change (IPCC) ocean climate change predictions in the North Pacific; summarize how this may affect the ecosystem and the likely impacts on managed stocks and non-target species; identify any new data requirements needed to detect and monitor climate-related changes; and consider how to integrate climate change effects into stock assessments and fishery management advice.

83. The SC agreed to continue to communicate with the FAO on developing a climate-change-related consultancy.

84. The Executive Secretary of the North Pacific Marine Science Organization (PICES), Dr. Sonia Batten, provided an overview and an update on the Basin-scale Events to Coastal Impacts (BECI) project (NPFC-2023-SC08-OP01). BECI has been endorsed by the United Nations Decade of Ocean Science and its objective is to implement an international ocean intelligence system of monitoring, research and analytical approaches that provides timely advice to decision-makers about the impact of current and future climate conditions on socio-ecological systems. Major components of the project are modeling; data mobilization; observation and monitoring; targeted at-sea research; and outreach, communication and coordination. In 2023, BECI convened a science plan development workshop and it is aiming to make a funding

announcement for an initial BECI project office and to appoint a Science Director to lead the development and implementation of BECI within this year. In 2024, BECI is aiming to establish its science plan and distribute it for comments, as well as to build an implementation plan and collaboration network.

7.1.1 Current knowledge

7.1.2 Ongoing research activities

85. China presented an overview of surveys conducted from 2021 to 2023 by Chinese research vessel "Song Hang" in the Northwestern Pacific Ocean in the NPFC Convention Area (NPFC-2023-SC08-WP12). This comprehensive program covers fisheries resources, larval-juvenile fish, plankton, and environmental surveys and has collected fundamental data and biological tissue samples that could improve understanding of the marine ecosystem in that part of the Convention Area. China welcomed any comments and suggestions for improving the survey, and invited participants to attend a workshop on survey design optimization for 2024 that will be held in March 2024 in Shanghai. China offered to financially support the travel of 1-2 participants from NPFC Members and other relevant experts.

86. Members provided some comments on the research surveys conducted by China and welcomed China's effort to collect more data on fisheries resources and marine ecosystems in the Convention Area.

7.1.3 Research priorities and potential scientific projects for SC

87. The DSCC presented an overview of the research project "Defying Dissolution: Deep-sea Scleractinian Reefs in the North Pacific" (NPFC-2023-SC08-IP14). Scleractinian reefs were discovered below the aragonite saturation horizon (ASH) in the North Pacific. This may be because the ASH has shoaled since formation due to ocean acidification. To test this hypothesis, research cruises were conducted in fall 2021 and fall 2022. The cruises included species distribution studies, species distribution and habitat suitability modeling, carbonate chemistry and dissolution experiments, and other research activities. Depth analyses are ongoing and the preliminary results will be presented at Ocean Sciences in February 2024.

88. Canada presented an overview of a research proposal (NPFC-2023-SC08-IP07) it has submitted to Canada's Competitive Science Research Fund (CSRF) to study the cumulative impacts of climate vulnerability and significant adverse impacts (SAIs) caused by bottom-contact fishing on vulnerable marine ecosystems (VMEs) in the NPFC Convention Area, specifically the Cobb-Eickelberg seamount chain in the Northeastern Pacific Ocean. The project is aimed at advancing progress on defining SAI, assessing the cumulative risks of SAIs

to VMEs caused by bottom-contact fishing and anticipated climate-induced changes, and using spatial optimization software to identify climate-resilient VMEs and potential VMEs to protect from SAIs.

Agenda Item 8. Data Collection and Management

8.1 Data Management System

89. The Data Coordinator, Mr. Sungkuk Kang, and a postdoctoral researcher under the NPFC Internship Program, Dr. Jihwan Kim, reported on the progress in the development of the SC-related data management system (NPFC-2023-SC08-IP03). The Data Coordinator explained updates to the Members Home, Significant dates/Events, Pacific Saury Weekly Report, Collaboration, and Annual reports sections, as well as updates to the NPFC GIS Map to include Pacific saury catch and effort data with sea surface temperature per 1 x 1 degree grid from 1994 to 2022. The NPFC Intern reported on the progress in the development of an NPFC neon flying squid map that will be similar to the Pacific Saury Catch and Effort Map, and invited Members to provide suggestions before the map is deployed on the Members' section of the NPFC website.

90. The SC noted that the NPFC Performance Review Panel had recommended developing GIS maps with catch and effort data for NFS, JS and JFS. The SC agreed that it could be useful to create such maps for NFS and JS. In the case of the JFS, the SC agreed that it may not be worthwhile as the JFS catch in the Convention Area is small and only taken by one Member.

91. The SC also discussed the distinction between the sharing of data for scientific analyses and stock assessment work within a scientific group of experts, and the displaying/visualization of data, for example on maps, for all NPFC Members. The SC agreed that, for scientific analyses and stock assessment work, data should be shared at the finest resolution possible. The SC agreed that the display/visualization could be done at coarser resolutions. The SC also noted that the appropriate resolution for displaying/visualizing data may differ by fisheries.

92. The SC requested the SSC NFS and the SWG JS to discuss whether it would be useful to create GIS maps with catch and effort data for NFS and JS. The SC agreed that, if the SSC NFS and/or the SWG JS determine that such maps would be useful, the SC would seek the Commission's guidance on how to present the data.

93. The Data Coordinator presented an overview of GIT repository options provided by GitHub and GitLab (NPFC-2023-SC08-WP13) and invited Members to indicate their preferences.

94. The SC expressed its preference for the GitHub Team plan. The SC requested the Secretariat to continue its discussions with GitHub to see if it is possible for the NPFC to utilize the GitHub Team Plan for free as a non-profit organization and report to TWG CMSA08 in January 2024.

95. The SC requested the Secretariat to develop guidelines and a manual for using GitHub in cooperation with Members. The SC encouraged Members to share any other resources that may be useful and requested the Secretariat to compile them into a list.

8.2 NPFC Data Sharing and Data Security Protocol

96. The Data Coordinator outlined the NPFC Data Sharing and Data Security Protocol that was developed and adopted by the Commission at its 7th meeting.

8.2.1 Revision of Regulations for Management of Scientific Data and Information

97. The Science Manager presented proposed revisions to the Regulations for Management of Scientific Data and Information to align it with the NPFC Data Sharing and Data Security Protocol (NPFC-2023-SC08-WP10).

98. The SC reviewed and endorsed the proposed revisions (Annex X).

8.3 Data needs, data gaps, and strategies to fill gaps

8.3.1 Information about species belonging to same ecosystem or dependent/associated with target stocks

99. The Chair reminded the SC that, in accordance with Article 10, paragraph 4(d), one of the functions of the SC shall be to assess the impacts of fishing activities on fisheries resources and species belonging to the same ecosystem or dependent upon or associated with the target stocks. She further pointed out that the NPFC Performance Review Panel has recommended that the SC and TCC should coordinate formal efforts to collect standardized data and validate bycatch of associated and dependent species, and that the SC develop strategies that address the lack of information needed to take ecosystem considerations into account for NPFC pelagic fisheries in the Convention Area, and include these in the SC's Research Plan, data collection procedures and obligations. The Chair also reminded the SC that SC06 agreed that the establishment of an observer program in the NPFC Convention Area would facilitate the collection of more data for such non-targeted species, as well as for NPFC priority species.

100. The SC agreed that it would be useful to have Members' historical information about discarded bycatch from the Convention Area. The SC requested Members to identify whether they have any historical information about species captured in surveys and/or discarded bycatch from

their fisheries in the Convention Area and to present summaries of such information to the relevant SC subsidiary body. The SC tasked its subsidiary bodies to review this information and report any potential impacts on species belonging to same ecosystem or dependent/associated with target stocks during SC09.

8.3.2 Potential roles of regional observer program or e-monitoring

101. The SC noted that its subsidiary bodies have identified some of the data needs and data gaps that could be filled by a regional observer program. The SC tasked its subsidiary bodies to review and update such data needs and gaps in light of advances in their scientific analyses and stock assessment work. The SC also tasked its subsidiary bodies to discuss the structure of a potential regional observer program, such as necessary levels of coverage by fishery and gear type. The SC agreed that these tasks would be a lower priority for the SSC PS and the TWG CMSA as they are currently working on the high priority tasks of the Pacific saury management strategy evaluation and the chub mackerel stock assessment, respectively.

102. The SC reaffirmed the scientific value of having a regional observer program. At the same time, some Members noted that the establishment of a regional observer program could be challenging and take a significant amount of time and suggested that Members' domestic observer programs could fill many of the data needs and gaps that have been identified. Other Members pointed out that it is difficult for Members to evaluate whether data collected by each other's observer programs are representative of the fished stock. The SC noted that the EU presented a template for collecting qualitative information about Members' sampling programs at TWG CMSA07. The SC requested the EU to share this template with Members and requested Members to fill it out and submit it to the relevant subsidiary bodies.

103. The SC noted that there remain some technical issues with electronic monitoring that require further discussion.

104. The EU pointed that a regional observer program and electronic monitoring are separate, albeit complementary, matters and that the SC should take care to distinguish between the two in its discussions. The logistical challenges associated with implementing a regional electronic monitoring program significantly add to the complexity of a scientific data collection initiative and might impede the discussions of traditional and well-established data collection methods such as observer programs.

Agenda Item 9. Scientific projects for 2024

9.1 Ongoing/planned projects

9.2 New projects

9.3 Review and prioritization of projects

105. The Science Manager presented a draft list of scientific projects that were discussed during the meetings of the SC and its subsidiary bodies (NPFC-2023-SC08-WP01 (Rev. 1)).

106. The SC agreed that capacity building within Members was important and support for scientists to attend training and meetings should be supported as much as possible. The SC agreed to add a new project to the list: "Other science meetings / capacity development." With that support would come an obligation to transmit the skills and knowledge to the SC through reports, workshops, or shared scientific products (e.g. modeling methods or code).

107. The SC reviewed the list of proposed scientific projects and endorsed it for consideration by the Commission (Annex Y).

108. The Science Manager presented a special project to be sponsored by the Special Project Fund which is to hire an expert in the use of data limited methods in stock assessment to assist the SWG NPA-SA in conducting an assessment of the SA and possibly NPA stocks in the Emperor Seamounts as recommended by SSC BF-ME04 (NPFC-2023-SC08-IP11). The Secretariat, in cooperation with the Chair of SSC BF-ME04, will prepare a proposal and submit it to the Finance and Administration Committee (FAC) for consideration.

109. The SC recommended that the FAC endorse this as a special project.

Agenda Item 10. Cooperation with other organizations

110. The Science Manager outlined a compiled list of cooperation opportunities and requests from other organizations, for consideration by the SC (NPFC-2023-SC08-IP02).

10.1 Reports on the joint NPFC-PICES activities since the SC07 meeting, including a report from the PICES Secretariat

111. Dr. Sonia Batten (PICES), reported on recent and upcoming planned joint activities between PICES and NPFC (NPFC-2023-SC08-OP01), highlighting the following:

(a) Participation by NPFC and PICES representatives at each other's annual meetings

(b) NPFC representation to the joint PICES-ICES Working Group (WG) on Small Pelagic Fish (WG 43)

(c) Involvement by some NPFC scientists, including the Chair of the NPFC SC, in the Working Group on the Ecology of Seamounts (WG 47)

(d) Co-sponsoring of a PICES-ICES-FAO symposium, "Small Pelagic Fish: New Frontiers

in Science and Sustainable Management" in 2022

(e) Co-sponsoring of a topic session, "Environmental variability and small pelagic fishes in the North Pacific: exploring mechanistic and pragmatic methods for integrating ecosystem considerations into assessment and management" by the NPFC at the PICES-2022 Annual Meeting in Busan, Korea in September 2022

(f) Co-convening of a hybrid workshop at PICES-2022 with members of WG47 on "Distributions of pelagic, demersal and benthic species associated with seamounts in the North Pacific Ocean and factors influencing their distributions"

(g) Co-sponsoring of a topic session, "S14: BIO Topic Session Seamount biodiversity: vulnerable marine ecosystems (VMEs) and species associated with seamounts in the North Pacific Ocean," at PICES-2023 in Seattle, USA.

(h) Agreement by the NPFC and PICES to hold a joint international course/workshop on VME indicator taxa identification, and approval of financial contributions of US$15,000 from each organization (postponed)

(i) Revision of the NPFC-PICES Framework for Enhanced Scientific Collaboration to plan the next phase

(j) Workshop in February 2024 to begin planning of the Small Pelagic Fish-2026 Symposium

(k) Holding of PICES-2024 in Honolulu, USA

(l) Endorsement of the BECI project by NPFC

112. The Science Manager reminded the SC that the planned joint international course/workshop on VME indicator taxa identification was first postponed because of the COVID-19 and subsequently further postponed due to difficulty finding a host for the course/workshop, which should be conducted in person. The course/workshop has since been removed from the SC's list of scientific projects, but can be restored when the SC determines it to be appropriate to do so.

10.2 SC representation at PICES meetings

10.2.1 SC representation in the Joint ICES-PICES WGSPF

113. Dr. Chris Rooper (Canada) provided a report on the activities of the joint PICES-ICES Working Group on Small Pelagic Fish in 2023 of relevance to the NPFC (NPFC-2023-SC08-IP15). These include:

(a) Two special issues in *Canadian Journal of Fisheries and Aquatic Sciences* (CJFAS) and *Marine Ecology Progress Series* (MEPS) resulting from the PICES-ICES-FAO symposium, "Small Pelagic Fish: New Frontiers in Science and Sustainable Management" conducted in 2022

(b) Plans to hold a small report writing workshop in February 2024 in La Paz, Mexico

(c) Proposal of a new PICES WG to jointly collaborate with the ongoing ICES WG
(d) Plans to hold a PICES topic session on advances in observational, analytical, and modeling tools that lead to better observations and improved understanding of small pelagic fish at the PICES Annual Meeting in 2024
(e) Plans to hold a Small Pelagic Fish symposium in spring 2026 in La Paz, Mexico

10.2.2 Report on PICES' topic session on VMEs and Seamounts

114. Ms. Devon Warawa (Canada) provided a report on the PICES S14: BIO Topic Session – "Seamount biodiversity: VMEs and species associated with seamounts in the North Pacific Ocean" and the business meeting of PICES WG47 on Ecology of Seamounts (NPFC-2023-SC08-IP16). At the topic session, the invited speaker, Dr. Ashley Rowden, presented a paper on "Methods and challenges for identifying VMEs and monitoring biodiversity on seamounts: a personal perspective from the South Pacific Ocean." There were also presentations by NPFC scientists on topics such as association analysis of seamount benthos for identifying the validity of VME indicator taxa; visual surveys and distribution models to identify VMEs in the Convention Area; distribution, abundance and size structure of deep-sea corals and sponges in the Northeastern Pacific Ocean, and a study from the Emperor Seamounts of environmental DNA as a potential tool for understanding demersal ichthyofauna in seamounts. The PICES WG47 business meeting discussed the WG's TOR and exchanged information and ideas about participants' seamount research activities.

10.2.3 Selecting SC representatives to PICES 2024

115. The Chair reminded the SC of the criteria and process it agreed on at SC07 for selecting an SC representative to PICES 2024 and encouraged Members to submit nominations in the intersessional period.

10.3 Report on cooperation between NPFC and NPAFC

116. The Deputy Director of NPAFC, Dr. Ricardo Federizon, presented the current status of the Five-year Work Plan to implement the NPAFC/NPFC Memorandum of Cooperation (NPFC-2023-SC08-OP03 (Rev. 1)) with commentary from the NPAFC.

117. The SC welcomed the continued collaboration between the NPFC and the NPAFC to implement their Memorandum of Cooperation.

10.4 FAO ABNJ Deep-sea fisheries project

118. Dr. Tony Thompson (FAO) presented an update on the ABNJ DSF Project (NPFC-2023-SC08-OP02). The work of the project has four main components: strengthening and implementing

regulatory frameworks, strengthening effective management of deep-sea fisheries, improving understanding and management of cross-sectoral interactions on deep-sea fisheries, and knowledge management and communication. The DSF Project would like to support a number of regional studies to review modalities for incorporating climate change effects into the work of deep-sea RFMOs, including the NPFC. The DSF Project would also like to partner with the ICES to assess data-limited stocks, such as SA and NPA, and monitor rapid change and would like suggestions from NPFC of stock experts that would like to join this initiative. The DSF Project will hold a symposium in 2025 on the "Application of the Ecosystem Approach to Fisheries Management in ABNJ – recent development in the monitoring, assessment and mitigation of ecosystem impacts of fisheries." The DSF Project is also reviewing the implementation of the FAO DSF Guidelines and will develop and publish the final draft in the FAO Fisheries and Aquaculture Technical Paper series in early 2024. The DSF Project thanks NPFC for its continued partnership with the DSF Project and looks forward to developing concrete joint activities to contribute to strengthened global fisheries management and protection of biodiversity in the ABNJ. To facilitate further progress, the DSF Project requests the NPFC to identify contact people for climate change work, data-limited stock assessments, and the ecosystem approach to fisheries management (EAFM) framework and symposium.

119. The SC identified the following points of contact for the DSF Project:
    (a) Climate change work: Dr. Erin Bohaboy (USA)
    (b) Data-limited stock assessment of SA and NPA: Dr. Takehiro Okuda (Japan)
    (c) EAFM framework and symposium: The NPFC Secretariat

10.5 Partnership with the Fisheries and Resources Monitoring System of FAO (FIRMS)

120. Dr. Aureliano Gentile (FAO) provided an overview of the FAO Blue Transformation strategy and an overview and update on the partnership between FIRMS and NPFC (NPFC-2023-SC08-OP04). The FAO Blue Transformation is a vision to expand aquatic food systems and increase their contribution to better production, better nutrition, better environment and better life. FIRMS was launched in 2004 to provide decision makers and others with high quality, authoritative information on global marine fisheries resources to develop informed fisheries and marine resource policies. FIRMS has steadily grown its membership as well as its information base and has now operationalized comprehensive reporting and developed a number of tools and products, such as the Global Record of Stocks and Fisheries (GRSF) areas database, an inventory of fishery management units, an inventory of fishing units, the FIRMS Global Tuna Atlas, regional databases on catch and effort. FIRMS Partners have also established core concepts, definitions, and data presentation formats and standards. In terms of recent key developments, FIRMS held a Steering Committee meeting to deliberate strategic

decisions for the next decade, is working on updating the FIRMS system, and is working to support SDG Indicator 14.4.1 (proportion of fish stocks within biologically sustainable levels). As for the NPFC's role in FIRMS, as a new Partner and data provider, NPFC is instrumental to increase the monitoring of the North Pacific region with data coverage and information, and with networking and flagging other opportunities for partnership.

121. The NPFC is invited to take part in assigning unique identifiers to NPFC stocks and fisheries and informing about the North Pacific fish stock structure; the FIRMS dissemination of the stock-by-stock disaggregation of the State of World Fisheries and Aquaculture (SOFIA) index, which will combine public data provided by RFBs and non-public data from the SDG14.4.1 Questionnaire and other national sources; contribute to the newly borne FAO sub-Committee on fisheries management; contribute to the GRSF Area database from the Member level; and contribute to the development of FIRMS information standards.

122. The SC welcomed the progress made so far in the partnership between NPFC and FIRMS and the plans for moving forward.

10.6 Partnership with WCPFC and ISC

123. On behalf of Dr. John Holmes, the Chair of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean (ISC), Ms. Sarah Hawkshaw (Canada) reported on progress towards concluding a Memorandum of Understanding (MOU) between the NPFC and the ISC (NPFC-2023-SC08-OP05). A draft MOU developed by the NPFC Executive Secretary was presented for discussion at ISC23 Plenary meeting held in July 2023 in Kanazawa, Japan. The MOU focuses on mutual interests, including exchanging data and scientific information in support of the work and objectives of both organizations; collaborating on research efforts relating to species and stocks of mutual interest; exchanging expertise gained, lessons learned and use of best practices in their areas of activity; and granting reciprocal observer status to representatives of the respective organizations in relevant meetings. The ISC Plenary was supportive of the MOU in general but sought to address some concerns. The ISC Chair is proposing changes based on the ISC Plenary's input. The ISC Chair and the NPFC Executive Secretary will work together to put in place language acceptable to both and the revised MOU will be presented for approval by each organization at the next available opportunity (NPFC: April 2024; ISC: June 2024).

124. The Executive Secretary informed the SC that the Western and Central Pacific Fisheries Commission (WCPFC) recently held its annual meeting, where it reviewed the draft MOU submitted by the NPFC and proposed revisions, and that the WCPFC is expected to submit a

revised proposal to NPFC in due course.

10.7 Partnership with SPRFMO

125. The Executive Secretary informed the SC that, following the 7th meeting of the Commission, the NPFC has signed an MOU with SPRFMO to facilitate consultation, cooperation, and collaboration between the two organizations.

10.8 Cooperation with other organizations

126. There was no discussion of cooperation with any other organizations.

Agenda Item 11. SC Terms of Reference (TOR) and 2024-2028 Research Plan and Work Plan

11.1 Review of the SC TOR

127. The SC reviewed its TOR and determined that no revisions are currently needed.

11.2 Five-year Research Plan

11.3 Five-year Work Plan

128. The SC reviewed and updated its 2023-2027 Five-Year Rolling Research Plan (NPFC-2022-SC08-WP02) and Work Plan (NPFC-2023-SC08-WP03 (Rev. 1)). The updated Research Plan and the Work Plan of the SC and its subsidiary bodies are attached as Annex Z.

11.4 Progress on addressing NPFC PR recommendations for SC

129. The SC's progress on addressing the NPFC Performance Review Panel's recommendations, as well as the SC's ongoing and future actions, are described in NPFC-2023-SC08-WP04 (Rev. 1).

Agenda Item 12. Other Matters

12.1 Coordination between SC and TCC

130. The Compliance Manager, Ms. Judy Dwyer, provided an update on the compliance program (NPFC-2023-SC08-IP09). She explained the current observer requirements as stipulated in the Convention and three CMMs, including the establishment of a regional observer and/or electronic monitoring program no later than COM09 for transshipment, and informed the SC that the SWG PD has had preliminary conversations on the development of a broader observer program that would also collect data on NPFC's pelagic fisheries. To ensure the data collected meet the SC's objectives, SC input will be needed to design the program, including in relation to scientific objectives, structure, minimum observer qualifications, data collection forms, training, certification, required coverage levels, operations, and data collection/reporting. The Compliance Manager also outlined the compliance-related recommendations from the NPFC

Performance Review Panel, as well as three new CMMs adopted by the Commission: a revised CMM on transshipment and new CMMs on sharks and marine pollution. In addition, the Compliance Manager reported on the launch and ongoing implementation of the NPFC Vessel Monitoring System (VMS) and pointed out that the related CMM (2023-12) also envisions potential use of the VMS to support scientific purposes.

131. The FAO suggested that it may be able to provide or help the NPFC develop a key for shark identification. The SC thanked the FAO for the offer.

132. The SC suggested it may be worthwhile for the SC Chair and the TCC Chair to hold periodic meetings, and, as appropriate, to include the Science Manager and the Compliance Manager, as well as the Chairs and leads of the subsidiary bodies of the SC and the TCC.

133. Based on the discussions above, the SC identifies the following as matters for coordination between the SC and the TCC and requests the Secretariat to inform the TCC of:
    (a) The SC supports the efforts of the TCC and the SWG PD to seek clarification on CMM 2023-11 for Japanese Sardine, Neon Flying Squid and Japanese Flying Squid to address the fact that paragraphs 1 and 2 do not define the historical existing level of the number of fishing vessels, and similar paragraphs in other CMMs.
    (b) The SC intends to work in cooperation with TCC and the Commission to amend CMM 2023-05 to address the ambiguity around the referenced effort limits agreed in February 2007 in Paragraph 4A and to amend CMM 2023-06 to determine the level of a historical average in Paragraph 3, i.
    (c) The SC will continue to discuss data needs and data gaps that could be filled by a regional observer program as described in paragraph 101 and inform the TCC about progress in these developments.

12.2 Other Matters

134. The SC reviewed the current list of NPFC priority species. The SC agreed that priority species should be species that are targeted or that are captured in large abundances in the Convention Area and therefore warrant prioritization for the provision of scientific advice. Based on this understanding, the SC recommended that the Commission add sablefish and skilfish to the list of NPFC priority species.

Agenda Item 13. Advice and recommendations to the Commission

135. Based on the recommendations from its SSCs, the TWG CMSA, and its SWGs, the SC recommends that the Commission:

(a) Develop a clear definition of what constitutes “bycatch.”
(b) Endorse its 5-Year Rolling Research and Work Plans (Annex Z).
(c) Endorse the proposed scientific projects (Annex Y).
(d) Consider the species summary documents as reference information when taking decisions on the management of the NPFC priority species (Annexes D-M), including the information about the trends in catch and effort and other scientific information relevant to management of NPA and SA and the information about domestic stock assessments in the species summaries for JFS, JS and BM.
(e) Consider the scientific meetings schedule for 2024 as described in paragraph 138.

Chub Mackerel

(f) Allocate funds for the participation of an invited expert in the TWG CMSA meetings to support the TWG CMSA in the stock assessment project (Scientific Projects, Annex Y).

Bottom Fish and Marine Ecosystems

(g) Endorse the proposed revisions to CMM 2023-05 (Annex P), including:
  i. A new interim encounter threshold for sponges of 350 kg based on analyses of fishery bycatch data.
  ii. Additional group of cold water corals, pennatulaceans, as a VME indicator taxa.
  iii. Modified nomenclature for cold water corals to reflect recent taxonomy revisions.
(h) Endorse the proposed revisions to CMM 2023-06 (Annex Q), including:
  i. A new interim encounter threshold for sponges of 350 kg for fishing gears other than pots based on analyses of fishery bycatch data.
  ii. Additional group of cold water corals, pennatulaceans, as a VME indicator taxa.
  iii. Modified nomenclature for cold water corals to reflect recent taxonomy revisions.
  iv. Encounter thresholds for pot gear of 2 kg for corals and 5 kg for sponges.
  v. Close two new areas as VME protection sites on Cobb Seamount.
(i) Note that:
  i. Although NPA catch was slightly higher in 2022 than 2021, the catch remains at low levels relative to historical values.
  ii. There are some indications that Japanese fishers have been avoiding targeting NPA since the encouraged catch limit was introduced in 2019.
  iii. There has been no indication of high recruitment of NPA detected in the monitoring survey.
  iv. SA catch has been about 1/2 of the mean for the last 10 years, but nominal CPUE is only slightly lower than the 10 year average.
(j) Consider, in cooperation with the SC and the TCC, amending CMM 2023-05 to address the ambiguity around the referenced effort limits agreed in February 2007 in Paragraph 4A and amending CMM 2023-06 to determine the level of a historical average in

Paragraph 3, i.

Pacific Saury

(k) Endorse the stock assessment report (Annex U).

(l) Consider the following to improve conservation and management of Pacific saury:

i. The current biomass is much lower than B_{MSY} and the TAC for 2023-2024 may not reduce fishing mortality (F) in those years. An HCR that reduces F when biomass is low may increase the probability of achieving long-term sustainable use of Pacific saury (i.e. higher long-term catch closer to MSY of around 396,570 tons). A reduction to the TAC for 2023-2024 would increase the probability of higher long-term biomass and catch levels in the Pacific saury stock.

ii. At the 8th Commission meeting, in accordance with its schedule, adopt an interim HCR from the list to be provided by the SWG MSE PS. In case the Commission cannot adopt an interim HCR, the following management recommendation is provided.

iii. An HCR that reduces the target harvest rate and TAC when biomass falls below its target level may be appropriate for Pacific saury. This type of HCR is used in managing many fisheries around the world. For example, if an HCR that reduces F linearly when biomass is below B_{MSY} is applied, the TAC calculated based on such an HCR ($B_{2023}*F_{MSY}*(B_{2023}/B_{MSY})$ = 73,490 tons could be smaller than the current catch. Note, the above HCR is currently being evaluated for management.

iv. The SSC PS noted that a possible TAC catch limit in 2024 calculated by $B_{2023}*F_{MSY}*(B_{2023}/B_{MSY})$ based on the 2023 assessment would be lower relative to that based on the 2022 assessment, even though biomass in 2023 itself is higher than that in 2022. The SSC PS discussed why this was the case and agreed that the main reason is an overall reduction of scales in biomass estimates in the 2023 assessment relative to that in 2022 because of slight changes in model configurations, use of new abundance indices, and time lag between fishery-independent and dependent abundance indices, particularly that the most recent CPUE data (2023) are not included in the model used to set the current limit in 2024.

v. There is a two-year lag between the collection of fishery data and stock assessment work. There is a one-year lag between the survey and stock assessment work. The condition of the stock may change substantially between collection of data and management so that management measures are less effective or less appropriate. Approaches to reducing the delay should be considered. Such approaches were considered in HCR analysis but were dropped due to time constraints.

(m) Allocate funds for the participation of an invited expert in the next SSC PS and WG NSAM meetings (Scientific Projects, Annex Y).

Other Priority Species

(n) Add sablefish and skilfish to the list of NPFC priority species.

(o) Amend CMM 2023-11 to change “spotted mackerel” to “blue mackerel.”

Data Sharing

(p) Adopt the revised Regulations for Management of Scientific Data and Information (Annex X).

(q) Update the data shared by the SC, TWG CMSA, SSC BF-ME, SSC PS, SSC NFS including subsidiary SWGs JFS, JS and BM, in accordance with their Work Plans.

Performance Review

(r) Note that the SC reviewed the Performance Review recommendations and provided comments on SC-related recommendations (NPFC-2023-SC08-WP04 (Rev. 1)).

136. In relation to other tasks for the SC specified in CMMs and the Convention, the SC informs the Commission of the following:

(a) The SC agreed to establish a Small Working Group on Milestones and tasked it to further develop milestones for conducting stock assessments and providing management advice (Annex V), and discuss the potential use of the biological data provision templates.

Chub Mackerel

(b) The SC will develop general protocols and guidelines for using GIT repositories for joint data analysis projects.

(c) The TWG CMSA will use SAM as the chub mackerel stock assessment model and complete the first assessment in 2024.

Bottom Fish and Marine Ecosystems

(d) The SC adopted the TOR for Data Sharing of Catch and Effort Data for Depletion Analysis of North Pacific Armorhead (Annex N) and template for data sharing (Annex O).

(e) The SC revised the TOR for the SSC BF-ME as described in Annex R.

(f) The SC endorsed the method proposed by Japan (NPFC-2019-SSC VME04-WP02) as one framework for identifying VMEs, noting that the density thresholds should be further explored.

(g) The SC will look for opportunities for collaboration with other organizations such as the FAO ABNJ Deep-sea Fisheries Project, PICES or NPAFC to collect new data (such as biomass estimates from fishery-independent surveys or biological data collections) that would help with stock assessments for bottom fisheries and outstanding issues on VME such as VME recovery.

(h) The SSC BF-ME plans to assess the status of SA in 2024.

(i) Based on the most recent sablefish stock assessments from the USA and Canada, the SC

noted that the spawning stock biomass has been increasing since about 2018, supported by a large coastwide recruitment in around 2016.

Pacific Saury

(j) The SC endorsed the revised TOR of the SSC PS (Annex S).

(k) The SC endorsed the revised Stock Assessment Protocol for Pacific Saury (Annex T).

Other Priority Species

(l) The SC noted that China's preliminary stock assessment indicated that the status of the NFS stock is healthy.

(m) Based on the latest Japanese domestic stock assessment for JFS, the SC noted that the estimated total biomass of the winter spawning stock decreased largely from 2015 to 2016 and has remained low since then, that SSB was lower than SSB_{MSY} and F was lower than F_{MSY} in 2021, and that the estimated total biomass was 141,000 MT and SSB was 49,000 MT in 2022.

(n) Based on the latest Japanese domestic stock assessment for JS, the SC noted that SSB exceeded SSB_{MSY} and current F (F2020–2022) exceeded F_{MSY}.

(o) Based on the latest Japanese domestic stock assessment for BM, the SC noted that biomass and SSB have been decreasing since 2011 and that the status in 2021 is that overfishing ($F > F_{MSY}$) is occurring and the stock is overfished ($SSB < SSB_{MSY}$).

(p) The SC agreed to establish the SSC NFS to supersede the SWG NFS.

Data Collection and Sharing

(q) The SC will continue to develop biological data provision templates for age, ALKs, length, and maturity at age.

(r) The SC will continue discussions on data gaps that could be filled by the establishment of an observer program in the NPFC Convention Area.

Climate change

(s) The SC will communicate with the FAO on developing a climate-change-related consultancy which will be funded by FAO.

Cooperation with Other Organizations

(t) The SC expressed its support for the development and implementation of the BECI project, which will provide valuable information for the SC's analyses, including those related to climate change.

(u) The SC agreed to continue its cooperation with DSF Project and identified focal point contacts for the joint activities on climate change, data-limited stock assessments and EAFM.

Agenda Item 14. Next meeting of SC and its subsidiary bodies

14.1 Meeting Schedule for 2024/2025

137. The Science Manager presented a proposed meeting schedule for 2024-2025 and a call for interest to host scientific meetings (NPFC-2023-SC08-IP01).

14.2 Meeting format and Venue

138. The SC suggested the following provisional meeting schedule for the 2024 operational year:
   (a) TWG CMSA09: 16–19 July in Yokohama, Japan (hybrid)
   (b) SSC NFS01: 22–23 August (virtual)
   (c) SSC PS13: 26–30 August 2024 (virtual)
   (d) SSC BF-ME05: 9–11 December 2024 in Tokyo, Japan (hybrid)
   (e) SSC PS14: 11–13, 16 December 2024 (3.5 days) in Tokyo, Japan (hybrid)
   (f) SC09: 17–20 December 2024 in Tokyo, Japan (hybrid)
   (g) TWG CMSA10: Early 2025 (4 days, virtual)

139. The SC's subsidiary bodies will hold informal web meetings to check progress and plan intersessional work, when needed.

140. Members were invited to consider hosting scientific meetings in the 2025 operational year and inform the Secretariat preferably by summer 2024.

Agenda Item 15. Press release

141. The SC endorsed the press release for publication on the NPFC website after the meeting.

Agenda Item 16. Selection of SC Chair and Vice-Chair

142. The SC re-elected Dr. Janelle Curtis (Canada) as the SC Chair.

143. The SC re-elected Dr. Jie Cao (China) as the SC Vice-Chair.

Agenda Item 17. Adoption of the Report

144. The SC08 Report was adopted by consensus.

Agenda Item 18. Close of the Meeting

145. The Executive Secretary congratulated the SC on the conclusion of its meeting and expressed his appreciation to the Chair and all participants for their contribution to its success.

146. Canada thanked the participants again for coming to Nanaimo.

147. The SC expressed its appreciation to Canada and the Secretariat for their hard work to organize

the meeting and its gratitude for Canada's generous hospitality.

148. The SC thanked the Chair for her leadership and guidance.

149. The SC expressed its appreciation to everyone who contributed to the NPFC's scientific work in the intersessional period and to the Chairs and Leads of the SC's subsidiary bodies.

150. The SC thanked the rapporteur for his support.

151. The meeting closed at 15:10 on 19 December 2023, Nanaimo time.

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 – Species summary for neon flying squid
Annex I – Species summary for Japanese sardine
Annex J – Species summary for Japanese flying squid
Annex K – Species summary for blue mackerel
Annex L – Species summary for Pacific saury
Annex M – Species summary for chub mackerel
Annex N – Terms of Reference for data sharing of catch and effort data for depletion analysis of North Pacific armorhead
Annex O – Template for data sharing of catch and effort data for depletion analysis of North Pacific armorhead
Annex P – Revised CMM 2023-05 - Conservation and Management Measure for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the Northwestern Pacific Ocean
Annex Q – Revised CMM 2023-06 - Conservation and Management Measure for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the Northeastern Pacific Ocean
Annex R – Revised Terms of Reference of the SSC BF-ME
Annex S – Revised Terms of Reference of the SSC PS

Annex T – Revised Stock Assessment Protocol for Pacific Saury

Annex U – Stock assessment report for Pacific saury

Annex V – Summary of the current assessment status for NPFC priority species and sablefish, skilfish, and rougheye and blackspotted rockfishes

Annex W – Table of tasks for the SWG JFS, the SWG JS, the SWG BM, and the SSC NFS in 2024

Annex X – Revised Regulations for Management of Scientific Data and Information

Annex Y – Scientific projects

Annex Z – Five-Year Research Plan and Work Plan of the Scientific Committee

Annex A

Agenda

Agenda Item 1. Opening of the Meeting

- 1.1 Welcome Address and Introductions
- 1.2 Appointment of Rapporteur
- 1.3 Meeting Arrangements

Agenda Item 2. Adoption of Agenda

Agenda Item 3. Review of NPFC Performance Review (NPFC PR) Panel Recommendations

- 3.1 Overview of key recommendations for SC over short term (next 1-5 years)

Agenda Item 4. Review of reports and recommendations from the Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA) and the Small Scientific Committees (SSC BF-ME and SSC PS)

- 4.1 Technical Working Group on Chub Mackerel Stock Assessment
- 4.2 SSC on Bottom Fish and Marine Ecosystems
- 4.3 SSC on Pacific Saury

Agenda Item 5. Report and recommendations from the Joint SC-TCC-COM Small Working Group on Management Strategy Evaluation for Pacific Saury (SWG MSE PS)

Agenda Item 6. Other priority species

- 6.1 Summary of progress on the remaining four priority species
  - 6.1.1 Neon flying squid
  - 6.1.2 Japanese sardine
  - 6.1.3 Japanese flying squid
  - 6.1.4 Blue mackerel
- 6.2 Species summaries
  - 6.2.1 Review of priority species summaries
  - 6.2.2 Potential additions
- 6.3 Changes to common and scientific species names
- 6.4 Domestic stock assessments of NFS, JFS, JS, and BM
- 6.5 Key milestones to achieve for NPFC stock assessment and provision of management advice
- 6.6 Future roles and activities of SWG NFS, SWG JFS, SWG JS, and SWG BM

6.6.1 Potential establishment of a new formal SC subsidiary body to focus on NFS
6.6.2 Scientific project(s) to support CPUE standardization and assessment of NFS
6.6.3 Virtual or in-person meetings

Agenda Item 7. Climate Change
7.1 Climate change effects on NPFC's priority species and associated ecosystems
7.1.1 Current knowledge
7.1.2 Ongoing research activities
7.1.3 Research priorities and potential scientific projects

Agenda Item 8. Data Collection and Management
8.1 Data Management System
8.2 NPFC Data Sharing and Data Security Protocol
8.2.1 Revision of Regulations for Management of Scientific Data and Information
8.3 Data needs, data gaps and strategies to fill gaps
8.3.1 Information about species belonging to same ecosystem or dependent/associated with target stocks
8.3.2 Potential roles of regional observer program and/or e-monitoring

Agenda Item 9. Scientific projects for 2024 and 2025
9.1 Ongoing/planned projects
9.2 New projects
9.2.1 Potential project(s) for PS
9.2.2 Potential project(s) for CM
9.2.3 Potential project(s) for NPA and SA
9.2.4 Potential project(s) for NFS
9.2.5 Other potential projects
9.3 Review, prioritization and funding of projects

Agenda Item 10. Cooperation with other organizations
10.1 Reports on the joint NPFC-PICES activities since the SC07 meeting, including a report from the PICES Secretariat
10.2 SC representation at scientific meetings
10.2.1 SC representation in the joint PICES/ICES Working Group on Small Pelagic Fish (WGSPF)
10.2.2 Report on PICES' topic session on VMEs and Seamounts
10.2.3 Selecting SC representatives to PICES 2024

10.3 Report on cooperation between NPFC and NPAFC
10.4 FAO ABNJ Deep-sea fisheries project
10.5 Partnership with the Fisheries and Resources Monitoring System of FAO (FIRMS)
10.6 Partnership with WCPFC and ISC
10.7 Partnership with SPRFMO
10.8 Cooperation with other organizations

Agenda Item 11. SC Terms of Reference (TOR) and 2023-2027 Research Plan and Work Plan
11.1 Review of the Scientific Committee TOR
11.2 Five-year Research Plan
11.3 Five-year Work Plan
11.4 Progress on addressing NPFC PR recommendations for SC

Agenda Item 12. Other matters
12.1 Coordination between SC and TCC
12.2 Other issues

Agenda Item 13. Advice and recommendations to the Commission

Agenda Item 14. Next meetings of SC and its subsidiary bodies
14.1 Meeting schedule for 2024/2025
14.2 Meeting format and venue

Agenda Item 15. Press release

Agenda Item 16. Selection of SC Chair and SC Vice-Chair

Agenda Item 17. Adoption of the Report

Agenda Item 18. Close of the Meeting

Annex B

List of Documents

MEETING INFORMATION PAPERS

Document Number	Title
NPFC-2023-SC08-MIP01 (Rev. 2)	Meeting Information
NPFC-2023-SC08-MIP02	Provisional Agenda
NPFC-2023-SC08-MIP03 (Rev. 2)	Annotated Indicative Schedule

WORKING PAPERS

Document Number	Title
NPFC-2023-SC08-WP01 (Rev. 1)	Scientific projects
NPFC-2022-SC08-WP02	NPFC SC Research Plan
NPFC-2023-SC08-WP03	Five-Year Work Plan of the Scientific Committee
NPFC-2023-SC08-WP04 (Rev. 1)	NPFC Performance Review recommendations for discussion at SC08
NPFC-2023-SC08-WP05	Report of Small Working Group for Japanese Sardine
NPFC-2023-SC08-WP06	Japanese Sardine Species Summary
NPFC-2023-SC08-WP07 (Rev. 1)	Blue Mackerel Species Summary
NPFC-2023-SC08-WP08 (Rev. 1)	Japanese Flying Squid Species Summary
NPFC-2023-SC08-WP09 (Rev. 3)	Pacific Saury Species Summary
NPFC-2023-SC08-WP10	Revised Regulations for Management of Scientific Data and Information
NPFC-2023-SC08-WP11 (Rev. 1)	Comparison of Length-Weight Relationships and Catch Numbers by Size and Age between China and Japan for Japanese Sardine and Blue Mackerel
NPFC-2023-SC08-WP12	Overview surveys from 2021 to 2023 by Chinese research vessel "Song Hang" in the NPFC convention area
NPFC-2023-SC08-WP13	GIT Repository Plan
NPFC-2023-SC08-WP14 (Rev. 1)	Neon Flying Squid Species Summary
NPFC-2023-SC08-WP15 (Rev. 1)	Chub Mackerel Species Summary
NPFC-2023-SC08-WP16	Summary of the 1st joint meeting of the Small Working Groups on NFS, JFS, JS, and BM
NPFC-2023-SC08-WP17	Summary of the 2nd joint meeting of the Small Working Groups on NFS, JFS, JS, and BM
NPFC-2023-SC08-WP18	Revised Terms of Reference for the Small Scientific Committee on Bottom Fish and Marine Ecosystems

INFORMATION PAPERS

Document Number	Title
NPFC-2023-SC08-IP01 (Rev. 2)	Meeting schedule for 2024-2025 and call for interest to host scientific meetings
NPFC-2023-SC08-IP02	A compiled list of cooperation opportunities and requests from other organizations
NPFC-2023-SC08-IP03	NPFC Data Management System
NPFC-2023-SC08-IP04	Domestic stock assessment of Japanese sardine by Japan
NPFC-2023-SC08-IP05	Domestic stock assessment of blue mackerel by Japan
NPFC-2023-SC08-IP06	Domestic stock assessment of Japanese flying squid by Japan
NPFC-2023-SC08-IP07	The cumulative impacts of climate vulnerability and significant adverse impacts (SAIs) caused by bottom-contact fishing on vulnerable marine ecosystems (VMEs) in the North Pacific Fisheries Commission (NPFC) Convention Area
NPFC-2023-SC08-IP08	Resolution on Climate Change
NPFC-2023-SC08-IP09	Compliance program update
NPFC-2023-SC08-IP10	Update Information of Chinese NFS fishery in the Northwest Pacific Ocean
NPFC-2023-SC08-IP11	Special project for hiring an expert to assist the SWG NPA-SA in conducting an assessment for Splendid Alfonsino and North Pacific Armorhead
NPFC-2023-SC08-IP12	Science Advice Progress and Milestones
NPFC-2023-SC08-IP13	Data Provision Templates
NPFC-2023-SC08-IP14	Defying Dissolution: Deep-Sea Scleractinian Reefs in the North Pacific
NPFC-2023-SC08-IP15	ICES PICES Working Group on Small Pelagic Fishes
NPFC-2023-SC08-IP16	Report on PICES' topic session on VMEs and Seamounts
NPFC-2023-SC08-IP17 (Rev. 1)	Press release

OBSERVER PAPERS

Document Number	Title
NPFC-2023-SC08-OP01	Report on Joint NPFC-PICES activities for SC08
NPFC-2023-SC08-OP02	FAO Deep-sea Fisheries Project
NPFC-2023-SC08-OP03 (Rev. 1)	Five-year Work Plan to implement NPAFC/NPFC Memorandum of Cooperation (MOC)

NPFC-2023-SC08-OP04	Update from FIRMS
NPFC-2023-SC08-OP05	NPFC-ISC MOU Status Update

REFERENCE DOCUMENTS

Document Number	Title
NPFC-2023-TWG CMSA07-Final Report	TWG CMSA07 meeting report
NPFC-2023-SWG MSE PS04-Final Report	SWG MSE PS03 and SWG MSE PS04 meeting reports
	Memorandum of Understanding between the South Pacific Regional Fisheries Management Organisation (SPRFMO) and the North Pacific Fisheries Commission (NPFC)
	Partnership Arrangement between FIRMS and NPFC
	NPFC Data Sharing and Data Security Protocol

Annex C

List of Participants

CHAIR

Janelle CURTIS
Janelle.Curtis@dfo-mpo.gc.ca

CANADA

Chris ROOPER
chris.rooper@dfo-mpo.gc.ca

Sarah HAWKSHAW*
sarah.hawkshaw@dfo-mpo.gc.ca

Susanna FULLER*
Susannafuller@oceansnorth.ca

CHINA

Qiuyun MA
qyma@shou.edu.cn

Libin DAI
libin.dai@qq.com

Jintao WANG
jtwang@shou.edu.cn

Zhou FANG*
zfang@shou.edu.cn

Guanyu HU*
1132843496@qq.com

Luoliang XU*
luoliang.xu@maine.edu

Heng ZHANG*
zhangh1@ecsf.ac.cn

Jie CAO
jcao22@ncsu.edu

EUROPEAN UNION

Karolina MOLLA GAZI
karolina.mollagazi@wur.nl

JAPAN

Kazuhiro OSHIMA
oshima_kazuhiro28@fra.go.jp

Shuya NAKATSUKA
nakatsuka_shuya49@fra.go.jp

Naohiko AKIMOTO*
naohiko@sol.dti.ne.jp

Midori HASHIMOTO
hashimoto_midori91@fra.go.jp

Kazunari HIGASHIGUCHI*
higashiguchi_kazunari34@fra.go.jp

Toshihide KITAKADO
kitakado@kaiyodai.ac.jp

Hiroshi KUBOTA*
kubota_hiroshi89@fra.go.jp

Hajime MATSUI
matsui_hajime90@fra.go.jp

Taketsugu MORIYAMA*
moriyama_taketsugu91@fra.go.jp

Shin-Ichiro NAKAYAMA
nakayama_shinichiro16@fra.go.jp

Shota NISHIJIMA
nishijima_shota02@fra.go.jp

Bungo NISHIZAWA
nishizawa_bungo05@fra.go.jp

Suguru OKAMOTO*
okamoto_suguru05@fra.go.jp

Takehiro OKUDA*
okuda_takehiro83@fra.go.jp

Kota SAWADA
sawada_kota27@fra.go.jp

Wataru TANOUE
wataru_tanoue550@maff.go.jp

KOREA

Jeongseok PARK
jeongseokpark@korea.kr

Hyejin SONG
hyejinsong@korea.kr

RUSSIA

Oleg KATUGIN*
okatugin@mail.ru

Dmitrii ANTONENKO*
dmantonenko@yandex.ru

Vladimir KULIK*
vladimir.kulik@tinro.ru

Emilia CHERNIENKO*
emilya.chernienko@tinro.ru

CHINESE TAIPEI

Wen-Bin HUANG
bruce@gms.ndhu.edu.tw

Yi-Jay CHANG
yjchang@ntu.edu.tw

Tung-hsieh CHIANG
chiangdon@ofdc.org.tw

Jhen HSU
jhenhsu@ntu.edu.tw

Chiao-Chih SHIH
hennessy@squid.org.tw

UNITED STATES

Erin BOHABOY
erin.bohaboy@noaa.gov

VANUATU

Lucy Andrea JOY
ljoy@fisheries.gov.vu

Mei-Chin JUAN
meichin.mdfc@gmail.com

Rocky KAKU
rky.kaku@gmail.com

OBSERVERS

Deep Sea Conservation Coalition

Amy BACO-TAYLOR*
abacotaylor@fsu.edu

Matthew GIANNI
matthewgianni@gmail.com

Bronwen GOLDER*
bronwen@savethehighseas.org

Eunhee KIM*
ekim@cies.re.kr

Lance MORGAN*
Lance.Morgan@marine-conservation.org

Lisa SPEER*
lspeer@nrdc.org

Food and Agriculture Organization (FAO)

Anthony THOMPSON
Anthony.Thompson@fao.org

Aureliano GENTILE
Aureliano.Gentile@fao.org

North Pacific Anadromous (NPAFC)

Ricardo FEDERIZON
rfederizon@npafc.org

North Pacific Marine Science Organization (PICES)

Sonia BATTEN
sonia.batten@pices.int

Kathryn BERRY
kathryn.berry@pices.int

The Pew Charitable Trusts

Nichola CLARK*
nclark@pewtrusts.org

Dave GERSHMAN*
dgershman@oceanfdn.org

Raiana MCKINNEY*
rmckinney@pewtrusts.org

Sebastian NICHOLLS*
snicholls@pewtrusts.org

Ashley WILSON*
awilson@pewtrusts.org

RAPPORTEUR

Alex MEYER
meyer@urbanconnections.jp

NPFC SECRETARIAT

Robert DAY
rday@npfc.int

Alex ZAVOLOKIN
azavolokin@npfc.int

Judy DWYER*
jdwyer@npfc.int

Yuko YOSHIMURA-TAKAMIYA
ytakamiya@npfc.int

Sungkuk KANG
skang@npfc.int

Jihwan KIM
jkim@npfc.int

Natsuki HOSOKAWA
nhosokawa@npfc.int

* Online participants

Annex D

Species summary for North Pacific armorhead

North Pacific armorhead (*Pentaceros wheeleri*)

Common names: Pelagic armorhead, Slender armorhead (English); 胸五棘鲷 (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.

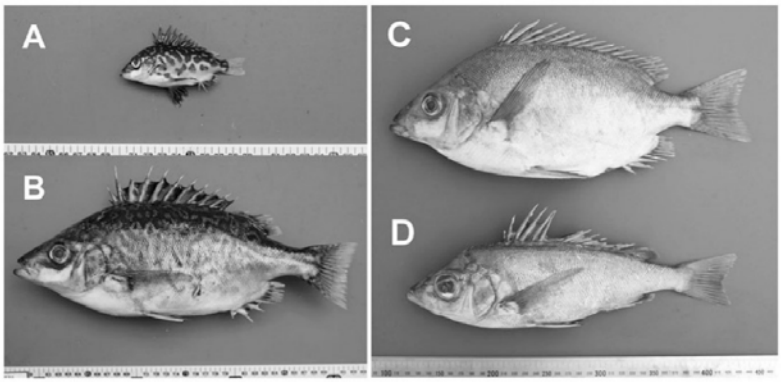


Figure 1: Photographs of Pentaceros wheeleri. *A) Pelagic juvenile, B) pelagic subadult, C) demersal adult (fat type), D) demersal adult (lean type) (from Kiyota et al. 2016)*

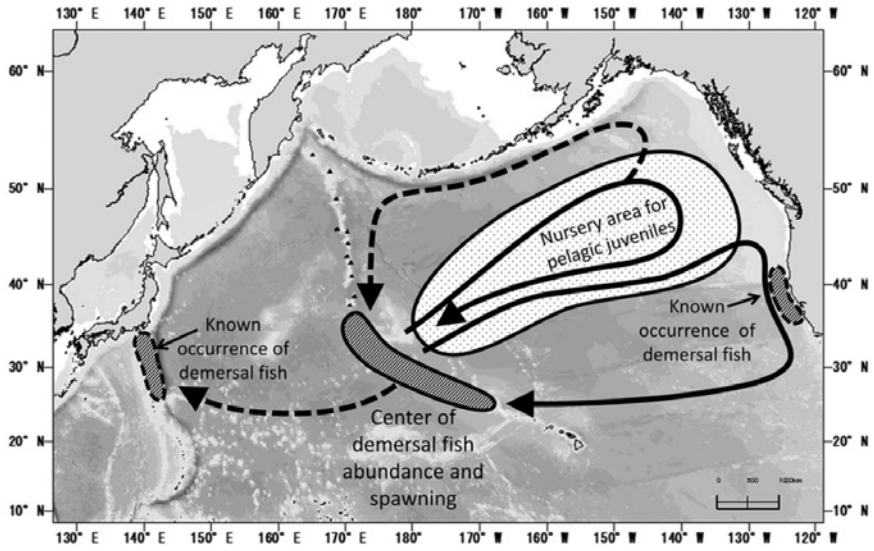


Figure 2: Known demersal habitats and hypothesized pelagic migration routes of Pentaceros wheeleri *(Kiyota et al. 2016 Figure 4, modified from Boehlert and Sasaki 1988).*

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). One or two Korean bottom trawl vessels operated from 2004 to 2019. Currently North Pacific armorhead is caught by Japan 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.

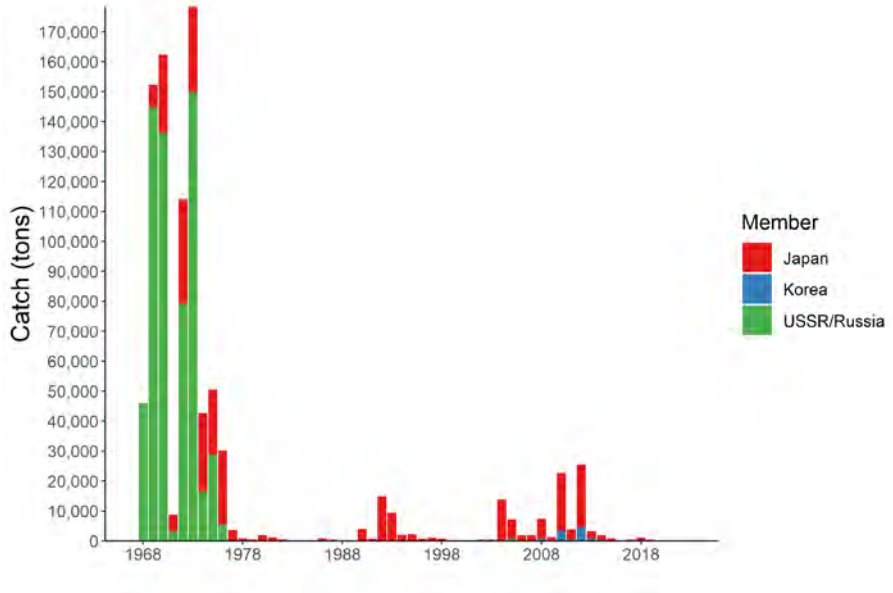


Figure 3: Historical trends of North Pacific armorhead catches in NPFC waters. *The annual amounts of catch by each country are shown by the bar plot.*

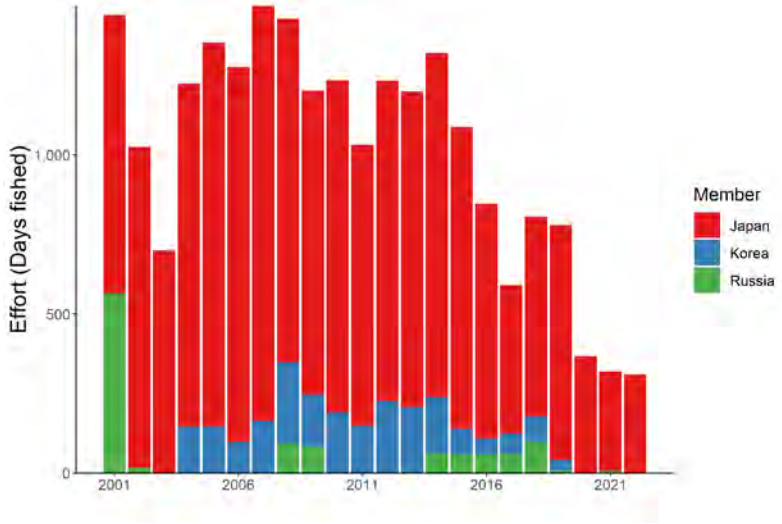


Figure 4. Historical fishing effort for North Pacific armorhead. *The annual fishing efforts by each country are shown by barplot. The efforts are calculated by the total fishing days operated during the year*

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 2023-05 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

Item	Status	Description
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	Member	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 available
		Gillnet	2008-present	Logbook data available
	Korea	Trawl	2013-2019	Logbook data

Data	Member	Fishery	Year	Comments
				available
	Russia	Trawl	2001-2002; 2005-2006; 2011; 2013	

Table 3: Biological data

Data	Member	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.

Annex E

Species summary for splendid alfonsino

Splendid alfonsino (*Beryx splendens*)

Common names: Splendid alfonsino (English); 红金眼鲷 (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).

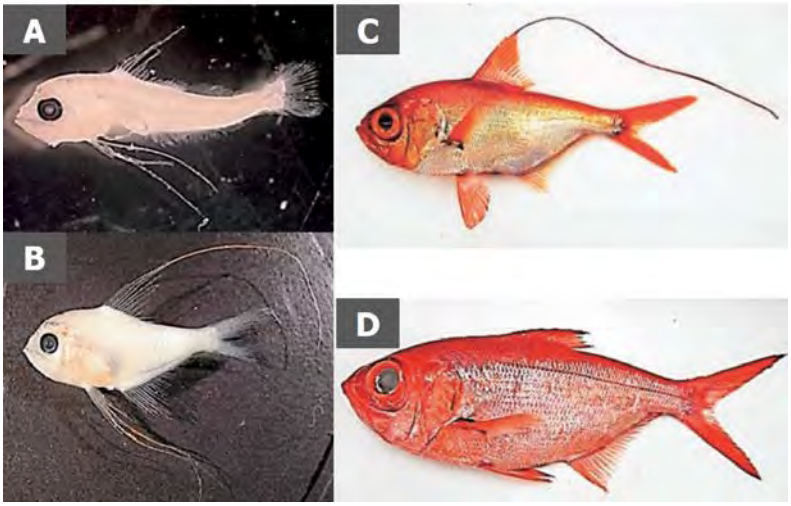


Figure 1: Photographs of Beryx splendens on different developmental stages *A) postlarva, B) juvenile, C) young, D) adult (from Watari et al. 2017)*

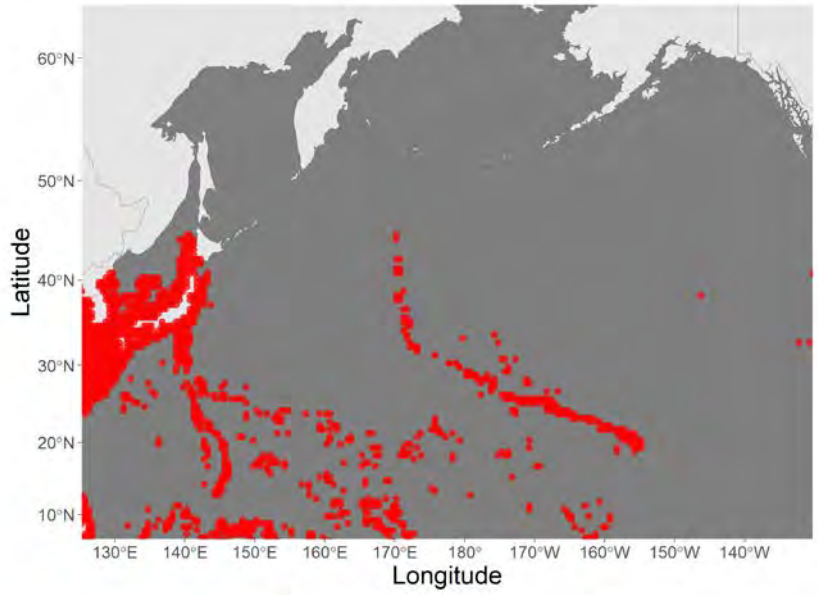


Figure 2: Known distribution of Beryx splendens around NPFC waters. *Points indicate observation data from original sources (AquaMaps 2019, October)*

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).

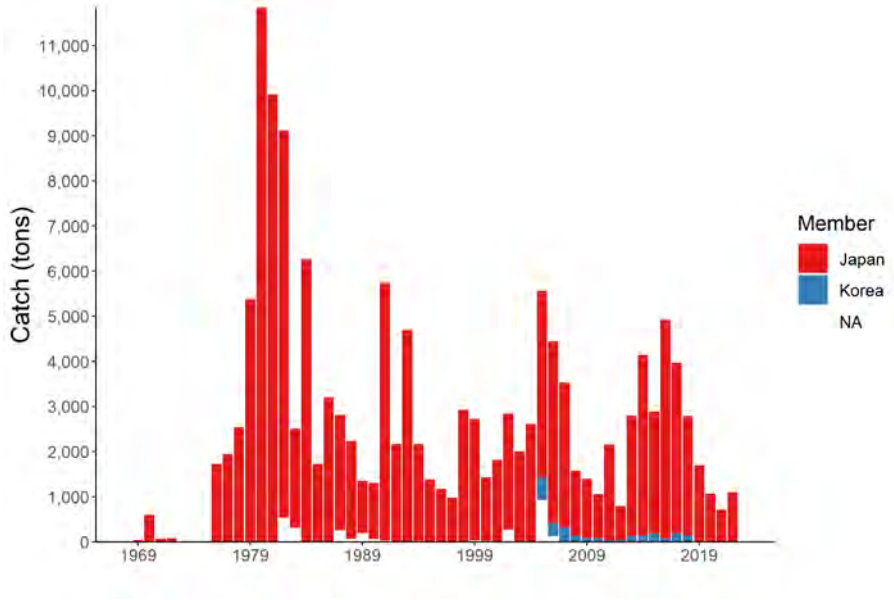


Figure 3: Historical trends of splendid alfonsino catches in NPFC waters. *The annual amounts of catch by each country are shown by the bar plot.*

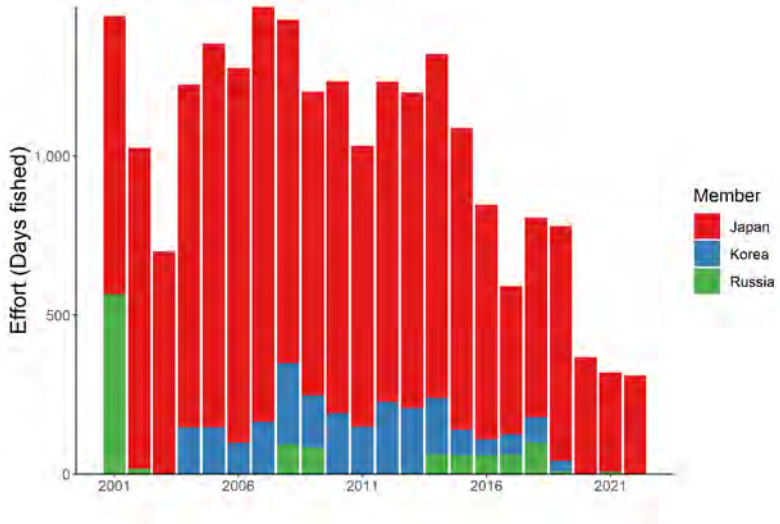


Figure 4. Historical fishing efforts for splendid alfonsino. *The annual fishing efforts by each country are shown by barplot. The efforts are calculated by the total fishing days operated during the year*

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 2023-05 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. The effectiveness of this measure yet to be clearly demonstrated (Sawada and Ichii 2020).

Data Availability

Table 2: Catch data

Data	Member	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 availabe
		Gillnet	2008-present	Logbook data available
	Korea	Trawl	2013-2019	Logbook data available
	Russia	Trawl	1969-1988; 2010; 2019	

Table 3: Biological data

Data	Member	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	

References

Watari, S., Yonezawa, J., Takeuchi, H., Kato, M., Yamakawa, M., Hagiwara, Y., & Ochi, Y. (2017). Fisheries biology and resource management of splendid alfonsino *Beryx splendens*. Bulletin of Japan Fisheries Research and Education Agency, 44, 1-46.

Kaschner, K., Kesner-Reyes, K., Garilao, C., Segschneider, J., Rius-Barile, J. Rees, T., & Froese, R. (2019, October). AquaMaps: Predicted range maps for aquatic species. Retrieved from https://www.aquamaps.org.

Shotton, R. (2016). Global review of alfonsino (*Beryx* spp.), their fisheries, biology and management. FAO Fisheries and Aquaculture Circular, (C1084), I.

Sawada, K., Nishida, K., Yonezaki, S. and Kiyota, M. (2018). Review of biology and fisheries of splendid alfonsino *Beryx splendens*, especially in the Emperor seamounts area. NPFC-2018-SSC-BF01-WP03. 26 pp.

Sawada, K., and Ichii, T. (2020) Catch size composition of splendid alfonsino in the Emperor Seamounts area before and after the implementation of the mesh size regulation. NPFC-2020-SSC BFME01-WP05 (Rev. 1). 3 pp.

Nishimura, A., & Yatsu, A. (2008, October). Application of surplus-production models to splendid alfonsino stock in the Southern Emperor and Northern Hawaiian Ridge (SE-NHR). In Fifth Intergovernmental Meeting on Establishment of New Mechanism for Management of High Seas Bottom Trawl Fisheries in the North Western Pacific Ocean (NWPBT/SWG-05), Tokyo, 17-18 October 2008 (pp. 1-11).

Species summary for sablefish

Sablefish (*Anoplopoma fimbria*)

Common names:

Black cod (USA & Canada)
ギンダラ, Gindara (Japan)
은대구, Eun-Daegu (Korea)

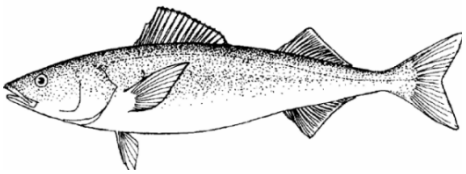


Figure 1. Sablefish (Anaplopoma fimbria).

Management

Active NPFC Management Measures

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

- CMM 2023-06 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.

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 revision of the operating model by Canada was completed in 2022 (DFO 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. 2022) and most recent USA West Coast assessment (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-present 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.

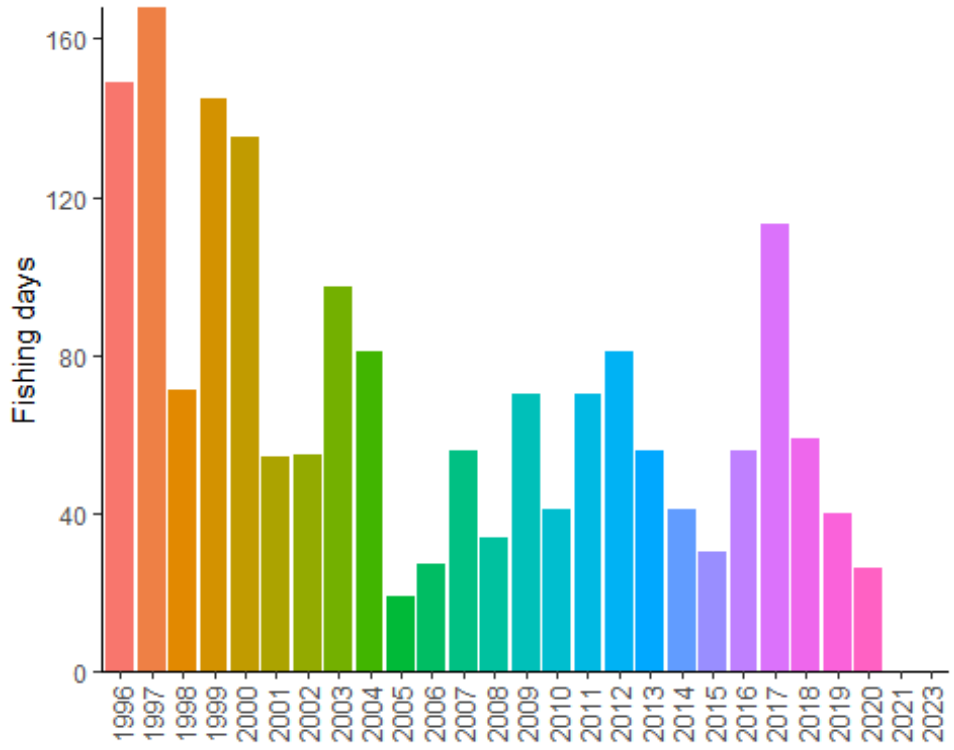


Figure 2. Fishing effort (in number of fishing days) for the Sablefish longline trap fishery conducted in NPFC waters (1996-present). Data are averaged across 3 years to comply with data privacy restrictions.

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 has been no fishing effort at seamounts from 2021-2023 resulting in no catch.

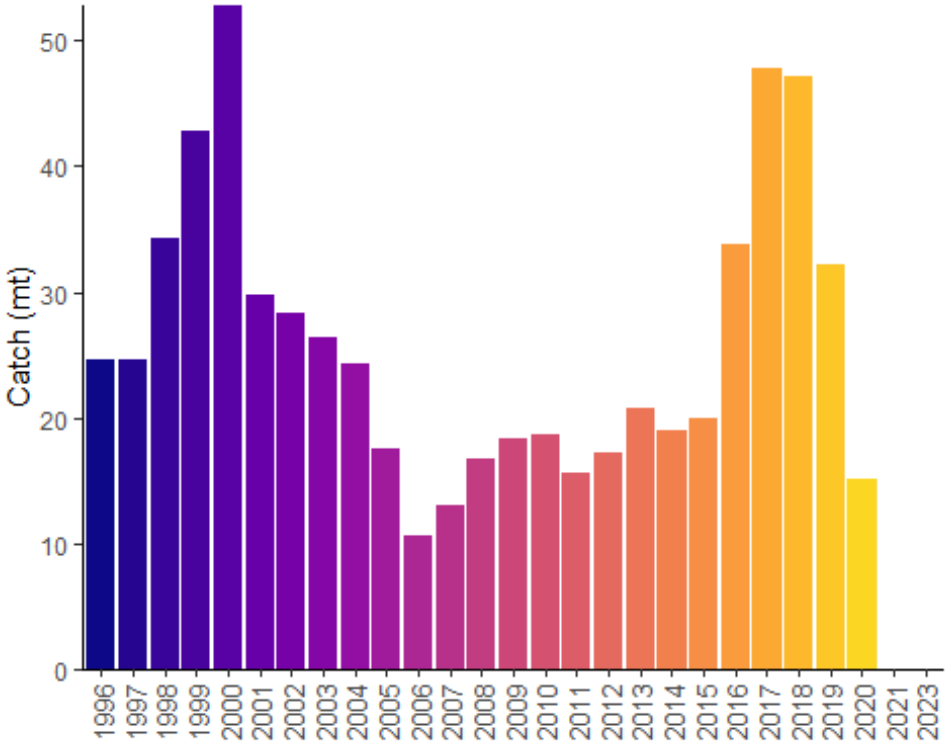


Figure 3. Landings of sablefish in the Canadian Sablefish fishery in NPFC region (1996-present). Data are averaged across 3 years to comply with data privacy restrictions.

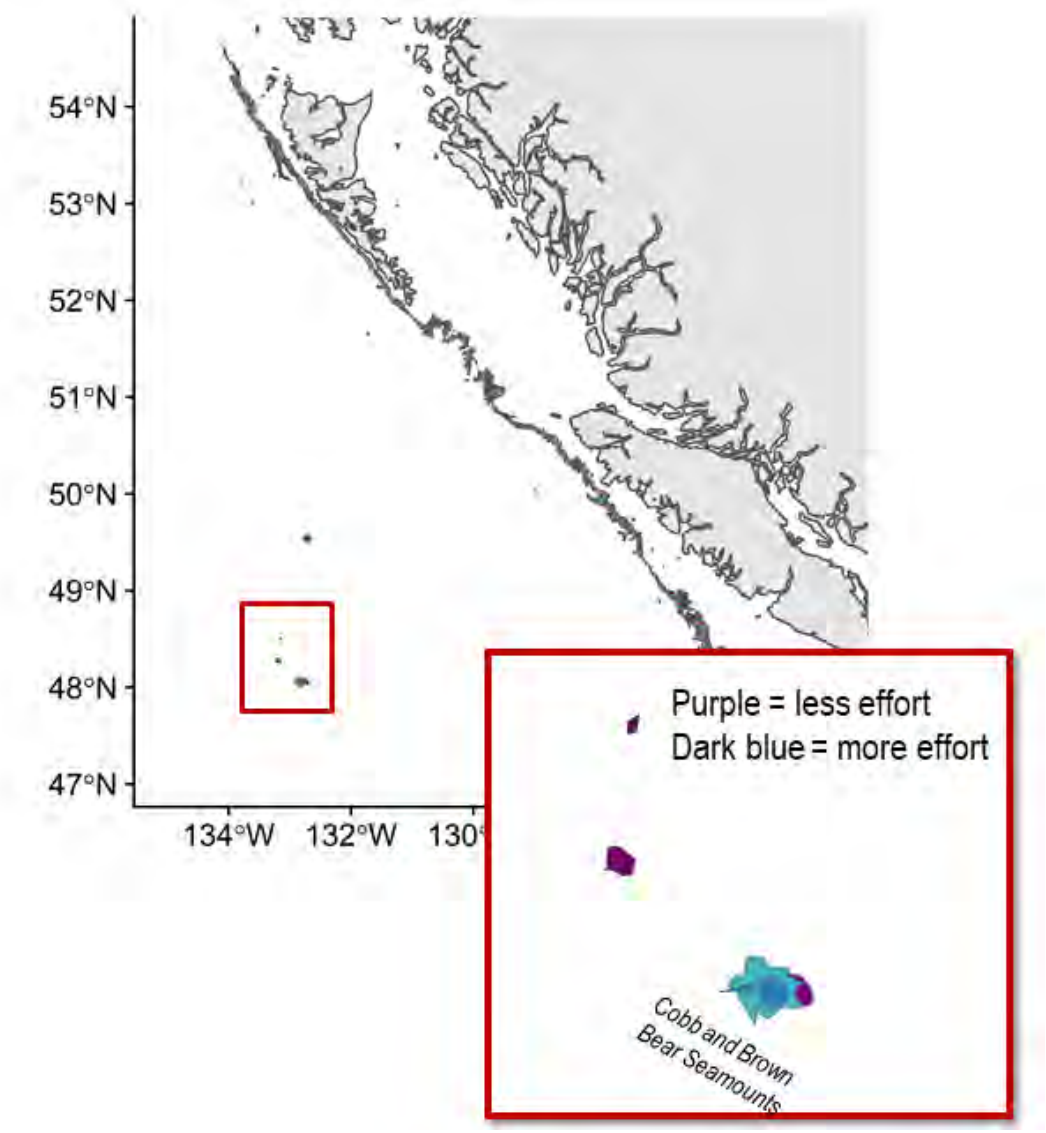


Figure 4. Relative change in spatial distribution of effort for Sablefish trap fishery from 2010-2017 to 2018-2019. Inset shows seamounts in the NPFC Convention Area.

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 = 47%). CPUE was not calculated in 2023, but has generally been increasing since 2012.

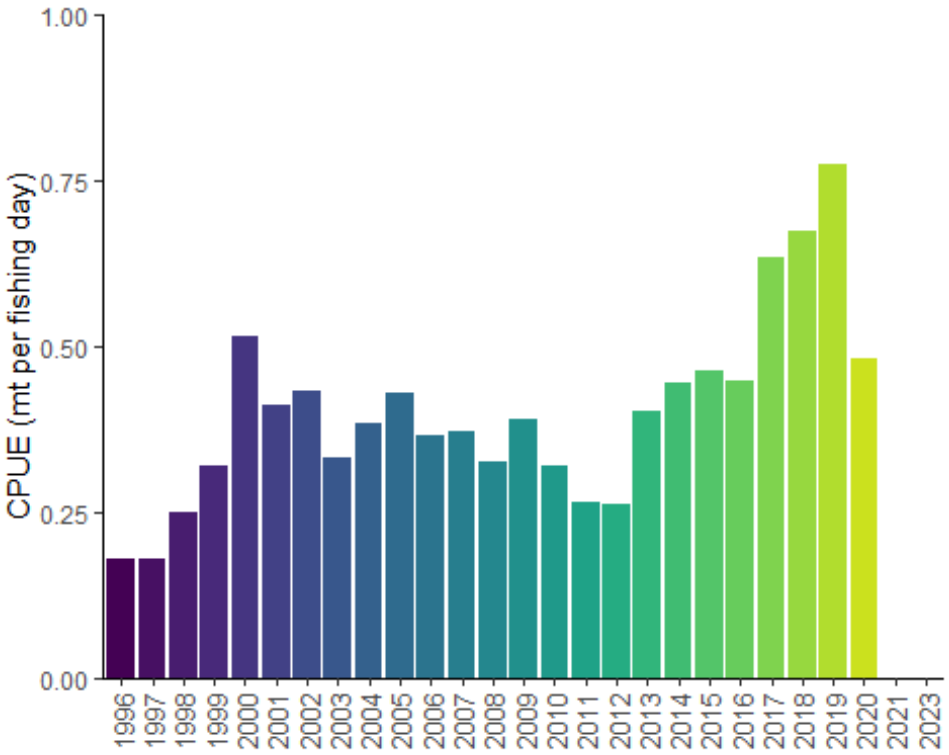


Figure 5. Catch per unit of effort for Canadian Sablefish fishery in NPFC region. Data are averaged across 3 years to comply with data privacy restrictions.

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.

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

The most recent stock assessments from the USA and Canada indicate the spawning stock biomass has been increasing since about 2018, supported by a large coastwide recruitment in ~2016 (data from Gothel et al. 2022, DFO 2023, Kapur et al 2021).

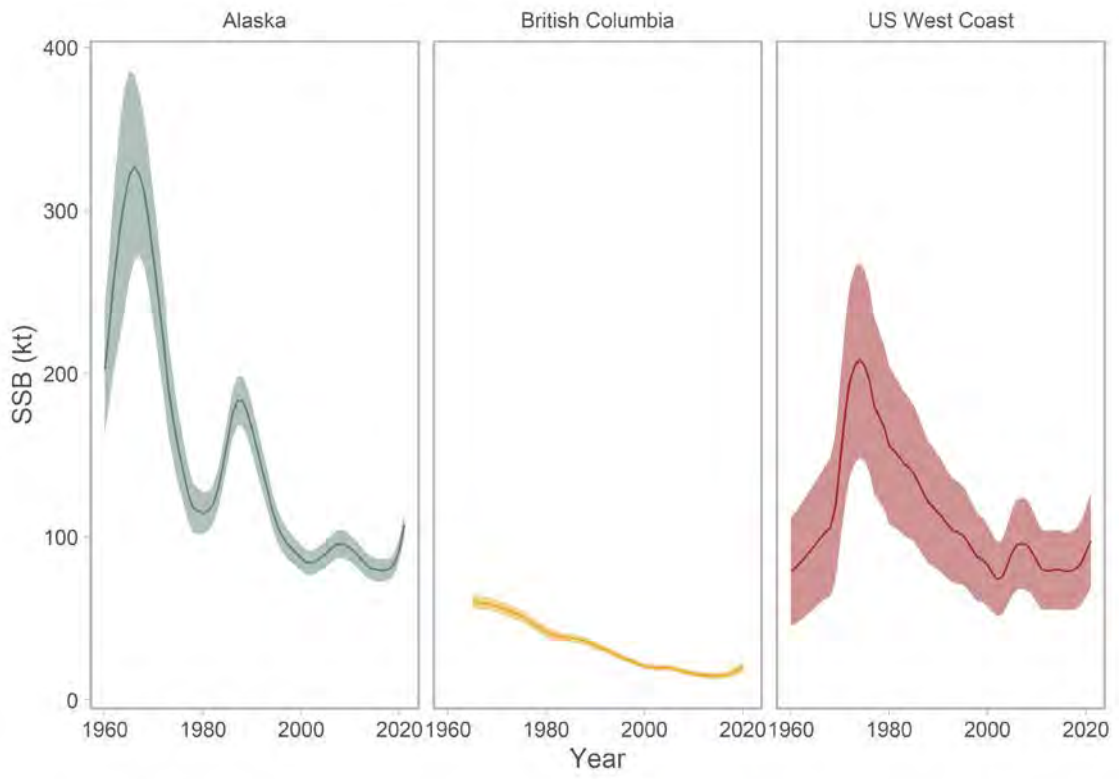


Figure 6. Sablefish (Anaplopoma fimbria) biomass estimated from stock assessments in Alaska, Canada and the US West Coast.

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 7; 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.

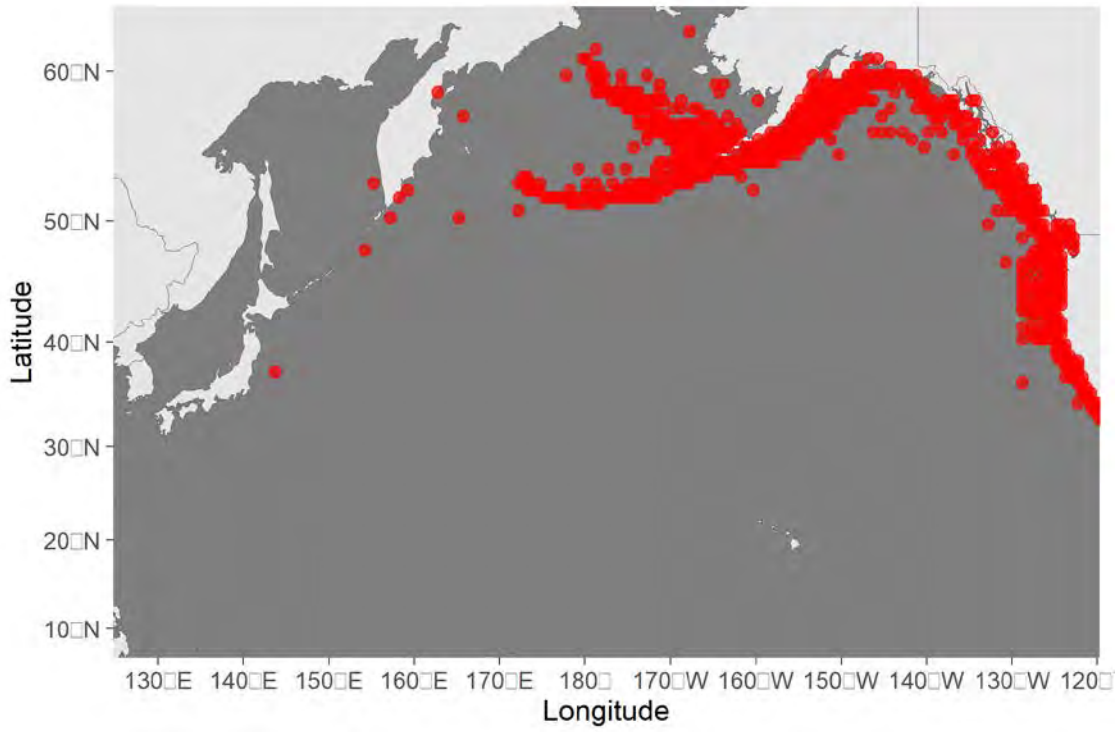


Figure 7. Map of distribution of sablefish in the North Pacific.

Literature cited

DFO. 2016. A revised operating model for Sablefish (*Anoplopoma fimbria*) in British Columbia, Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2016/015.

DFO. 2020. Evaluating the robustness of candidate management procedures in the BC Sablefish (*Anoplopoma fimbria*) fpshery for 2019-2020. DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/025.

DFO. 2023. A Revised Operating Model for Sablefish in British Columbia in 2022. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2023/010.

DFO. 2023. Application of the British Columbia Sablefish (*Anoplopoma fimbria*) Management Procedure for the 2023-24 Fishing Year. DFO Can. Sci. Advis. Sec. Sci. Resp. 2023/009.

Goethel, D.R., Rodgveller, C.J., Echave, K.B., Shotwell, S.K., Siwicke, K.A., Hanselman, Malecha, P.W., D.H., Cheng, M., Williams, M., Omori, K.,and Lunsford, C.R. 2022. Assessment of the sablefish stock in Alaska. In “Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the GOA and BS/AI.” Anchorage, AK: North Pacific Fishery Management Council.

Jasonowicz, A. J., F. W. Goetz, G. W. Goetz, and K. M. Nichols. 2017. Love the one you’re with: genomic evidence of panmixia in the sablefish (*Anoplopoma fimbria*). Can. J. Fish. Aquat. Sci. 74:377-387.

Kapur, M.S., Lee, Q., Correa, G.M., Haltuch,M., Gertseva, V. and Hamel, O.S. 2021. Status of sablefish (*Anaplopoma fimbria*) along the US West Coast in 2021. Pacific Fisheries Management Council, Portland, Oregon, 196 p.

Shotwell, K., Goethel, D.R., Deary, A., Echave, K., Fenske, K., Fissel, B., Hanselman, D., Lunsford, C., Siwicke, K., and Sullivan, J. 2020. Ecosystem and socioeconomic profile of the sablefish stock in Alaska. In “Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the GOA and BS/AI.” Anchorage, AK: North Pacific Fishery Management Council.

Thorson, J. 2019. Guidance for decisions using the Vector Autoregressive Spatio-Temporal (VAST) package in stock, ecosystem, habitat and climate assessments. Fisheries Research 210: 143–161. doi:10.1016/j.fishres.2018.10.013.

Wolotira, R. J. J., T. M. Sample, S. F. Noel, and C. R. Iten. 1993. Geographic and bathymetric distributions for many commercially important fishes and shellfishes off the west coast of North America, based on research survey and commercial catch data, 1912-1984. NOAA Tech. Memo. NMFS-AFSC-6. 184 pp.

Annex G

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)

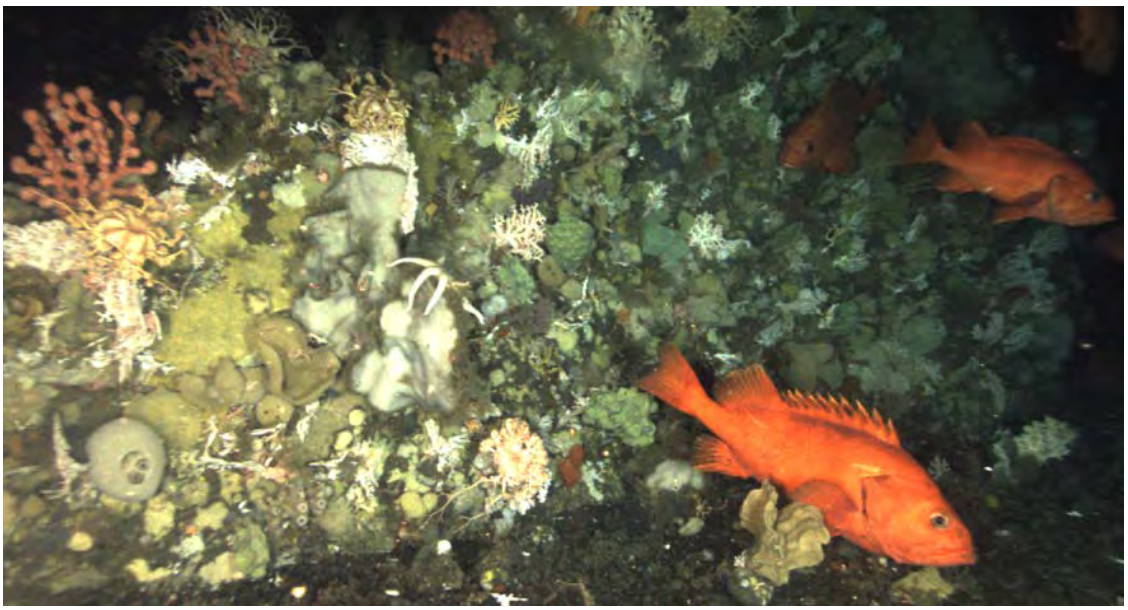


Figure 1. Blackspotted rockfish (Sebastes melanostictus).

Management

Active NPFC Management Measures

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

- CMM 2023-06 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.

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 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 (Sullivan 2022, Spencer et al. 2022).

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.

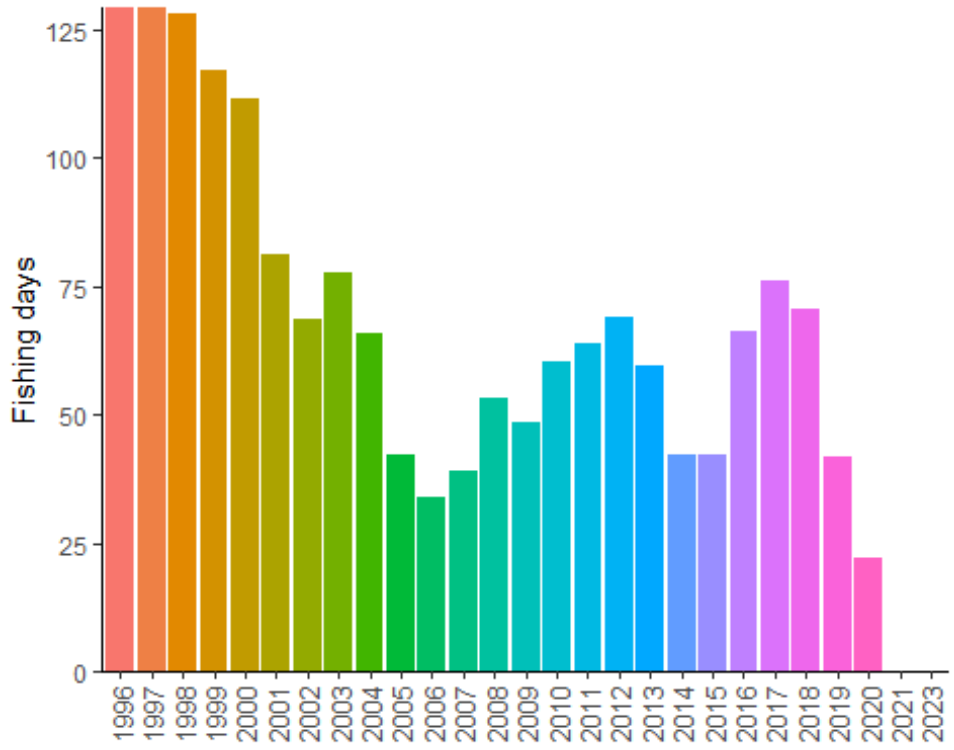


Figure 2. Fishing effort (in number of fishing days) for the Sablefish longline trap fishery conducted in NPFC waters (1996-present). Data are averaged across 3 years to comply with data privacy restrictions.

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 has been no fishing effort at seamounts from 2021-2023 resulting in no catch.

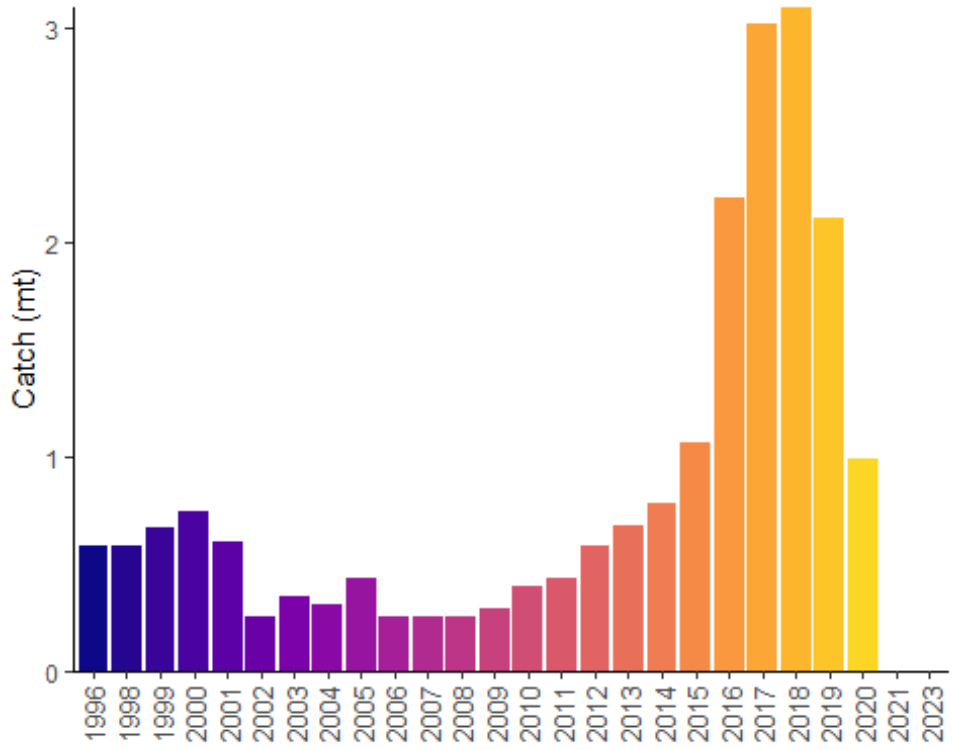


Figure 3. Landings of blackspotted and rougheye rockfishes in the Canadian Sablefish fishery in NPFC region (1996-present). Data are averaged across 3 years to comply with data privacy restrictions.

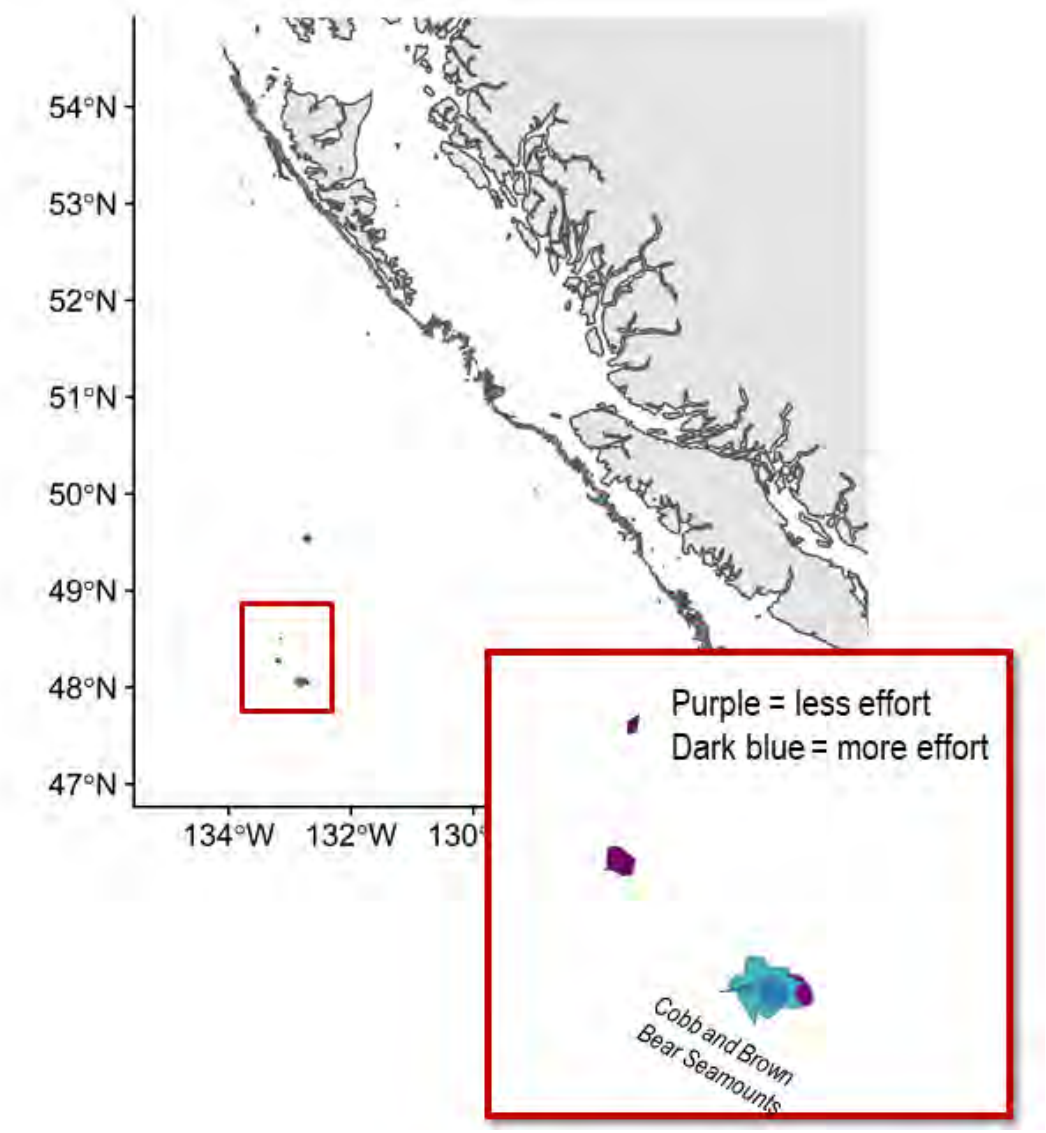


Figure 4. Relative change in spatial distribution of effort for Sablefish trap fishery from 2010-2017 to 2018-2019. Inset shows seamounts in the NPFC Convention Area.

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 = 107%). CPUE was not calculated in 2023 due to the absence of fishing in the Convention Area, but has generally been increasing since 2012.

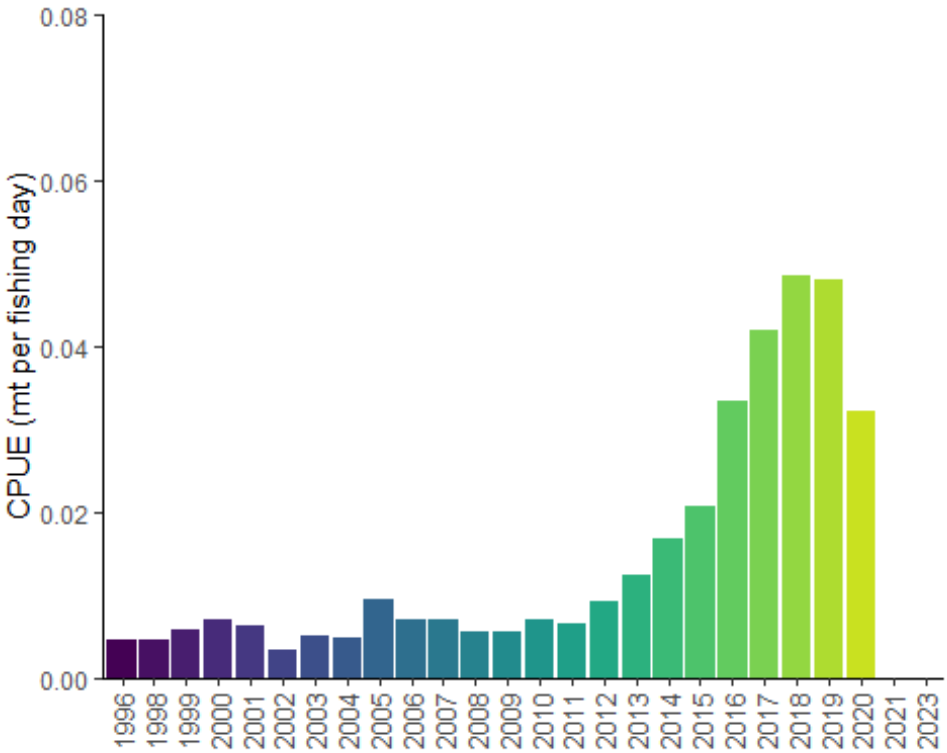


Figure 5. Catch per unit of effort for blackspotted and rougheye rockfishes in the Canadian Sablefish fishery in NPFC region. Data are averaged across 3 years to comply with data privacy restrictions.

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.

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).

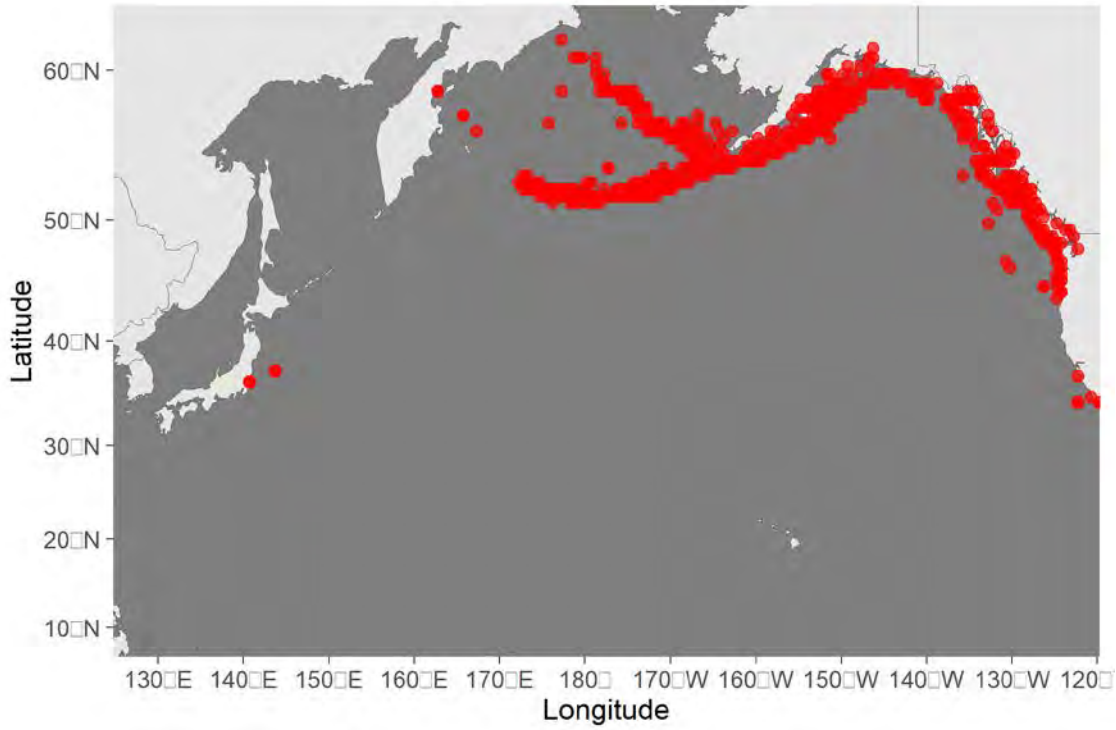


Figure 6. Map of distribution of blackspotted and rougheye rockfishes in the North Pacific.

Literature cited

DFO. 2020. Rougheye/Blackspotted Rockfish (*Sebastes aleutianus/melanostictus*) Stock Assessment for British Columbia in 2020. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2020/047.

Gharrett, A.J., A.P. Matala, E.L. Peterson, A.K. Gray, Z. Li, and J. Heifetz. 2007. Distribution and population genetic structure of sibling rougheye rockfish species. Pages 121-140 In J. Heifetz, J. DiCosimo, A.J. Gharrett, M.S. Love, V.M. O'Connell, and R.D. Stanley (eds.) 2007. Biology, assessment, and management of North Pacific rockfishes. Alaska Sea Grant College Publication AK-SG-07-01, University of Alaska Fairbanks.

Love, M.S., M. Yoklavich, and L. Thorsteinson. 2002.The Rockfishes of the North Pacific. University of California Press, Berkeley, California. 405 p.

Orr, J.W. and S. Hawkins. 2008. Species of the rougheye rockfish complex: resurrection of *Sebastes melanostictus* (Matsubara, 1934) and a redescription of *Sebastes aleutianus* (Jordan and Evermann, 1898) (Teleostei: Scorpaeniformes). Fish. Bull. 106(2):111-134

Shotwell, S.K., D.H Hanselman, P.J.F. Hulson, and J. Heifetz. 2014. Assessment of rougheye and blackspotted rockfish stock in the Gulf of Alaska. In Stock assessment and fishery evaluation report for the groundfish fisheries of the Gulf of Alaska. p.655-750. North Pacific Fishery Management Council, 605 W. 4th. Avenue, Suite 306, Anchorage, AK 9950-2252.

Sullivan J. 2022. Assessment of rougheye and blackspotted rockfish stock complex in the Gulf of Alaska. In Stock assessment and fishery evaluation report for the groundfish fisheries of the Gulf of Alaska. North Pacific Fishery Management Council, 605 W. 4th. Avenue, Suite 306, Anchorage, AK 9950-2252.

Spencer, P.D., J.N. Ianelli, and N. Laman. 2022. Assessment of the blackspotted and rougheye rockfish complex in the eastern Bering Sea/Aleutian Islands. In Stock assessment and fishery evaluation report BSAI. North Pacific Fishery Management Council, 605 W. 4th Ave, suite 306. Anchorage, AK 99501

Yang, M.S. and M.W. Nelson. 2000. Food habits of the commercially important groundfishes in the Gulf of Alaska in 1990, 1993, and 1996. NOAA Tech. Memo. NMFS-AFSC-112. 174 p.

Annex H

Species summary for neon flying squid

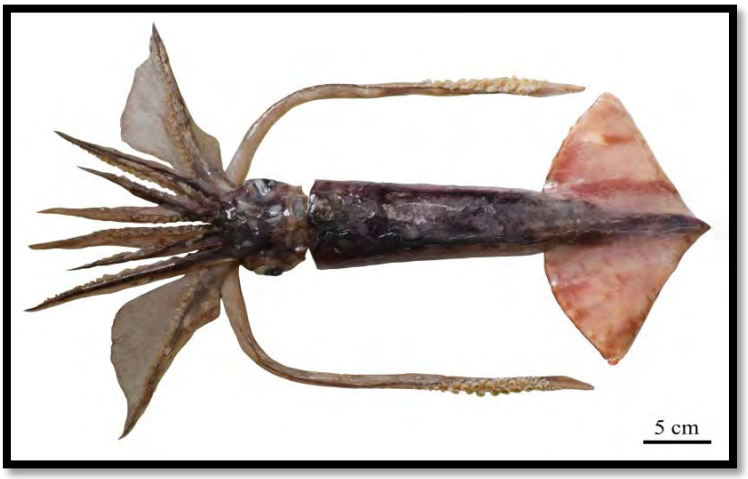


Figure 1. The pictures of neon flying squid

Neon Flying Squid (*Ommastrephes bartramii*)

Common names:

柔鱼 [rou yu] (Chinese); neon flying squid (English); アカイカ [akaika] (Japanese); 빨강오징어(Korean); Кальмар Бартрама [kalmar bartrama] (Russian); 赤魷 [chi-you] (Chinese Taipei).

Other common names: Red flying squid; Webbed flying squid; Red ocean squid (https://www.sealifebase.ca/comnames/CommonNamesList.php?ID=58132&GenusName=Ommastrephes&SpeciesName=bartramii&StockCode=3971)

Management

Active management measures

The following NPFC conservation and management measure (CMM) pertains to this species:
CMM 2023-11 For Japanese Sardine, Neon Flying Squid and Japanese Flying Squid
Available from https://www.npfc.int/active-conservation-and-management-measures.

Management summary

Does not specify catch limits.

Members of the Commission and CNCPs with substantial harvest of neon flying squid in the Convention Area shall refrain from expansion, in the Convention Area, of the number of fishing vessels authorized to fish such species from the historical existing level.

Members of the Commission and CNCPs without substantial harvest of the neon flying squid in the Convention Area are encouraged to refrain from expansion, in the Convention Area, of the number of fishing vessels entitled to fly their flags and authorized to fish for such species from the historical existing level.

Members of the Commission participating in fishing for the neon flying squid in areas under their jurisdiction adjacent to the Convention Area are requested to take compatible measures.

Table1. Management Summary

Convention/Management Principle	Status	Comment/Consideration
Biological reference point(s)	🔴	Not established.
Stock status	○	Status determination criteria not established.
Catch or effort limits	🟡	Recommended effort limits.
Harvest control rule	🔴	Not established.
Other		

🟢 OK 🟡 Intermediate 🔴 Not accomplished ○ Unknown

Stock assessment

No unified stock assessment has been conducted by NPFC for the species.

Some members have conducted stock assessment or related studies for neon flying squid based on the information only from their own fisheries or surveys (Ichii et al. 2006; Chen, 2010; Cao et al.

2014).

Data

Survey

Japan conducted drift net survey in summer from 1999-2020 and jigging survey in winter from 2018~2020. Russia conducted upper epipelagic surveys from 1984-1992 and from 1999-2019 (see details in Table 2).

Fishery

Neon flying squid was harvested by China, Japan, Korea, Russia, Chinese Taipei and Vanuatu. Fishing methods included jigging, drift net, dip net and set net.

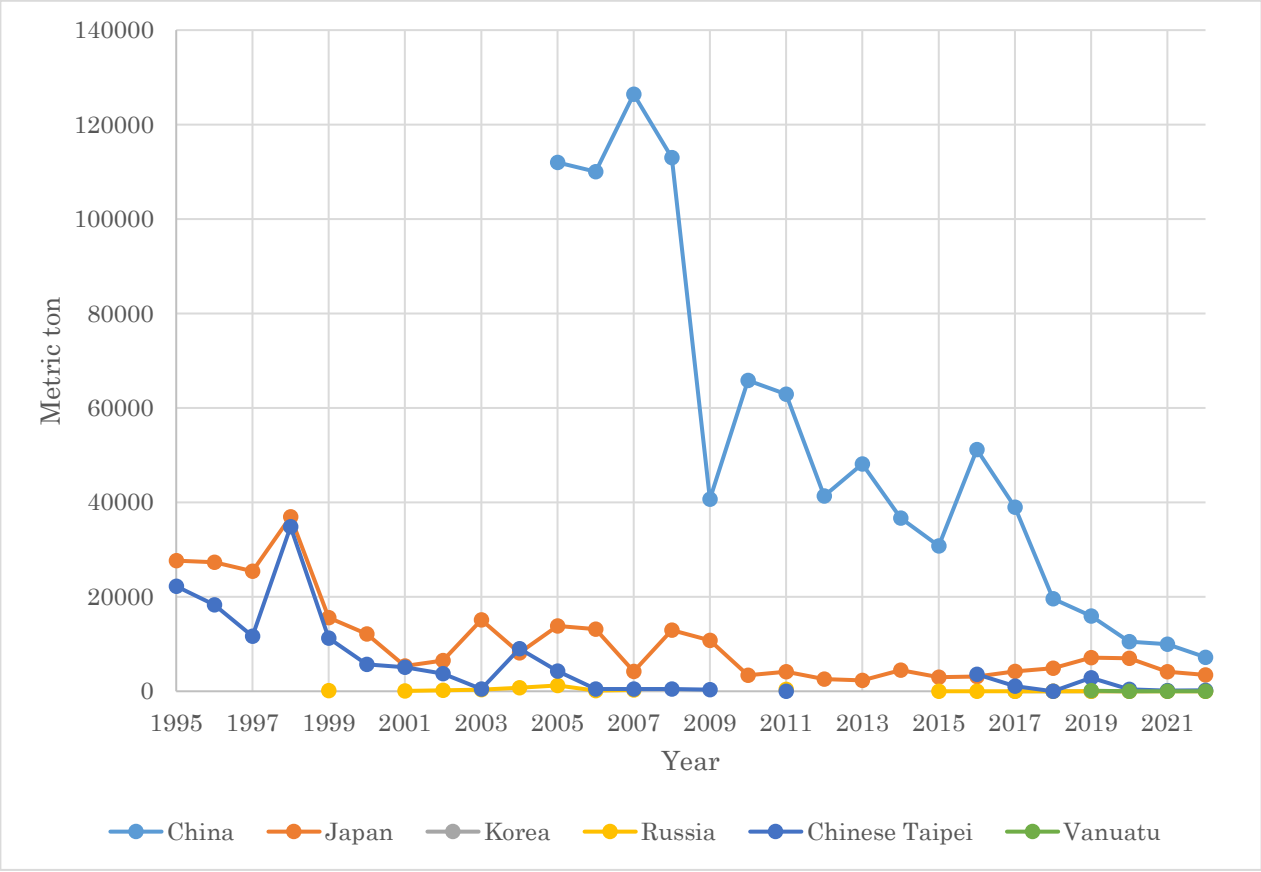


Figure 2. The historical catch of neon flying squid reported by members.

Data availability

Table 2. Data availability from Members regarding neon flying squid

Category and data sources	Description	Years with available data	Average sample size/ year or data coverage	Potential issues to be reviewed
CHINA				
Catch statistics				
Squid-jigging fisheries	Official statistics, reports from annual report	Official statistics: 2005-2019 Fishery data before 2005 (need to be confirmed)	Coverage = 100%	The neon flying squid catches are obtained from the fisheries logbook data provided by the fisheries company
Size composition data				
Length measurements	Sampling from commercial squid-jigging fishing vessels	2010-2016 Data before 2005 (need to be confirmed)	800-1000 fish/year	May lack representativeness
Aging	Sampling from commercial squid-jigging fishing vessels	2010-2016 Data before 2005 (need to be confirmed)	80-200 fish /year	May lack representativeness
Abundance indices (commercial)				
Squid-jigging fisheries	Squid-jigging logbook	1995-2019 Fishery data before 2005 (need to be confirmed)	Coverage=100%	Will conduct standardization

Category and data sources	Description	Years with available data	Average sample size/ year or data coverage	Potential issues to be reviewed
JAPAN				
Catch statistics				
Jigging fishery	Logbook	1995-2020	Coverage=100%	
Size composition data				
Length and weight measurements	Drift net survey (Summer)	1999-2020	500-600 squid/year	
	Jigging survey (Winter)	2018-2020	300-400 squid/year	
Abundance indices (survey)				
Summer survey on abundance of the autumn and winter-spring cohorts	Drift net survey CPUE for each cohort (individuals/panel)	1999-2020	20-30 stations/year	Small samples of male and matured female for the autumn cohort
Winter survey on abundance of the winter-spring cohort	Jigging survey CPUE (individuals/line)	2018-2020	12-16 stations/year	
Abundance indices (commercial)				
Jigging fishery	Logbook Standardized CPUE of the winter-spring cohort	1995-2020	Coverage=100%	Standardize CPUE for the autumn cohort

Category and data sources	Description	Years with available data	Average sample size/ year or data coverage	Potential issues to be reviewed
KOREA				
Catch statistics				

Jigging	Official statistics, reports from fisheries	2017 and 2019	Coverage =100%	
Size composition data				
Length measurements	Measured by observers while onboard	2017	3100 fish	Measurement details to be reviewed
Abundance indices (commercial)				
Jigging	Logbook data available	2017	60 set 2017	Data coverage details to be reviewed

Category and data sources	**Description**	**Years with available data**	**Average sample size/year or data coverage**	**Potential issues to be reviewed**
RUSSIA				
Catch statistics				
Drift net fishery	Official statistics, reports from fisheries associations	Official statistics: 1982-1990, 1999-2007, 2011 1985-1998, 2008-2010 and 2012-2020 (no data available); publications: 1972-2012	Coverage 1982-1984 ?%, 1999-2007, 2011 =100%	Data coverage details to be reviewed
Size composition data				
Length measurements	Sampling from commercial fishing vessels. Sampling during research	1999-2007, 2011 2012-2019	100-4,000 squids /year (ca. 50 measurements per sampling)	Data coverage details to be reviewed

	surveys.			
Abundance indices (survey)				
Summer-autumn surveys to assess pelagic squids abundance	Upper epipelagic surveys	1984-1992, 1999-2019 (August-November)	60-80 stations/year 60-80 stations/year	Changes in abundance and migration patterns; development survey protocol and conduct standardization

Category and data sources	**Description**	**Years with available data**	**Average sample size/ year or data coverage**	**Potential issues to be reviewed**
CHINESE TAIPEI				
Catch statistics				
Dip net fishery Set net	Fishing gear used in different periods: 1977~1979: jigging 1980~1983: jigging and gillnet 1984~1992: gillnet 1993 till now: jigging	Data from 1977~1996 was provided by Taiwan Squid Fishery Association , data from 1997~2017 was based on logbook, and data from 2018~2020 was the statistics on landings.	Coverage 1977-1996 = ? % Coverage 1997-2017 = ? % Coverage 2017-2020 =100%	Only catch data is available before 1997.

Category and data sources	**Description**	**Years with available data**	**Average sample size/ year or data coverage**	**Potential issues to be reviewed**

VANUATU				
Catch statistics				
squid jigging fishery	from logbook	2019	logbook from 2013 to now, coverage 100%	VU has authorized 4 vessels to conduct Pacific saury and squid jigging fishery in NPFC Convention Area. However, the vessel only targets neon flying squid by hand when they couldn't catch Pacific saury. Until now, we have only had squid catch information in 2019.

Biological Information

Distribution and migration

Neon flying squid is an oceanic squid distributed in temperate and subtropical waters of the Pacific, Indian and Atlantic Oceans. The North Pacific population occurs mainly between 20◦ and 50◦N, and comprises two cohorts: a fall cohort with a hatching period from September to February and a winter–spring cohort with a hatching period mainly from January to May, but extending to August. Neon flying squid makes an annual round-trip migration between its subtropical spawning grounds and its northern feeding grounds near the Subarctic Boundary.

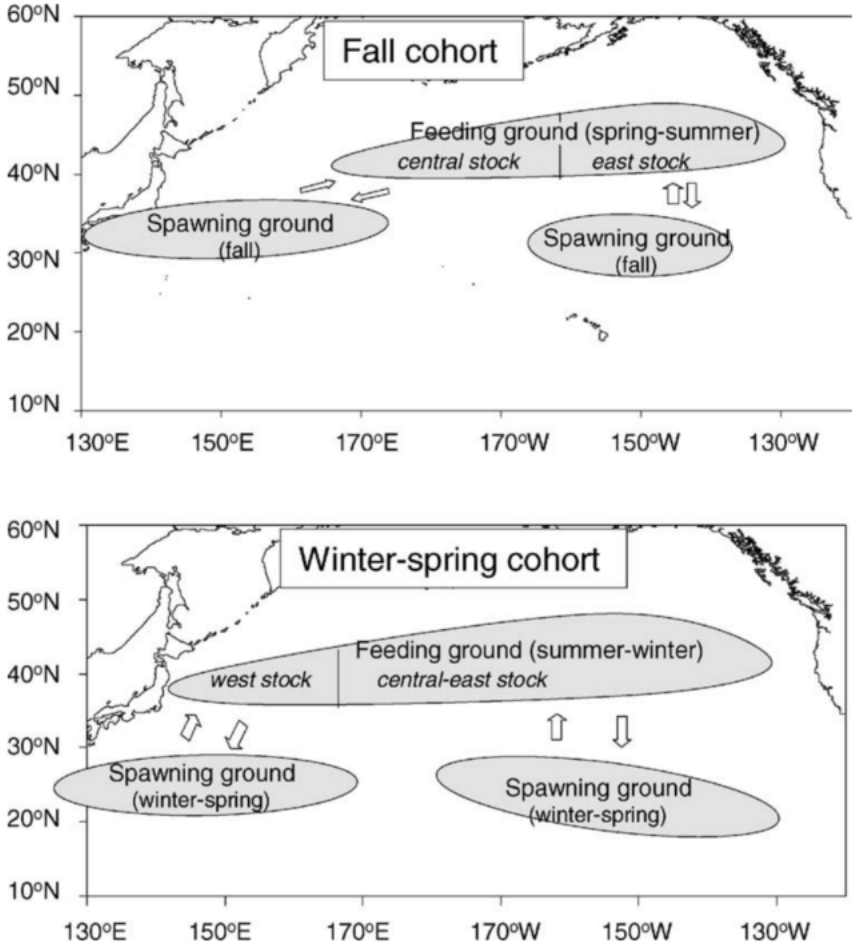


Figure 3. Migration patterns of the fall and winter–spring cohorts of neon flying squid in the North Pacific.

Life history

Growth is exponential during the first 30 days after hatching and then becomes more or less linear. It is suggested that this shift in growth accompanies a change in the feeding behavior that is thought to occur once the fused tentacles, which form a proboscis in the hatchlings, separate and become functional.

Neon flying squid at 7-10 months of age and has an estimated 1-year life span. Size at maturity is about 30–33 cm ML in males and 40–55 cm ML in females. The maximum ML is around 45 cm in males and 60 cm in females.

During its northward migration and at the feeding grounds in the central North Pacific, neon flying squid feeds mainly on fishes, squids and crustaceans. Many marine mammals feed on neon flying squid. It is an important prey of northern fur seals in the central North Pacific, and a minor prey of short-beaked common dolphins (Bower and Ichii 2005).

Literature cited

John R. Bower; Taro Ichii. The red flying squid (*Ommastrephes bartramii*): A review of recent research and the fishery in Japan. 2005. Fisheries Research.

Chih-Shin Chen. Abundance trends of two neon flying squid (*Ommastrephes bartramii*) stocks in the North Pacific. 2010. ICES Journal of Marine Science.

Cao, Jie; Chen, Xinjun; Tian, Siquan. A Bayesian hierarchical DeLury model for stock assessment of the west winter-spring cohort of neon flying squid (*Ommastrephes bartramii*) in the northwest Pacific Ocean. 2015. Bulletin of Marine Science.

Taro, Ichii; Kedarnath, Mahapatra; Hiroshi, Okamura; Yoshihiro, Okada. Stock assessment of the autumn cohort of neon flying squid (*Ommastrephes bartramii*) in the North Pacific based on past large-scale high seas driftnet fishery data. 2006. Fisheries Research.

Annex I

Species summary for Japanese sardine

Japanese sardine (*Sardinops melanostictus*)

Common names:

拟沙丁鱼, Ni Sha Ding Yu (China)
マイワシ, Maiwashi (Japan)
정어리, Jeong-eoli (Korea)
Дальневосточная сардина (Russia)
遠東擬沙丁魚, Yuan-Dong-Ni-Sha-Ding-Yu (Chinese Taipei)

Figure 1. Japanese Sardine (Sardinops melanostictus).

Management

Active NPFC Management Measures

The following NPFC conservation and management measure (CMM) pertains to this species:

- CMM 2023-11 For Japanese Sardine, Neon Flying Squid and Japanese Flying Squid

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

Management Summary

The current management measure for Japanese Sardine does not specify catch or effort limits. The CMM states that Members and Cooperating non-Contracting Parties currently harvesting Japanese Sardine should refrain from expansion of the number of fishing vessels authorized to fish Japanese Sardine in the Convention Area. New harvest capacity should also be avoided until as stock assessment has been completed.

A stock assessment for Japanese Sardine is conducted by Japan within their EEZ and used for management of the domestic fishery.

Table 1. Current status of NPFC management measures

Convention or Managment Principle	Status	Comment or Consideration
Biological reference point(s)	Not accomplished	Not established for NPFC CA (Established in Japan EEZ)
Stock status	Unknown	Status determination criteria not established for NPFC CA (Established in Japan EEZ)
Catch limit	Intermediate	Recommended catch, effort limits
Harvest control rule	Not accomplished	Not established for NPFC CA (Established in Japan EEZ)
Other		

Assessment

There is currently no stock assessment for Japanese Sardine conducted by NPFC for the Convention Area.

Japan conducts stock assessments for the Pacific stock of Japanese sardine using tuned virtual population analysis (VPA) and MSY-based reference points (Furuichi et al. in press). Only the Pacific stock is distributed into the NPFC Convention Area. The most recent stock assessment in Japan included foreign catches from China and Russia, with some assumptions about age composition of these catches. Information on the size, weight and age of the catch from the NPFC CA would be useful if it were made available for Japan's stock assessment.

Estimated recruitment, biomass, and spawning stock biomass (SSB) have gradually increased since 2010 (Figure 2a). Japan uses a hockey-stick stock-recruitment relationship with regime shifts between a standard-recruitment state and a high-recruitment state and considers the current state to be the standard-recruitment state (Figure 2b). In the last five years (2018-2022), SSB was estimated to be higher than SSBmsy but F has been gradually increasing at higher levels than Fmsy (Figure 2c).

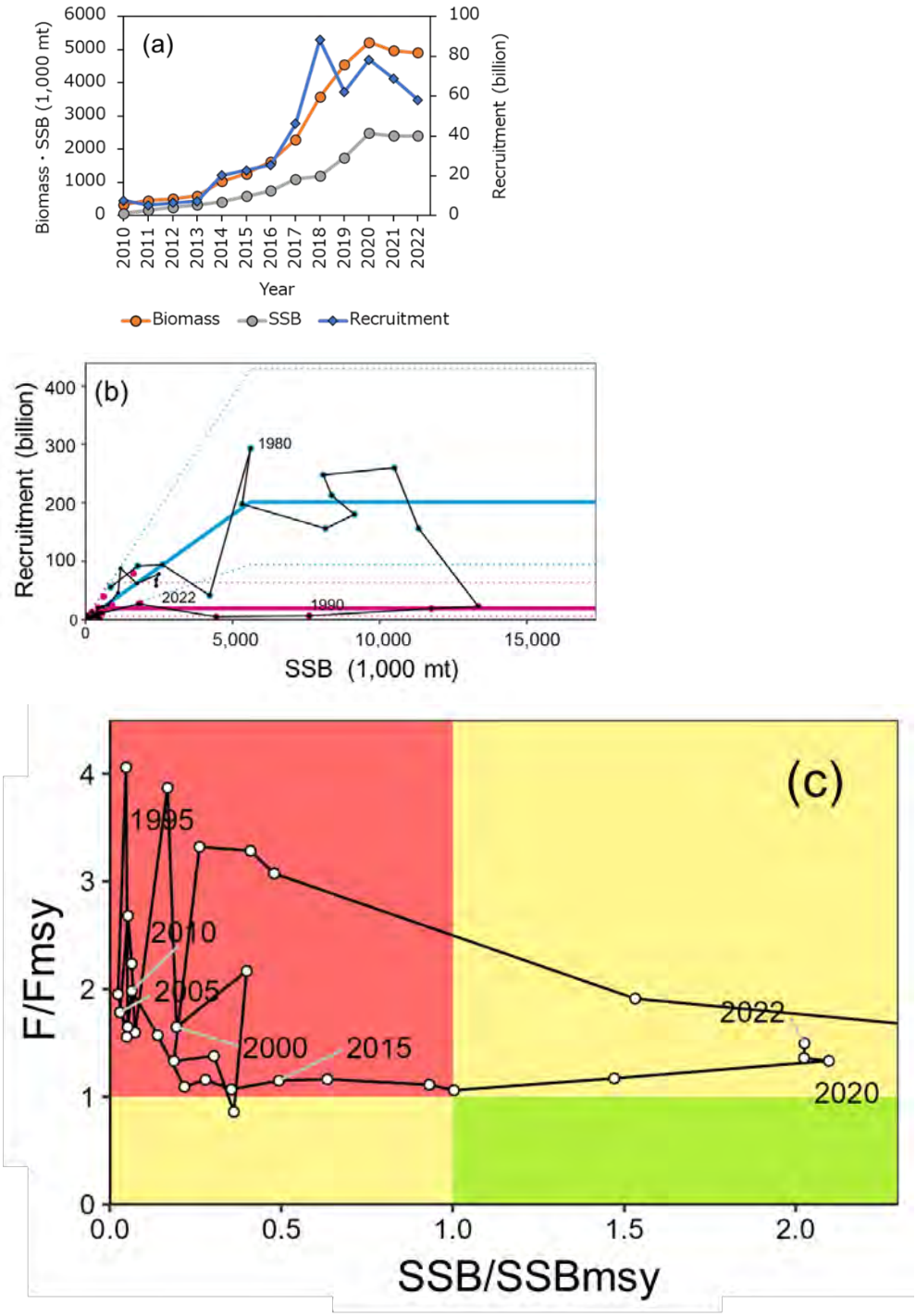


Figure 2. Time series of spawning stock biomass, total biomass and recruitment from the domestic Japanese Sardine stock assessment (panel a) and stock recruit relationship (panel b). Kobe plot indicating historical and current status of Japanese sardine in relation to MSY-based reference points reprinted from Japan's domestic stock assessment of Japanese Sardine (Furuichi et al. in press; panel c).

Data

Surveys

Japan conducts three surveys that estimate recruitment for a number of pelagic species, including Japanese Sardine (Table 2). The surveys target pre-recruits and juveniles to determine an index of recruitment. Japan also conducts a monthly egg and larval survey that is used to estimate spawning stock biomass. Surveys are conducted in spring (1995-2020), summer (2001-2020) and fall (2005-2020) at 30-80 stations per year. The survey protocol can be found at (Oozeki et al. 2007). Russia has conducted a summertime acoustic-trawl survey since 2010 that examines mid-water and upper epipelagic species including Japanese Sardine.

Fishery

China, Japan and Russia catch Japanese sardine. China does not target the species, but it is captured as bycatch in other fisheries (e.g. chub mackerel). Catches are primarily by purse seine, with a smaller component of the catch taken by pelagic trawl. China's catch of Japanese Sardine is taken exclusively from the Convention Area from April to December. China's existing catch records are from 2016 to 2020 and show increasing catches during that time period as the stock may have been increasing. The historical catches (prior to 2016) are unknown, thought to be low and likely need to be confirmed.

Japan's fishery for Japanese Sardine occurs inside their EEZ and is mostly conducted by large purse seine vessels (>90% of the catch). Additional components of the fishery include set nets, dip nets and other gears. The fishery experienced very high catches in the 1980's and early 1990's, a decline to very low catches from 1995 to ~2010 and has been recovering since then. The fishery is conducted year round, but mainly during the summer season.

The Russian fishery occurs inside their EEZ and is prosecuted primarily by pelagic trawling (>90% of the catch), with a smaller component of the catch coming from purse seines. The success of Russian fishery depends on the migration patterns and overall abundance of Japanese Sardine, as the sardine move into Russian waters when their abundance is high. For this reason, there was no catch from 1994-2011 when the stock abundance was low, but in recent years (since 2016) as the stock has recovered and water temperatures have been warm there have been increasing catches in Russia. The Russian fishery occurs primarily from June to November.

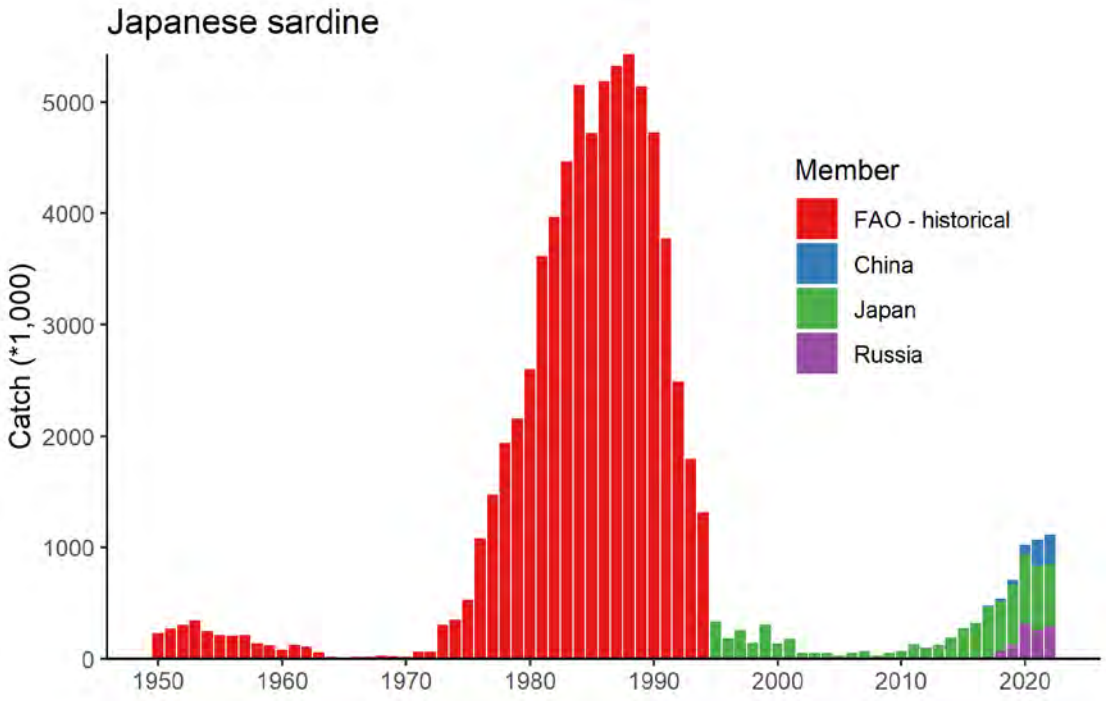


Figure 3. Historical catch of Japanese Sardine.

Other NPFC Members (Canada, Korea, Chinese Taipei, USA and Vanuatu) do not target Japanese Sardine. Chinese Taipei has some historical records of Japanese Sardine bycatch in the Pacific Saury fishery (~100 mt) and Korea has a small amount of historical bycatch data from the bottom trawl fishery. Vanuatu, USA and Canada have no record of Japanese Sardine catches.

Fishery catch data is available for Members from the NPFC website (https://www.npfc.int/system/files/2022-03/NPFC-2023-AR-Annual%20Summary%20Footprint%20-%20Japanese%20Sardine.xlsx) since 2001. Prior years fishery catch data was downloaded from FAO data collections at https://www.openfisheries.org using rfisheries package (Karthik Ram, Carl Boettiger, and Dyck 2013).

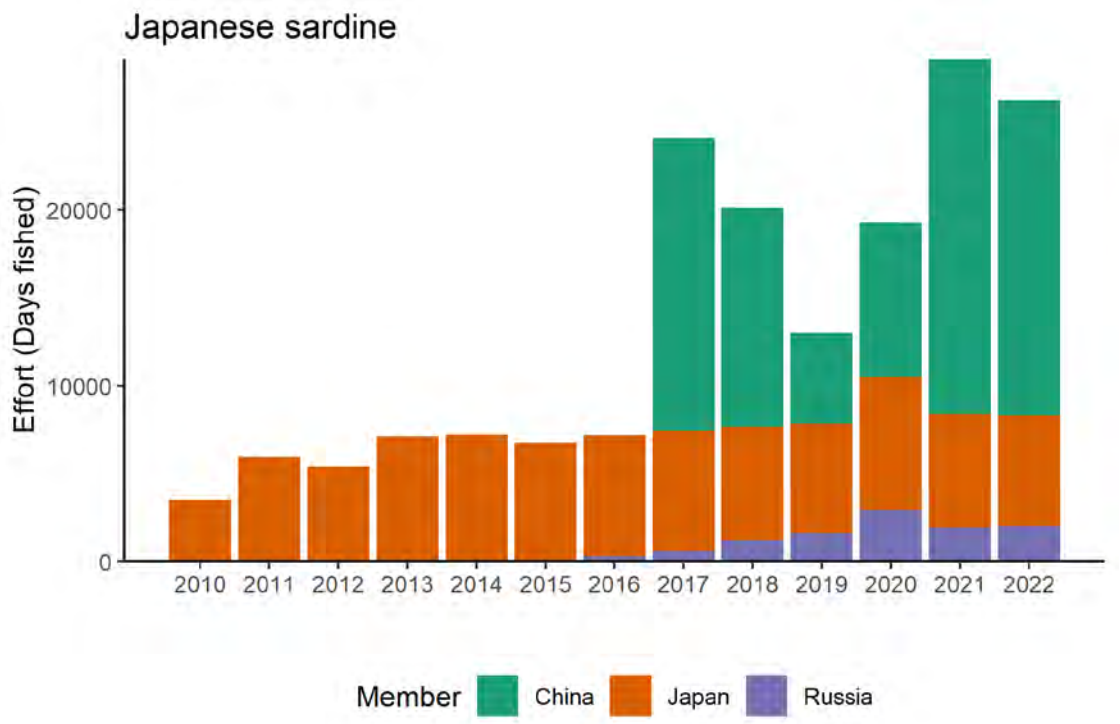


Figure 4. Historical fishing effort for Japanese Sardine.

Biological collections

China has collected biological data from fishery catches of Japanese Sardine since 2020. These collections included length data as well as maturity and age structures.

Russia collects length and weight data, age structures (scales) and maturity data from both commercial catches and surveys.

Japan also collects length, weight, maturity and age data from the survey and fishery to support their stock assessment.

Data availability from Members regarding Japanese sardine

Data	Source	Years	Comment
Catch	China	2016-present	Catches from convention area
	Japan	1995-present	Historical catch data from 1968 available, catches in national waters
	Korea		Minor bycatch in bottom trawl fishery

Data	Source	Years	Comment
	Russia	2016-present	Catches primarily in national waters, not convention area
	Chinese Taipei		Minor bycatch in Pacific saury fishery
CPUE			not developed
Survey	Japan		Pre-recruit survey
	Japan		Juvenile survey
	Japan		Monthly egg and larval survey
	Russia	2010-present	Acoustic-trawl survey
Age data	China	2020-present	Commercial catch
	Japan		Commercial and survey catches
	Russia		Commercial and survey catches
Length data	China	2020-present	Commercial catch
	Japan		Commercial and survey catches
	Russia		Commercial and survey catches
Maturity/fecundity	China	2020-present	Commercial catch
	Japan		Commercial and survey catches
	Russia		Commercial and survey catches

Special Comments

None

Biological Information

Distribution

Japanese sardine (*Sardinops melanostichtus*; Figure 1) are a pelagic species that occurs in large migratory schools in the coastal waters of China, Chinese Taipei, Japan, Korea and Russia (Figure 5, (Kaschner et al. 2019)). They generally migrate from the south to the north during summer, returning to inshore areas in the south to spawn in the winter. Japanese sardine feed mainly on zooplankton and phytoplankton.

Life history

Japanese sardine are short-lived and fast growing, maturing early at 2-years old. Their maximum length is ~24 cm and their maximum reported age is 25 years (Whitehead 1985). Their growth rates and spawning patterns are highly influenced by the environment (Niino et al. 2021)

Taxonomically, the Japanese sardine are closely related to other species around the globe including Sardinops from southern Africa, Australia, South America and California.

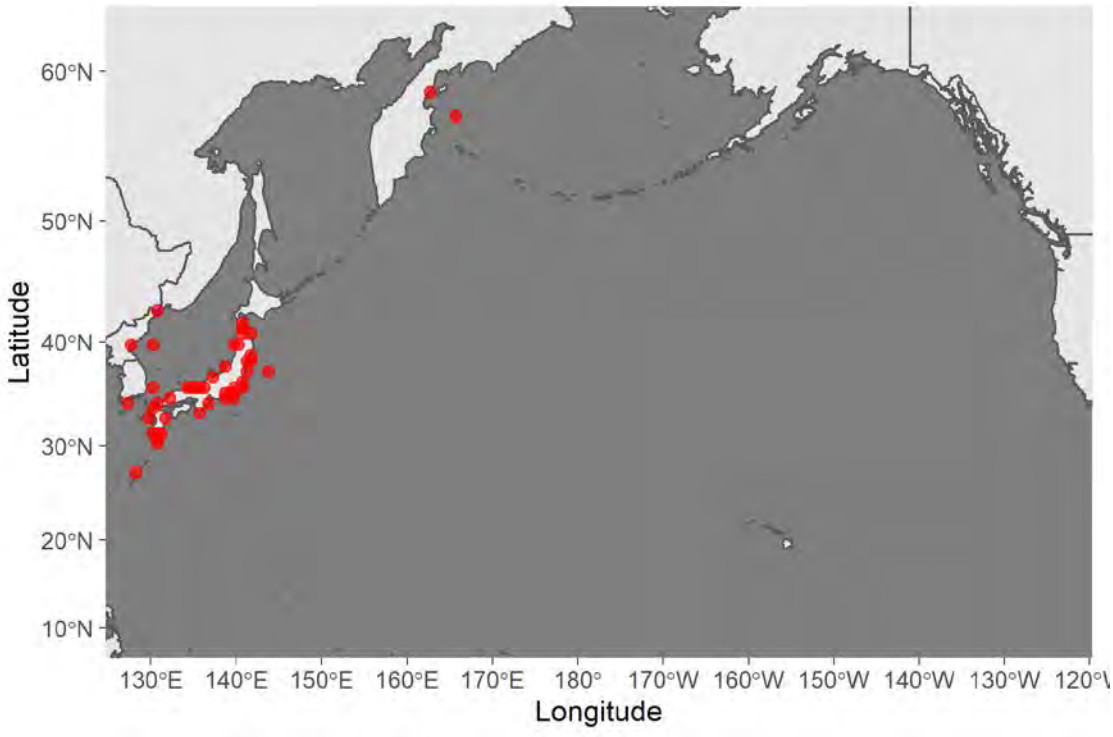


Figure 5. Map of distribution of Sardine species in the North Pacific.

Literature cited

Furuichi, S., Yukami. R., Kamimura, Y., Nishijima, S., Watanabe, R., Isu, S., & Higashiguchi, K. (in press) Stock assessment and evaluation for Japanese Sardine Pacific stock (fiscal year 2023).

In Marine Fisheries Stock Assessment and Evaluation for Japanese Waters (fiscal year 2023/2024). Japan Fisheries Agency and Fisheries Research and Education Agency of Japan. Tokyo, 51pp. (will be published at https://abchan.fra.go.jp/hyouka/doc2023/)

Karthik Ram, Carl Boettiger, and Andrew Dyck. 2013. “Rfisheries: R Interface for Fisheries Data. R Package Version 0.1.” 2013. http://CRAN.R-project.org/package=rfisheries.

Kaschner, K., Kesner-Reyes K., Garilao C., Segschneider J., J. Rius-Barile, Rees T., and R. Froese. 2019. “AquaMaps: Predicted Range Maps for Aquatic Species. Data Retrieved from Https://Www.aquamaps.org.”

Niino, Yohei, Sho Furuichi, Yasuhiro Kamimura, and Ryuji Yukami. 2021. “Spatiotemporal spawning patterns and early growth of Japanese sardine in the western North Pacific during the recent stock increase.” *Fisheries Oceanography*, no. April: 1–10. https://doi.org/10.1111/fog.12542.

Oozeki, Yoshioki, Akinori Takasuka, Hiroshi Kubota, and Manuel Barange. 2007. “Characterizing Spawning Habitats of Japanese Sardine (*Sardinops Melanostictus*), Japanese Anchovy (Engraulis Japonicus), and Pacific Round Herring (Etrumeus Teres) in the Northwestern Pacific.” *CalCOFI Rep.* 48 (December).

Whitehead, Peter J. P. 1985. “FAO Species Catalogue. Vol. 7. Clupeoid Fishes of the World (Suborder Clupeoidei). An Annotated and Illustrated Catalogue of the Herrings, Sardines, Pilchards, Sprats, Shads, Anchovies and Wolf-Herrings.” *FAO Fish. Synop.* 125(7/1): 1–303.

Annex J

Species summary for Japanese flying squid

Japanese Flying Squid (*Todarodes pacificus*)

Common names:

太平洋褶柔鱼 [tai ping yang zhe rou yu] (Chinese); Japanese flying squid (English); スルメイカ [surume-ika] (Japanese); 살오징어 [sal-o-jing-eo] (Korean); тихоокеанский кальмар [tihookeanskiy Kalmar] (Russian); 日本魷 [ri-ben-you] (Chinese Taipei).

Other common names: Japanese common squid, Pacific flying squid.

Management

Active NPFC Management Measures

The following NPFC conservation and management measure pertains to this species:
CMM 2021-11 For Japanese Sardine, Neon Flying Squid and Japanese Flying Squid
Available from https://www.npfc.int/active-conservation-and-management-measures.

Management Summary

The current management measure for Japanese flying squid (JFS) does not specify catch or effort limits. The CMM states that Members and Cooperating non-Contracting Parties currently harvesting JFS should refrain from expansion of the number of fishing vessels authorized to fish JFS in the Convention Area. New harvest capacity should also be avoided until as stock assessment has been completed.

Japan has been conducted stock assessment annually for two stocks of JFS such as the autumn- and winter-spawning stocks since 1997. Japanese domestic total allowable catch (TAC) has been annually set for JFS based on acceptable biological catch (ABC) determined based on the stock assessment results.

Table 1. Management Summary

Convention/Management Principle	Status	Comment/Consideration
Biological reference point(s)	●	Not established for NPFC CA (Established in Japan EEZ).
Stock status	○	Status determination criteria not established for NPFC CA (Established in Japan EEZ).
Catch limit	●	Not established for NPFC CA (Established in Japan EEZ).
Harvest control rule	●	Not established for NPFC CA (Established in Japan EEZ).
Other		

● OK ● Intermediate ● Not accomplished ○ Unknown

Stock Assessment

No stock assessment has been conducted by NPFC for the Convention Area.

Japan conducts annual stock assessments for the autumn-spawning stock and winter-spawning

stock of JFS (Figure 1, Miyahara et al. 2023, Okamoto et al. 2023). The latest stock assessment for the winter-spawning stock in Japan included overseas catch from Russia, China and Korea (Fig. 1a). Estimated biomass and spawning stock biomass (SSB) have decreased drastically since 2015 (Fig. 1b). Japan uses a Beverton–Holt stock-recruitment relationship (Fig. 1c). In 2021, SSB was estimated lower than SSBmsy and F was lower than Fmsy (Fig. 1d).

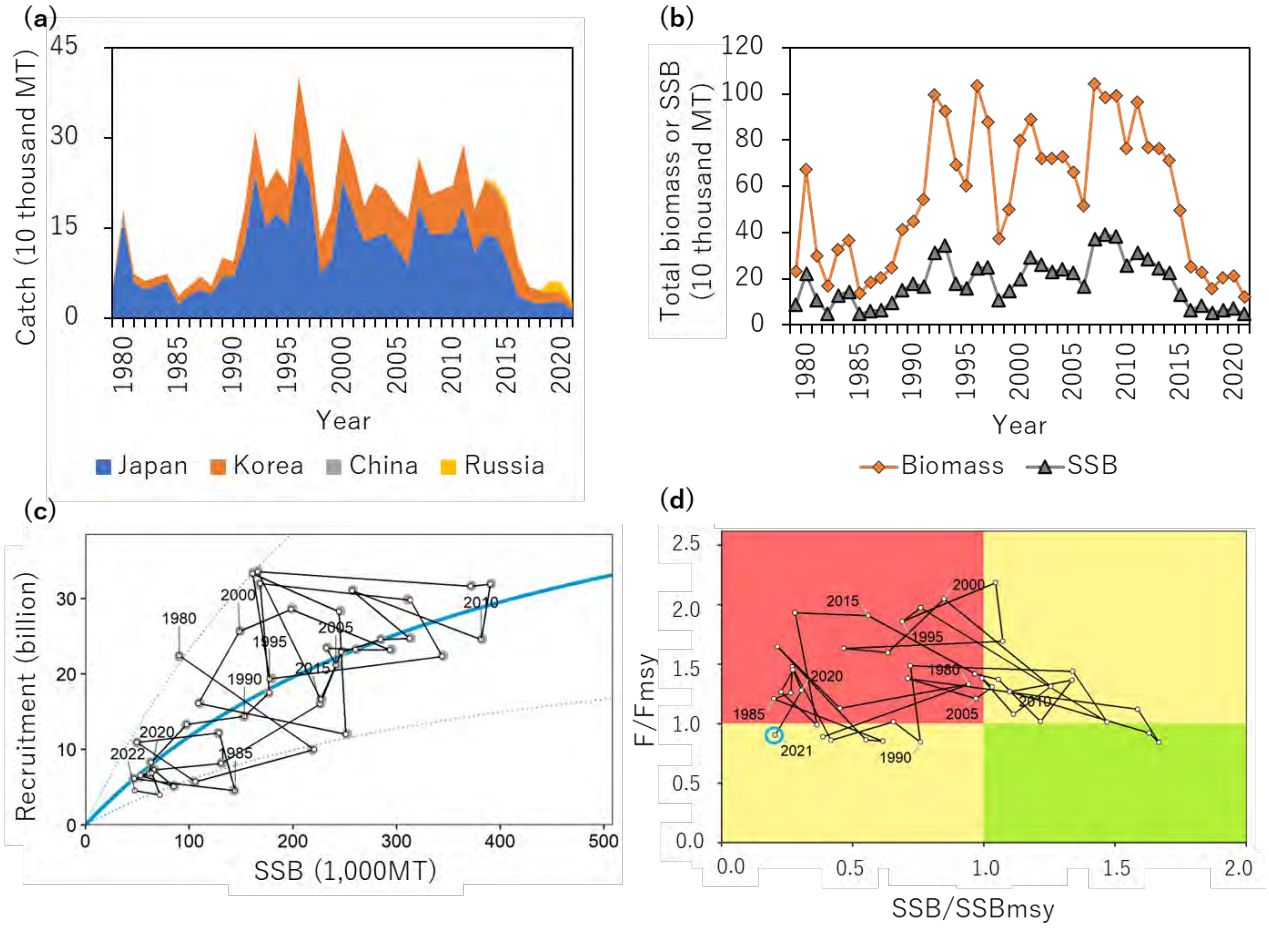


Figure 1. Summary of the stock assessment for the winter-spawning stock Japanese flying squid by Japan (Okamoto et al. 2023). (a) Time series of catch of each Member from fishing year 1979 to 2021. (b)Estimated biomass and SSB. (c) Stock-recruitment relationship. (d) Kobe plot.

Data

Survey

JFS are encountered in several surveys conducted by Japan and Russia. Japanese surveys encounter multiple life history stages of one or more seasonal stocks, including larvae (winter survey), recruits (May-June), and adults (July-September). Russia conducts a survey of JFS during their feeding migration into Krill Islands waters, this results in number and biomass estimated by area swept method for Krill Islands waters (annual, for winter stock only). While this survey captures only a

portion of the stock so not fully representing stock biomass, it may help identify environmental impact on migration patterns, timing, etc.

Fishery

The winter-spawning stock of JFS is harvested in the NPFC Convention Area (see Biological Information).

JFS are caught by Members in both the Convention Area and National Waters. Catch tables are available at the NPFC website (https://www.npfc.int/system/files/2023-04/NPFC-2023-AR-Annual%20Summary%20Footprint%20-%20Squids%20%28Rev.%201%29_0.xlsx). Catches of JFS in the Convention Area are low, as the majority of catches comes from Japanese and Russian national waters (Figure 2). JFS are caught using a variety of gears, most commonly squid jigging and trawl, but purse seine and set net are also used. They are predominantly caught as a targeted species, not as bycatch in other fisheries. However, in some seasons, they can be caught as bycatch in the Japanese sardine fishery. Chinese fishing fleets do not target JFS but encounter them in low quantities as bycatch in other fisheries.

There is no fishery CPUE index developed for this species in the Convention Area. Japan has already developed fishery-dependent/independent abundance indices to use in the domestic stock assessment.

Age data are collected by port samplers from a subset of Japanese fishing ports and for several Japanese prefectural research bodies. The squid's statolith is used for counting daily ages and estimating hatching dates (Nakamura and Sakurai 1991).

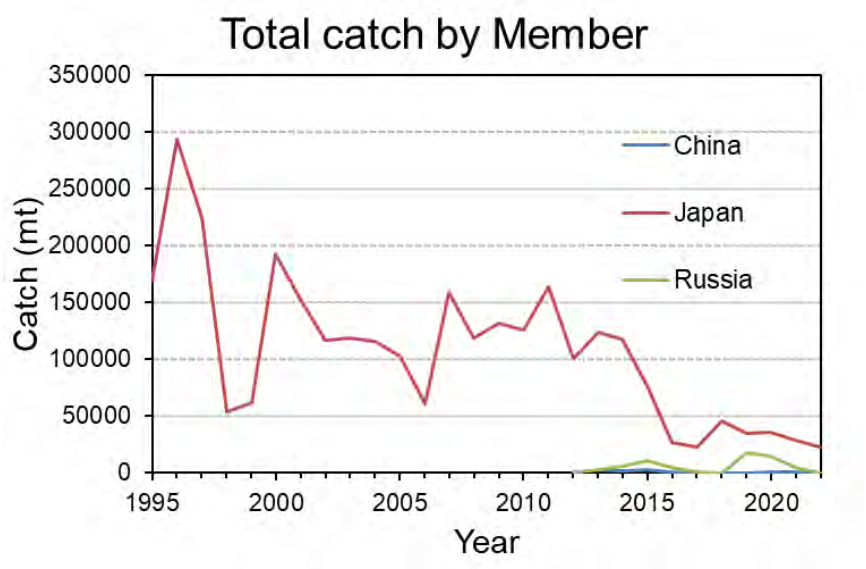


Figure 2. Total catch (mt) for each Member reporting Japanese flying squid catches during 1995-present.

Data table

Table 2. Data availability from Members regarding Japanese flying squid

Japanese flying squid: China, Japan, Russia.*

* No fishery targets Japanese flying squid. No relevant data.

Category and data sources	Description	Years with available data	Average sample size/ year or data coverage	Potential issues to be reviewed
JAPAN				
Catch statistics				
Coastal jigging fishery	Official statistics; Reports from fisheries associations and markets	1979-2022 (only after 1995 at some ports)	Coverage = 100%	
Offshore jigging fishery	Logbook	1979-2022	Coverage = 100%	
Trawl fishery	Logbook	1980-2022	Coverage = 100%	
Purse seine fishery	Official statistics; Reports from fisheries associations and markets (only at Hachinohe and Mie);	1995-2022	Coverage = 100%	
Set net	Official statistics; Reports from fisheries association	1995-2022	Coverage = 100%	
Size composition data				
Length measurements	Port sampling by eight local fisheries research bodies at major ports on the Pacific side	1979-2022	3000-15000 fish/year (about 50 individuals measured per a single size sampling)	Data coverage in the eastern Hokkaido (Nemuro Strait)

Aging	Port sampling by three local fisheries associations and nine fisheries research bodies	2012-2022	500-1200 fish/year	Data coverage in the eastern Hokkaido (Nemuro Strait)
Abundance indices (survey)				
Winter survey for larvae	BONGO net	2001-2022	65-204 stations/year	Review survey protocol and conduct standardization
Survey for recruitment from May to June	Midwater trawl	1996-2022	24-63 stations/year	Review survey protocol and conduct standardization
Survey for recruitment in June	Jigging	1972-2022	25-83 stations/year	Review survey protocol and conduct standardization
Survey for recruitment from June to July	Midwater trawl mainly targeting saury	2001-2022	33-136 stations/year	Review survey protocol and conduct standardization
Survey for recruitment in July	Midwater trawl	2019-2022	20-40 stations/year	Short time series (four years)
Survey for recruitment in August	Jigging	1979-2022	28-66 stations/year	Review survey protocol and conduct standardization
Abundance indices (commercial)				
Coastal jigging fishery	Monthly catch and effort data reported by fisheries associations and markets in the seven major regions during fishing season	1979-2022	25-37 observations/year	

	from July to December; Standardized CPUE for domestic stock assessment			

Category and data sources	Description	Years with available data	Average sample size/year or data coverage	Potential issues to be reviewed
RUSSIA				
Catch statistics				
Jigging fishery	Official statistics, reports from fisheries associations	Official statistics: 1964-1970, 2013-2022, 1971-2012 (no data available); publications: 1967-2018	Coverage 1964-1970 ?%; Coverage 2013-2022 =100%	Data coverage details to be reviewed
Midwater trawl fishery				
Size composition data				
Length measurements	Sampling from commercial fishing vessels. Sampling during research surveys.	1966-1975 1992-2022	500-3,000 squids /year (ca. 50 measurements per sampling)	Data coverage details to be reviewed
Aging	-	-	-	-
Abundance indices (survey)				
Summer trawl and acoustic (echo integration) surveys to assess pelagic squids abundance	Mid-water upper epipelagic surveys	1992-2022 (June-July) 1992-2022 (July-August)	60-80 stations/year 60-80 stations/year	Changes in abundance and migration patterns; development survey protocol and conduct standardization

Biological Information

Distribution and migration

JFS are distributed mainly in the northwest Pacific (Figs 3 and 4) and their northward/southward shifts in distribution range occur in response to changes in water temperature (Murata 1990, Sakurai et al. 2013). JFS extent their distribution up to 50° N in September. There are northmost (eastmost) and southmost occurrences recorded in Canada and Hong Kong, respectively (Jereb and Roper 2010, Okutani 2015).

The autumn- and winter-spawning stocks have spatially different nursery areas and migration patterns (Fig 4). Although the nursery area of the autumn-spawning stock is located in the Sea of Japan, the winter-spawning stock has the nursery area east of Hokkaido and Tohoku regions of Japan, of which a part overlaps the NPFC Convention Area. Both stocks conduct southward migration via the Sea of Japan towards each spawning grounds. The main spawning grounds of the autumn-spawning stock are in the Tsushima Strait and in the Sea of Japan off southern Honshu Island (Goto 2002, Yamamoto et al. 2002), while those of the winter-spawning stock are in the East China Sea (Okutani and Watanabe 1983, Bower et al. 1999).

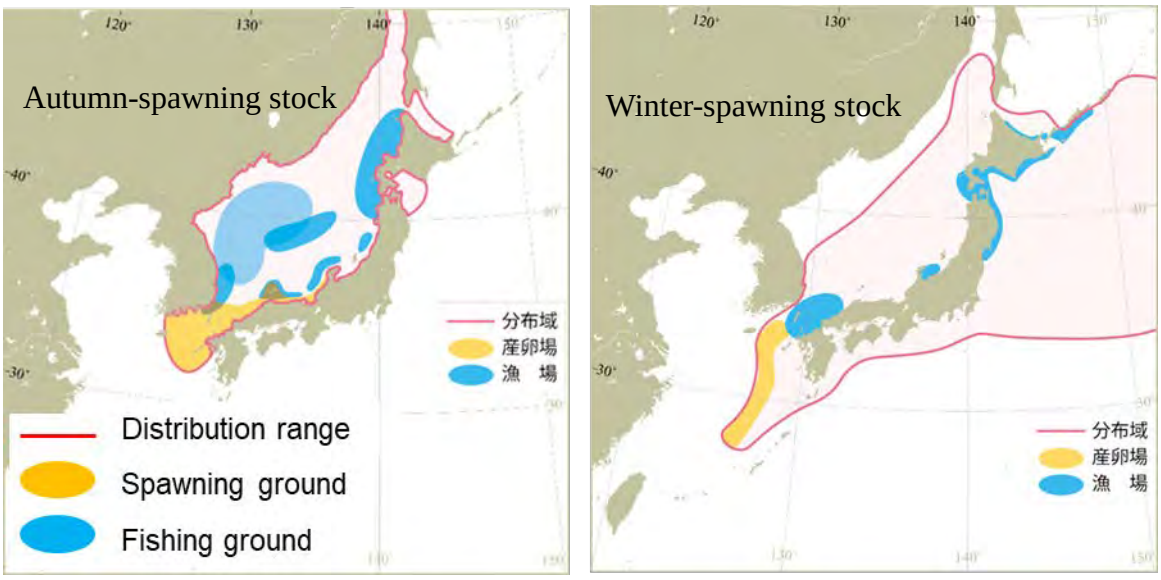


Figure 3. Distribution ranges, spawning grounds, and fishing grounds of the autumn- and winter-spawning stocks. These figures were modified based on Miyahara et al. (2023) and Okamoto et al. (2023).

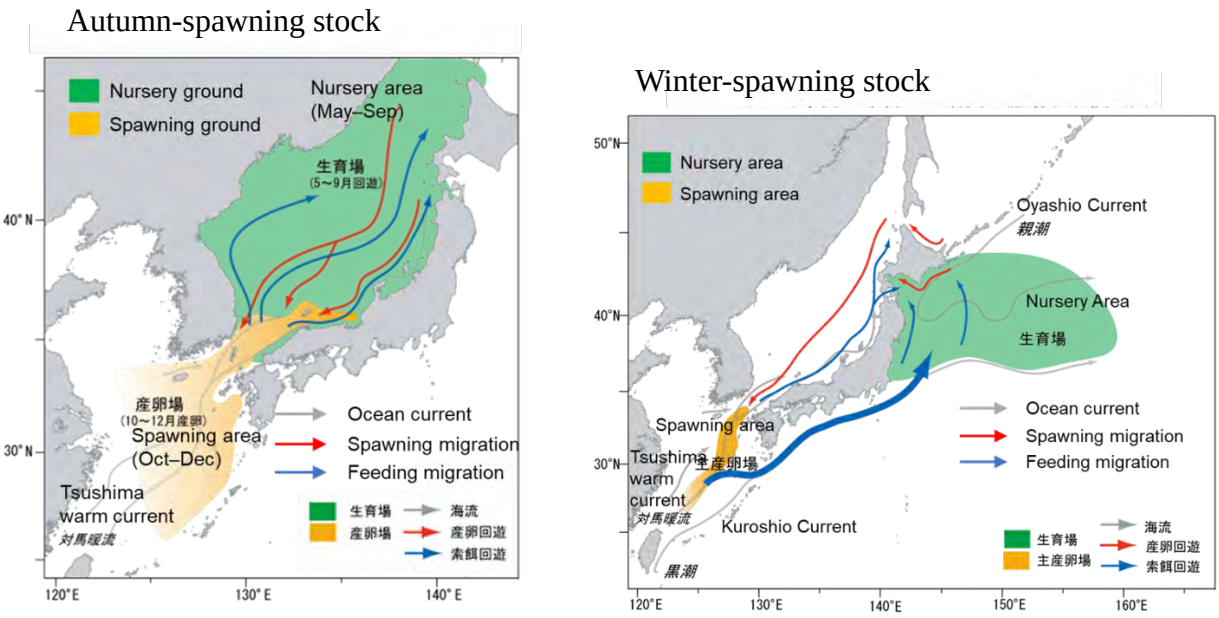


Figure 4. Seasonal migration of the autumn- and winter-spawning stocks. These figures were modified based on Miyahara et al. (2023) and Okamoto et al. (2023).

Stock Structure

There are distinct sub-populations (stocks) which spawn during different seasons (Murata 1990, Sakurai et al. 2013). The autumn-spawning stock is most abundance, followed by the winter-spawning stock which is distributed in the waters off eastern Japan Oyashio region (Sakurai et al. 2013, Miyahara et al. 2023, Okamoto et al. 2023). There is, in addition, minor stock of spring/summer spawned squid.

Life history

Maximum size thought to be 50 cm (mantle length) for females, smaller for males (Jereb and Roper 2010). Females are thought to mature around 20-25 cm (mantle length). The JFS lifespan is approximately one year (Murata 1990). JFS prey on myctophids, anchovies, crustaceans, gastropod larvae, and chaetognaths, and are preyed upon by rays and several marine mammals (Jereb and Roper 2010, Uchikawa and Kidokoro 2013).

Literature Cited

Bower, J. R., Nakamura, Y., Mori, K., Yamamoto, J., Isoda, Y., Sakurai, Y. (1999). Distribution of *Todarodes pacificus* (Cephalopoda: Ommastrephidae) paralarvae near the Kuroshio off southern Kyushu, Japan. Marine Biology, 135: 99–106.

Goto, T. (2002). Paralarval distribution of the ommastrephid squid *Todarodes pacificus* during fall in the southern Sea of Japan, and its implication for locating spawning grounds. Bulletin of

Marine Science, 71: 299–312.

Jereb, P. and Roper, C. F. E. (2010) Cephalopods of the world. An annotated and illustrated catalogue of cephalopod species known to date. Volume 2. Myopsid and Oegopsid Squids.FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. 328–332, https://www.fao.org/3/i1920e/i1920e.pdf

Miyahara, H., Okamoto, S., Nishijima, S., Matsukura, R., Matsui, H., Moriyama, T., Takasaki, K., Saito, T. and Inagake, D. (2023) Stock assessment and evaluation for autumn-spawning stock of Japanese flying squid (fiscal year 2022). Marine fisheries stock assessment and evaluation for Japanese waters. Japan Fisheries Agency and Japan Fisheries Research and Education Agency. Tokyo, 97pp, https://abchan.fra.go.jp/wpt/wp-content/uploads/2023/06/details_2022_19-Surume-A.pdf (in Japanese)

Murata, M. (1990) Oceanic resources of squids. Marine and Freshwater Behaviour and Physiology 18: 19–71

Nakamura, Y., Sakurai, Y. (1991) Validation of daily growth increments in statoliths of Japanese common squid *Todarodes pacificus*. Nippon Suisan Gakkaishi 57: 2007–2011

Okamoto, S., Miyahara, H., Matsui, H., Moriyama, T., Kurashima, A., Abo, J., Nishijima, S. and Setou, S. (2023) Stock assessment and evaluation for winter-spawning stock of Japanese flying squid (fiscal year 2022). Marine fisheries stock assessment and evaluation for Japanese waters. Japan Fisheries Agency and Japan Fisheries Research and Education Agency. Tokyo, 49pp, https://abchan.fra.go.jp/wpt/wp-content/uploads/2022/details_2022_18-Surume-W.pdf (in Japanese)

Okutani, T., and Watanabe, T. (1983). Stock assessment by larval surveys of the winter population of *Todarodes pacificus* Steenstrup (Cephalopoda: Ommastrephidae), with a review of early works. Biological Oceanography 2: 401–431.

Okutani, T. (2015). Cuttlefishes and Squids of the World, new edition. National Cooperative Association of Squid Processors. Tokyo, http://www.zen-ika.com/zukan/index-e.html

Sakurai, Y., Kidokoro, H., Yamashita, N., Yamamoto, J., Uchikawa, K., and Takahara, H. (2013). *Todarodes pacificus*, Japanese common squid. In: Rui, R, Ron, O. D, and Graham, P (eds) Advances in Squid Biology, Ecology and Fisheries. Part II Oegopsid Squids. Nova Biomedical, New York, 249–272.

Uchikawa, K., and Kidokoro, H. (2013). Feeding habits of juvenile Japanese common squid *Todarodes pacificus*: Relationship between dietary shift and allometric growth. Fisheries Research, 152: 29–36.

Yamamoto, J., Masuda, S., Miyashita, K., Uji, R., and Sakurai, Y. (2002). Investigation on the early stages of the Ommastrephid squid *Todarodes pacificus* near Oki Islands (Sea of Japan). Bulletin of Marine Science, 71: 897–992.

Species summary for blue mackerel

Blue mackerel (*Scomber australasicus*)

澳洲鮐 [ao-zhou-tai] (Chinese), ゴマサバ [gomasaba] (Japanese), 망치고등어 [Mang-chi-go-deung-eo] (Korean), пятнистая скумбрия [pyatnistaya skumbriya] (Russian), 花腹鯖 [Hua-Fu-Ching] (Chinese Taipei)

Other common names: Spotted mackerel

Management

Active NPFC Management Measures

None

Management Summary

- ✓ Conservation and Management Measure has not been set for blue mackerel in the NPFC.
- ✓ In Japan, total allowable catch (TAC) has been introduced to management of mackerels (blue mackerel and chub mackerel) since 1997.

Convention/Management Principle	Status	Comment/Consideration
Biological reference point(s)	🔴	Not established for NPFC CA (Established in Japan EEZ).
Stock status	○	Status determination criteria not established for NPFC CA (Established in Japan EEZ).
Catch limit	🔴	Not established for NPFC CA (Established in Japan EEZ).
Harvest control rule	🔴	Not established for NPFC CA (Established in Japan EEZ).
Other		

🟢 OK 🟡 Intermediate 🔴 Not accomplished ○ Unknown

Stock Assessment

No stock assessment has been conducted by NPFC.

Japan conducts stock assessments for the Pacific stock and the East China Sea stock of blue mackerel (BM) using tuned virtual population analysis (VPA) and MSY-based reference points

(Yukami et al. 2019a, Hayashi et al. 2019). Only the Pacific stock is distributed as far as the NPFC Convention Area. The most recent stock assessment in Japan included foreign catches from China and Russia, with some assumptions on species composition and age composition of mackerel (Fig. 1a). Estimated recruitment, biomass, and spawning stock biomass (SSB) have declined dramatically since the 2010s (Fig. 1b). Japan uses a Ricker stock-recruitment relationship. In the last two years (2020-2021), SSB was estimated to be lower than SSBmsy and F was higher than Fmsy (Fig. 1d).

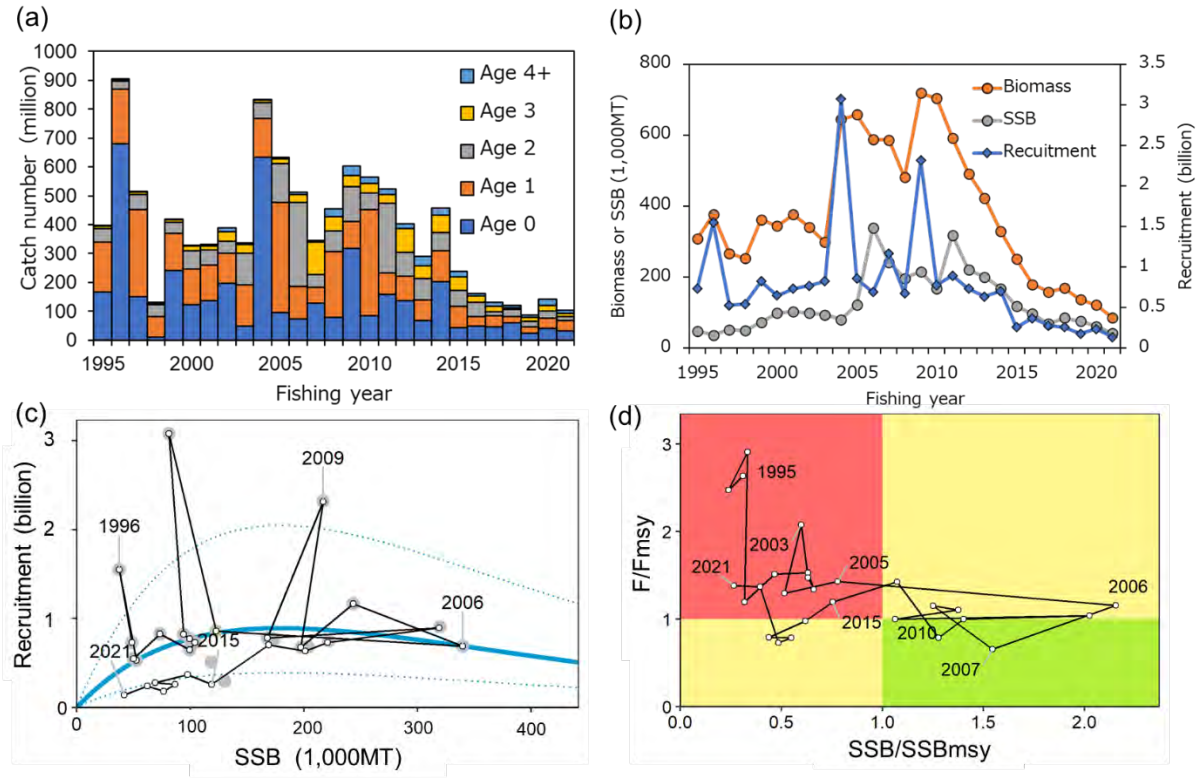


Figure 1: Summary of the stock assessment for the Pacific BM stock by Japan (Yukami et al. 2023). (a) Time series of catch number by age. (b) Estimated biomass, SSB, and recruitment. (c) Stock-recruitment relationship. (d) Kobe plot.

Data

Survey

Japan conducts three surveys: (1) egg and larval distribution survey (every month), (2) juvenile survey (May-Jul since 2001), and (3) pre-recruit fish survey (Aug-Oct since 2001). The egg survey

has been used as an abundance index for SSB in Japan's domestic stock assessment (Figs. 2, 3). Other members do not conduct surveys for BM.

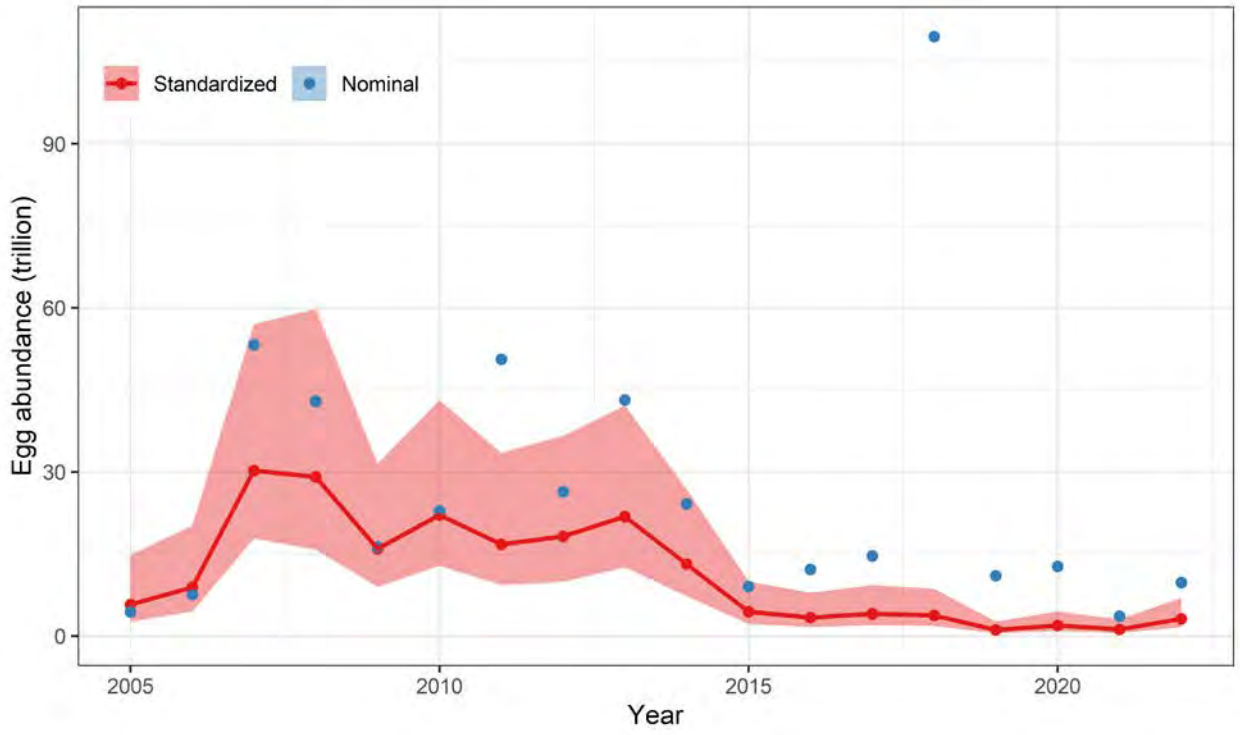


Figure 2: Time series of egg abundance indices. Nominal standardized indices are shown. This standardization incorporates the effect of species misidentification of chub mackerel as blue mackerel, which is a reason why standardized values are lower than nominal values in most years typically 2018. See Kanamori et al. (2021) for details.

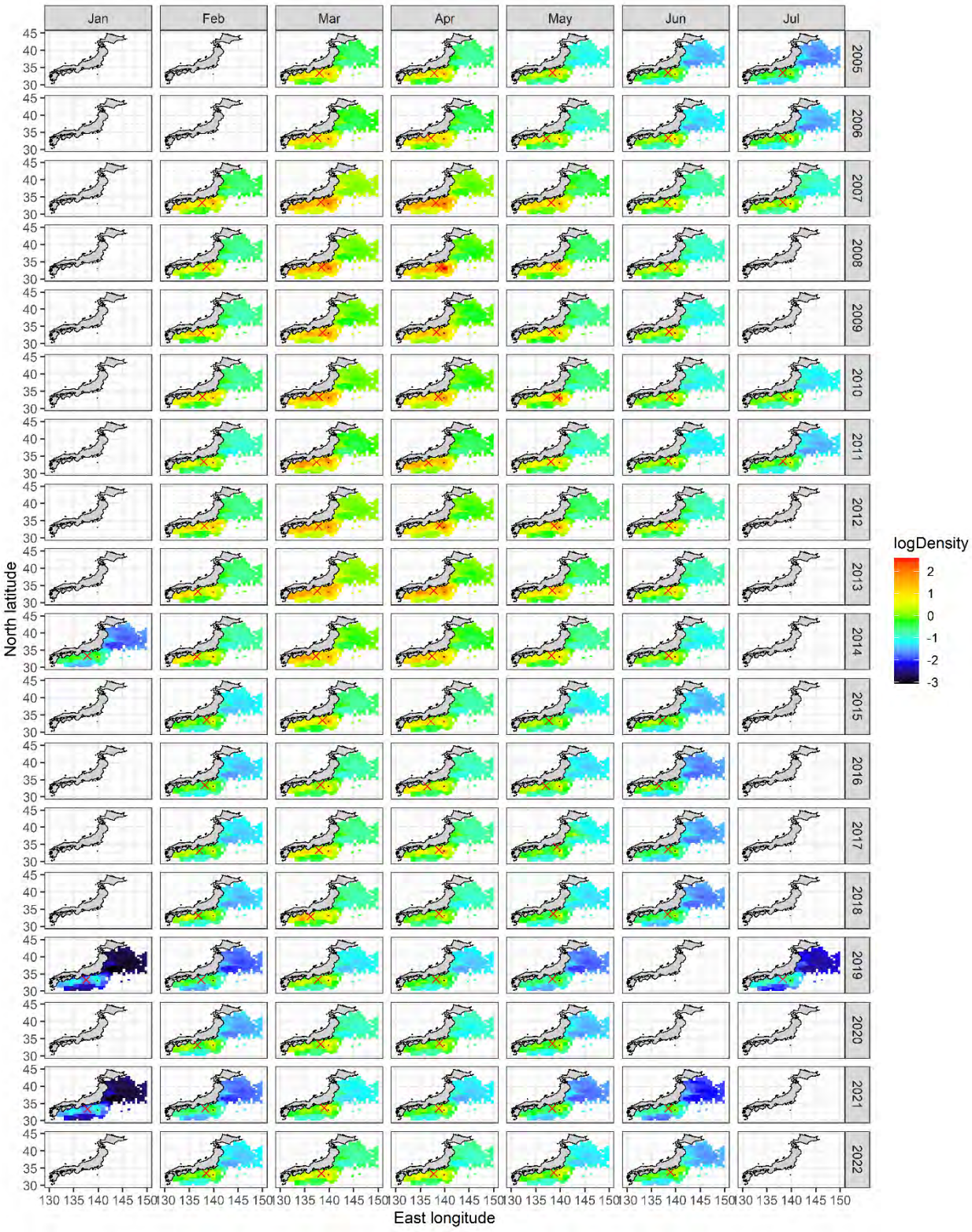


Figure 3: Spatial distributions of BM eggs on the Pacific coast of Japan by month (column) by year (row), estimated from the seasonal VAST model (Thorson et al. 2020) with the egg survey data. The sign of X in red represents the centroid of abundance distributions.

Fishery

The fishing grounds of Japanese fisheries are located in the waters on the continental shelves and slopes, around the waters of islands within Japan's EEZ. The main fishing gears of Japan are purse seine (large vessels >40 GRT and small vessels <40 GRT), set net and dip net. In the 1980s, BM were mainly caught by dip net. From the 1990s, the large and small-scale purse seine fisheries dominated the catch. BM catch has decreased since the 2010s (Fig. 4). Chub and blue mackerels are caught together by the fisheries and summed up as "mackerel" in Japan's fishery statistics of Japan. The catch of BM was estimated from the mixing ratio survey of landings. Japan conducts the identification of each species by external shape; BM has distinct black spots on both sides of the body, and the interval between the splines of the first dorsal fin of BM is narrower than that of chub mackerel. The proportion of BM catch in the total mackerel catch was about 10% from 2016 to 2022.

China conducts a BM fishery only in the NPFC Convention Area, in the same fishing grounds as for chub mackerel. China takes samples to determine the composition of mackerel species in the catch and collects biological information. The proportion of blue mackerel is about 10% of the mackerel catch from 2014 to 2021, but increases to 25% in 2022. Thus, it is estimated that the catch weight of China (27.7 thousand MT) exceeded that of Japan (24.7 thousand MT) in 2022 (Fig. 4).

In Russia, there are no accurate catch statistics on the proportion of blue and chub mackerels. However, the portion of BM is very small and probably comprises less than 1% of the total mackerel catch by Russia.

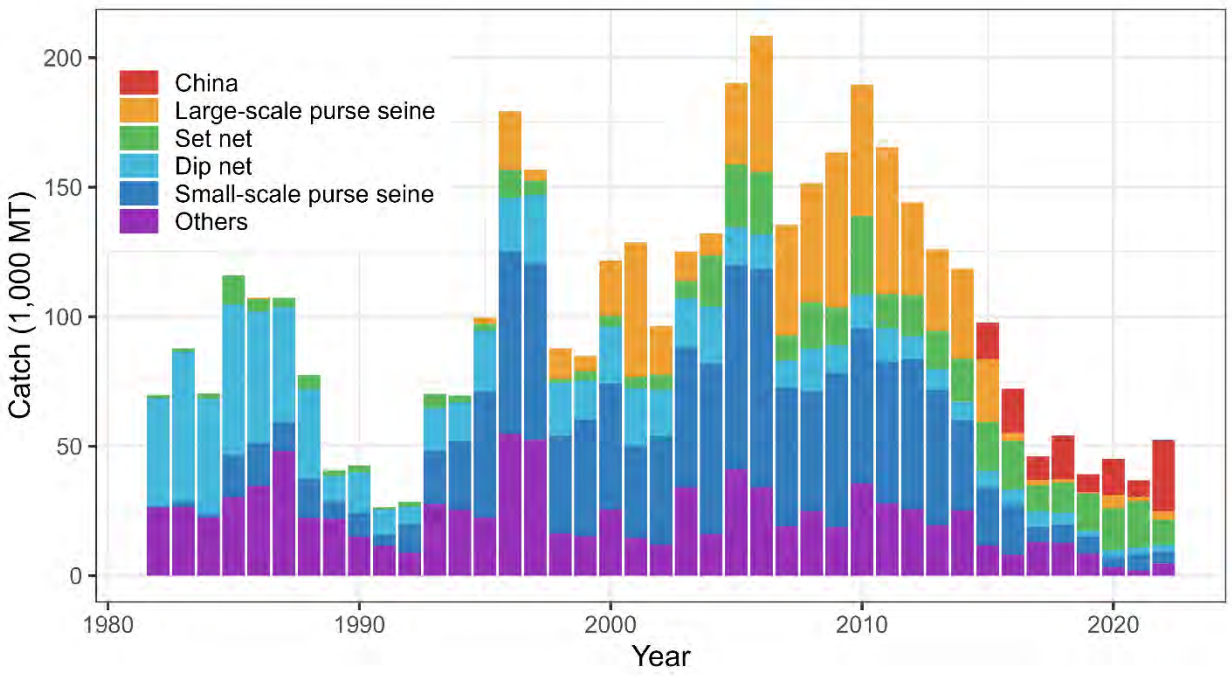


Figure 4: Time series of catch weight from 1982 to 2022 for the Pacific BM stock. Colors represent different fisheries in Japan, and purse seine and pelagic trawl fisheries in China are aggregated as red. Russia is assumed not to have fished for BM.

Data table

Data availability tables which include information about catch, abundance indices and biological data from China and Japan are respectively shown below (Tables 1, 2). For Russia, no relevant data are available.

Table 1: Data availability table from China.

Category and data sources	**Description**	**Years with available data**	**Average sample size/ year or data coverage**	**Potential issues to be reviewed**
CHINA				

Catch statistics				
Purse seine fishery Trawl fishery	Official statistics, reports from annual report	Official statistics: 2015-2022	Coverage=100 %	The blue mackerel and Japanese sardine catches are from the fishing catch provided by the fishery company
Size composition data				
Length measurements	Port sampling by Institute and technology group.	2018-2022	550-800 fish/year	Details to be reviewed
Aging	Sampling during research surveys and from commercial fishing vessels	2020-2022	30-180 fish/year	Details to be reviewed
Catch at age (CAA)	Estimate CAA from the above data	2020-2022	Age-length keys are to be developed	Evaluate uncertainty of catch at age, especially on changes of growth depending on recruitment abundance
Abundance indices (survey)				

Abundance indices (commercial)				
Purse seine fishery	Purse seine logbook	2015-2022	10-60/year	Should separate blue mackerel and chub mackerel Will conduct standardization

Table 2: Data availability table from Japan.

Category and data sources	**Description**	**Years with available data**	**Average sample size/ year or data coverage**	**Potential issues to be reviewed**
JAPAN				
Catch statistics				
Purse seine fishery	Official statistics; reports from fisheries associations and markets	Official statistics: 1950-2022, other reports: 1982-2022	Coverage=100 %	The spotted mackerel catches are estimated from chub and spotted mackerel catches based on port sampling data
Dip net fishery				
Set net				
Size composition data				
Length measurements	Port sampling by 17 local fishery institutes in 17 prefectures	1995-2022	4,000-40,000 (average 10,000) fish/year (ca.	Data coverage review

			100 measurements per sampling)	
Aging	Port sampling by 17 local fishery institutes in 17 prefectures	1995-2022	500-1000 fish/year	Data coverage review
Catch at age (CAA)	CAA is estimated with length measurement and aging data	1995-2022	Age-length keys are created approximately by quarter and local regions	Evaluation of uncertainty in catch at age, especially on changes in growth depending on recruitment abundance
Abundance indices (survey)				
Year-round for egg density	Almost all local fisheries research bodies join this survey program. NORPAC net is sampling gear. This survey is conducted for small pelagic species.	2005-2022	ca. 6000 stations in total, 1000-4000 stations with spotted mackerel eggs/year	Review survey protocol and conduct standardization
Abundance indices (commercial)				
Dip net fishery	Logbook data are collected from fishermen in Shizuoka prefecture since 1995	1995-2022	100-500/year	Standardization

Special Comments

Although the Small Working Group (SWG) previously used ‘spotted mackerel’ as the common name of this species, the SWG recommended to SC to change the common name to ‘blue mackerel’ for consistency with the FAO database of fish species.

Catch statistics specific to blue mackerel in the NPFC Convention Area are not available because combined catch of chub and blue mackerels have been reported to NPFC (https://www.npfc.int/summary-footprint-chub-mackerel-fisheries). China and Japan began to share data on the proportion of BM in the mackerel fishery and data on the size composition of the BM catch to allow for accurate stock assessment of BM.

Biological Information

The below descriptions are mostly extracted from Yukami et al. (2019b).

Distribution and migration

Blue mackerel is distributed from Japan to Australia and New Zealand in the Indo-West Pacific (Frose and Pauly 2022). Blue mackerel around Japan is divided into two stocks by spatial distributions in Japanese stock assessments: Pacific stock and East China Sea stock (Hayashi et al. 2019, Yukami et al. 2019; Fig. 5). Below we describe biological information based on the Pacific stock of blue mackerel.

Blue mackerel tends to distribute in warm offshore waters. The main distribution area for adults is around water of the Kuroshio current. The larvae hatch around the Kuroshio current and are distributed from the coastal water of southern Honsyu to the transition water between Kuroshio and Oyashio currents located 165 to 170 East longitude, the same as the chub mackerel larvae. The juveniles sized at 5 to 15cm fork length (FL) transferred to transition water, migrate to north as they grow, feed at the area from coastal water of eastern Hokkaido and Kurill Islands to the subarctic water around 165 degree East longitude where the surface temperature around 13°C in summer to fall. They reach 20 to 25cm FL in fall to winter, and migrate south to the coastal waters of Joban and Boso to offshore water around Kuroshio current for wintering. A wintering ground in the water

near Emperor Seamounts was observed for 2004 year class which had high recruitment. Age 1 fish did not appear in the water north of Sanriku district after wintering until 1980, but they have migrated to the water from Tohoku to Hokkaido with the increase of surface temperature since 2001. They return south for wintering and migrate to the Izu Islands water for spawning in spring. Many schools distribute near Kuroshio current at the coastal water of southern Honshu all the year and are targeted by many fisheries. These are different from the schools that largely migrate from near the Kuroshio current at the Izu Island to Tohoku and Hokkaido waters. It is suggested that many fish above age 3 do not migrate north of Sanriku district and stay at the western water near the cape Ashizuri with small migrations or stay near the spawning grounds. Furthermore, it is considered that the observation of schools mainly consisting of age 8 fish at the Emperor seamounts area in 2008 to 2015 were due to the dominant recruitment spawned at the water south of Hachijo Island.

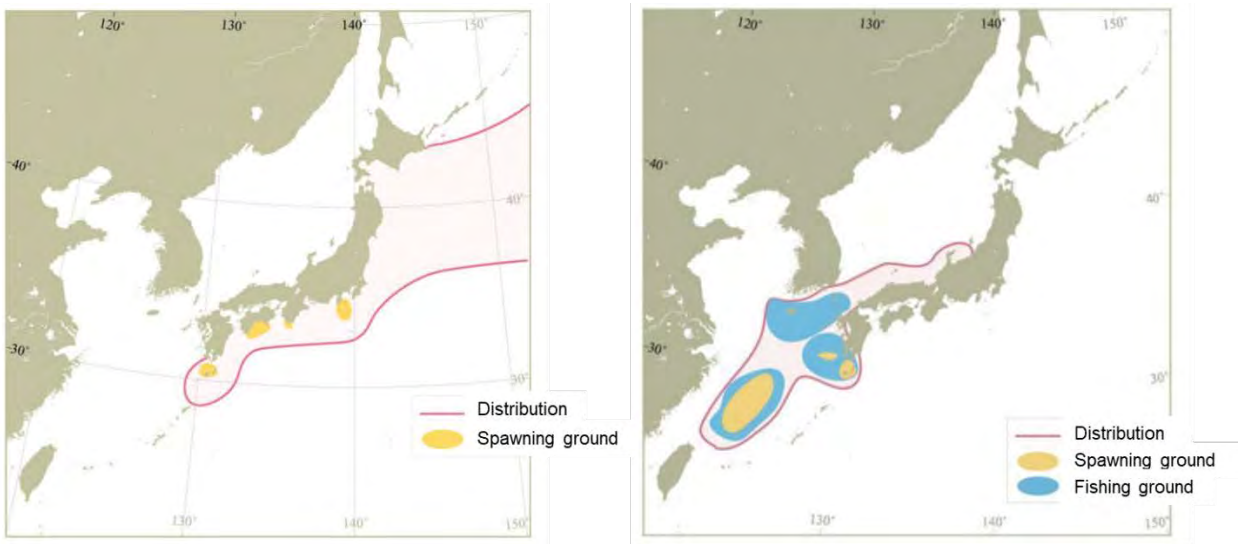


Figure 5: Distribution and spawning ground of the Pacific stock (left) and the East China Sea stock (right) of blue mackerel.

Age and growth

The larvae grow 1mm per day until 5cm FL after hatching observed by otolith reading, then it grows 15cm after 80days, and over 20cm of 120 days after hatching. The scale annuli reading is practical for the fish after subadult stage, it is used for the survey. Otolith annuli and daily ring readings are

also effective for age determination. It is suggested that fish becoming 20-25cm FL at age 0 in fall, 28-31cm at age 1 in summer, 30-34cm at age 2, 33-36cm at age 3, around 37cm at age 4, and 45cm at the maximum. The longevity was estimated around age 6 from size composition of catch, but the oldest age 11 was reported. The growth at younger ages is different by area, and in the western area of offshore Kumano there is a tendency for faster growth than fish occur in the water north of Izu Islands. The average length (FL), weight (the averages in caught fish in 2017 to 2021) by age are shown in Fig. 6.

The length-weight (LW) relationships in Japan and China are shown in Fig. 7 (see also Furuichi et al. 2021). Although the estimated parameters from the Chinese samples in 2021 and 2022 were different from the others probably due to the small sample sizes and narrow sampling ranges of length (Table 3), their shapes are almost identical. This suggests that the degree of obesity for BM was little different between Chinese and Japanese fishing grounds.

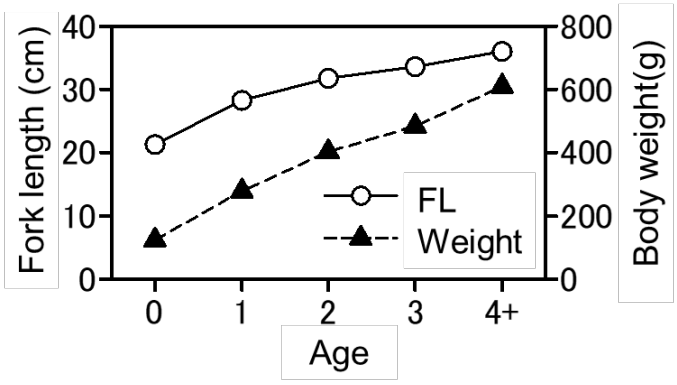


Figure 6: Relationship between age and fork length and relationship between age and body weight of BM (the averages of caught fish for the latest five years 2017-2021).

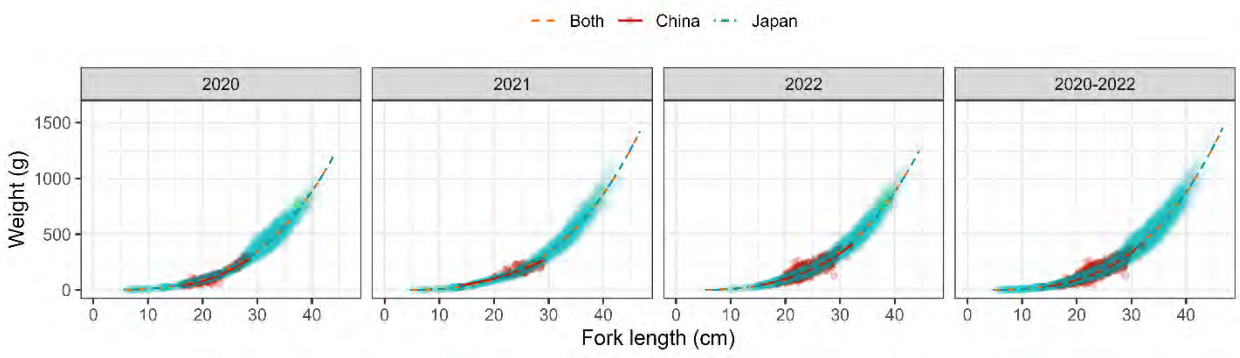


Figure 7: Relationships between fork length and weight from 2020 to 2022 of BM in Japan.

Table 3: Parameters of the relationship between fork length (cm) and weight (g) by Member from 2020 to 2022. The parameters are estimated by the least square method from the equation $W = aL^b$. *'Both' in the 'Member' column represents China + Japan and N represents sample size.*

Year	Member	*a*	*b*	*N*
2020	Both	0.0054	3.25	9818
2020	China	0.0024	3.49	218
2020	Japan	0.0056	3.25	9600
2021	Both	0.0053	3.25	7711
2021	China	0.0398	2.62	56
2021	Japan	0.0052	3.26	7655
2022	Both	0.0051	3.27	12405
2022	China	0.0117	3.01	632
2022	Japan	0.0051	3.27	11773
2020-2022	Both	0.0053	3.26	29934
2020-2022	China	0.0049	3.28	906
2020-2022	Japan	0.0053	3.26	29028

Reproduction

The blue mackerel mature and spawn above 30cm FL from the observation of ovary tissue. The mature age was considered age 2 and above and it is assumed that all the fish age 2 and above are mature and spawn (Figs. 6. 8). The spawning grounds are found from the waters southern Kyusyu and cape Ashizuri to the Kuroshio current water near Izu Islands (Fig5). The recruitments hatched at the larger spawning ground in the East China sea supposed to migrate into the Pacific water. A spawning season are from December to June next year at the western waters of cape Ashizuri, January to March in the East China sea, and February to March near the water of cape Ashizur. The spawning season of main spawning ground of blue mackerel near Izu Island are March to June, but it considered that it is not suitable as spawning grounds by the short spawning season from the ovary tissue observation and small amount of spawning eggs sampled. However, it is supposed that larvae and juvenile occurring in the north of transition area consist of the fish hatched at the Izu Island spawning grounds in March to June, same as chub mackerel.

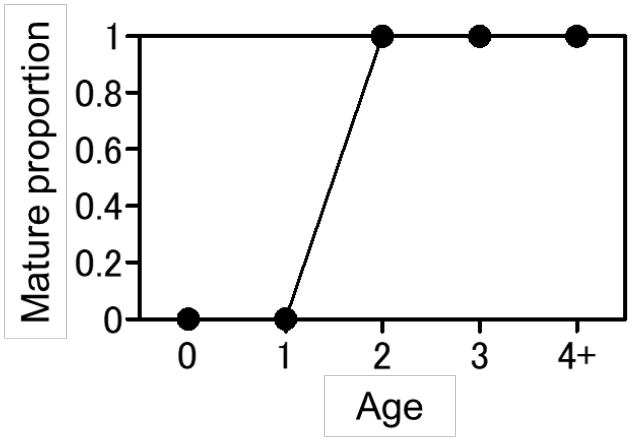


Figure 8: Mature proportion by age.

Predator-prey relationship

Larvae feed on planktonic crustaceans and larvae of anchovy or sardines. Juveniles feed on small teleost and cephalopods with preys mentioned above. It preys on fishes including anchovy, benttooth and lantern fishes, crustaceans like krill and cephalopods at the Kumano Nada fishing

ground, horned krill and anchovy at Sanriku fishing ground and copepod, krill, anchovy, lantern fishes, cephalopod like Enoploteuthidae and salpa in the transition area between Kuroshio and Oyashio where located offshore of Joban and Sanriku. Predation on blue mackerel by whales is observed during periods of high abundance.

Literature Cited

Froese, R. & D. Pauly. Editors. (2022) FishBase. World Wide Web electronic publication. www.fishbase.org, (08/2022).

Furuichi, S., Kamimura, Y., & Yukami, R. (2021) Length–length and length–weight relationships for four dominant small pelagic fishes in the Kuroshio–Oyashio current system. Thalassas: An International Journal of Marine Sciences, 37: 651-657.

Hayashi, A., Yasuda, T., Kurota, H., & Yukami R. (2019). Stock assessment and evaluation for Blue Mackerel Pacific stock (fiscal year 2019). In *Marine Fisheries Stock Assessment and Evaluation for Japanese Waters (fiscal year 2019/2020)*. Fisheries Agency and Fisheries Research and Education Agency of Japan. http://www.fra.affrc.go.jp/shigen_hyoka/peer_review/2020/index.html

Kanamori, Y., Nishijima, S., Okamura, H., Yukami, R., Watai, M., & Takasuka, A. (2021). Spatio-temporal model reduces species misidentification bias of spawning eggs in stock assessment of spotted mackerel in the western North Pacific. *Fisheries Research*, 236: 105825. https://doi.org/10.1016/j.fishres.2020.105825

Thorson, JT., CF. Adams, EN. Brooks, LB. Eisner, DG Kimmel, CM. Legault, LA., Rogers, EM. Yasumiishi. (2020) Seasonal and interannual variation in spatio-temporal models for index standardization and phenology studies. ICES J. Mar. Sci., 77: 1879-1892.

Yukami, R., Isu, S., Kamimura, Y., & Furuichi, S. (2019a). *Research Institute Meeting Report on (Biological) Reference Points for the Pacific Stock of Blue Mackerel (Scomber Australasicus) in FY2019*. http://www.fra.affrc.go.jp/shigen_hyoka/peer_review/2020/index.html

Yukami, R., Isu, S., Kamimura, Y., Furuichi, S., Watanabe, R., & Kanamori, Y. (2019b). Stock assessment and evaluation for Blue Mackerel Pacific stock (fiscal year 2019). In *Marine*

Fisheries Stock Assessment and Evaluation for Japanese Waters (fiscal year 2019/2020). Fisheries Agency and Fisheries Research and Education Agency of Japan. http://www.fra.affrc.go.jp/shigen_hyoka/peer_review/2020/index.html

Yukami, R., Nishijima, S., Kamimura, Y., Furuichi, S., Watanabe, R. (2023). Stock assessment and evaluation for Blue Mackerel Pacific stock (fiscal year 2022). In *Marine Fisheries Stock Assessment and Evaluation for Japanese Waters (fiscal year 2022/2023)*. Japan Fisheries Agency and Fisheries Research and Education Agency of Japan. Tokyo, 57pp. https://abchan.fra.go.jp/wpt/wp-content/uploads/2023/07/details_2022_07.pdf

Annex L

Species summary for Pacific saury

Pacific saury (*Cololabis saira*)

Common names:

秋刀鱼, Qiū dāoyú (China)
サンマ, 秋刀魚, Sanma (Japan)
꽁치, kkongchi (Korea)
сайра, Saira (Russia)
秋刀魚, Chiu-dao-yu or 山瑪魚, San-ma-hi (Chinese Taipei)

Figure 1. Pacific Saury (Cololabis saira).

Management

Active NPFC Management Measures

The following NPFC conservation and management measure (CMM) pertains to this species:

- CMM 2023-08 For Pacific Saury

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

Management Summary

The current management measure for Pacific Saury specifies both catch and effort limits guided by science advice provided in the form of a stock assessment conducted by the Small Scientific Committee on Pacific Saury. For 2023 and 2024 Members of the Commission agree that the annual catches of Pacific saury in the Convention Area and the areas under their jurisdiction adjacent to the Convention Area should not exceed 250,000 metric tons. In these years, the annual total allowable catch (TAC) of Pacific saury in the Convention Area shall be limited to 150,000 metric tons. Each Member of the Commission shall reduce the annual total catch of Pacific saury by the fishing vessels entitled to fly its flag in 2023 and 2024 by 55% from its reported catch in 2018.

The current management measure also states that each Member of the Commission participating in Pacific saury fisheries shall implement either of the following measures;

(a) to reduce the number of fishing vessels flying its flag and fishing for Pacific saury in the Convention Area by 10% from the number of its fishing vessels that fished for Pacific saury in the Convention Area in 2018; or

(b) to prohibit fishing vessels flying its flag from engaging in fishing for Pacific saury in the Convention Area outside its designated fishing period of no longer than 180 consecutive days each year.

In order to protect juvenile fish, Members of the Commission shall take measures for fishing vessels flying their flags to refrain from fishing for Pacific saury in the areas east of 170°E from June to July.

Table 1. Current status of NPFC management measures

Convention or Managment Principle	**Status**	**Comment or Consideration**
Biological reference point(s)	Established	Updated annually in stock assessment
Stock status	Established	Updated annually in stock assessment
Catch limit	Established	Recommended catch limits updated routinely by Commission
Harvest control rule	Intermediate	In progress by SWG MSE PS
Other	Not accomplished	Management strategy evaluation in progress, Age structured model development in progress

Assessment

A stock assessment for Pacific Saury is conducted annually by the NPFC's Small Scientific Committee on Pacific Saury (SSC PS) available at: https://www.npfc.int/system/files/2023-02/SSC%20PS10%20report_0.pdf. The assessment has been a collaborative effort among Members of SSC PS based on a Bayesian state-space production model (BSSPM) since 2019 (Figure 2).

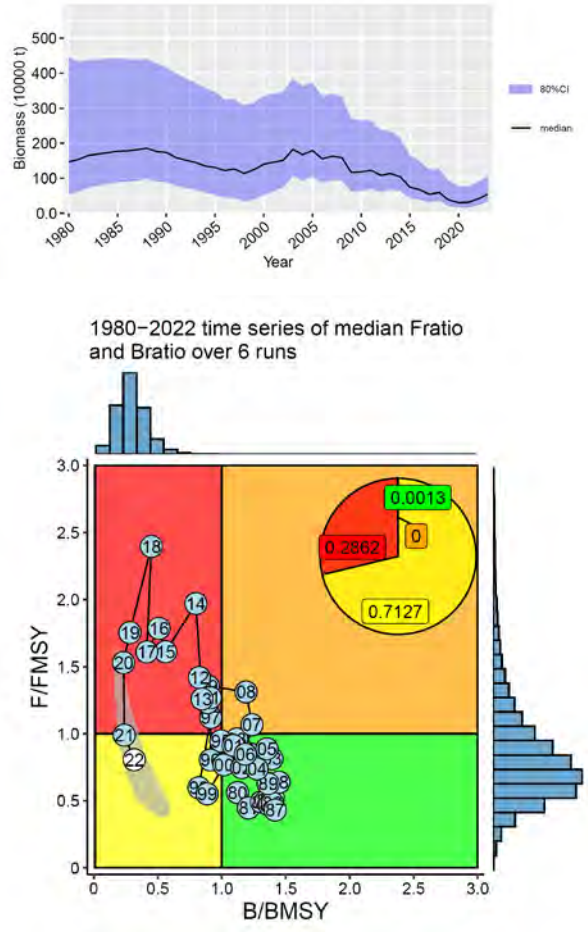


Figure 2. Time series of biomass (left panel) and Kobe plot (right panel) Pacific Saury stock assessment.

The total catch of Pacific saury has been in decline since approximately 2010 (Figure 3). Similarly the biomass estimated by the BSSPM stock assessment has also generally declined from its peak during the past two decades.

Data

Surveys

Since 2003, Japan has been conducting a biomass survey covering a wide area of the NPFC Convention area with several research vessels before its main fishing season. The main purpose of the surveys is to understand the distribution and abundance of Pacific saury and to develop abundance indices for use in stock assessments. Fish sampling also contributes to the understanding of length composition and its inter-annual change.

Fishery

The fishing grounds are west of 180o E but differ among Members who fish for Pacific saury: China, Japan, Korea, Russia, Chinese Taipei, and Vanuatu. The stick-held dip net gear has become

the dominant fishing technique to catch Pacific saury in the northwest Pacific Ocean. Near the coast Japan also catches Pacific Saury with setnet gear. The fishing is mainly carried out from June-November with peaks typically in the late summer or fall. Other NPFC Members (Canada and USA) do not target Pacific saury.

Standardized catch per unit effort (CPUE) is calculated by all Members participating in the Pacific saury fishery and a joint standardized CPUE is calculated across all Member each year and utilized in the assessment (Hsu et al. 2023).

Updated data on Pacific saury catches in the northwestern Pacific Ocean from 1995 are available on the NPFC website: https://www.npfc.int/pacific-saury-catches. Prior years fishery catch data was downloaded from FAO data collections at https://www.openfisheries.org using rfisheries package (Karthik Ram, Carl Boettiger, and Dyck 2013).

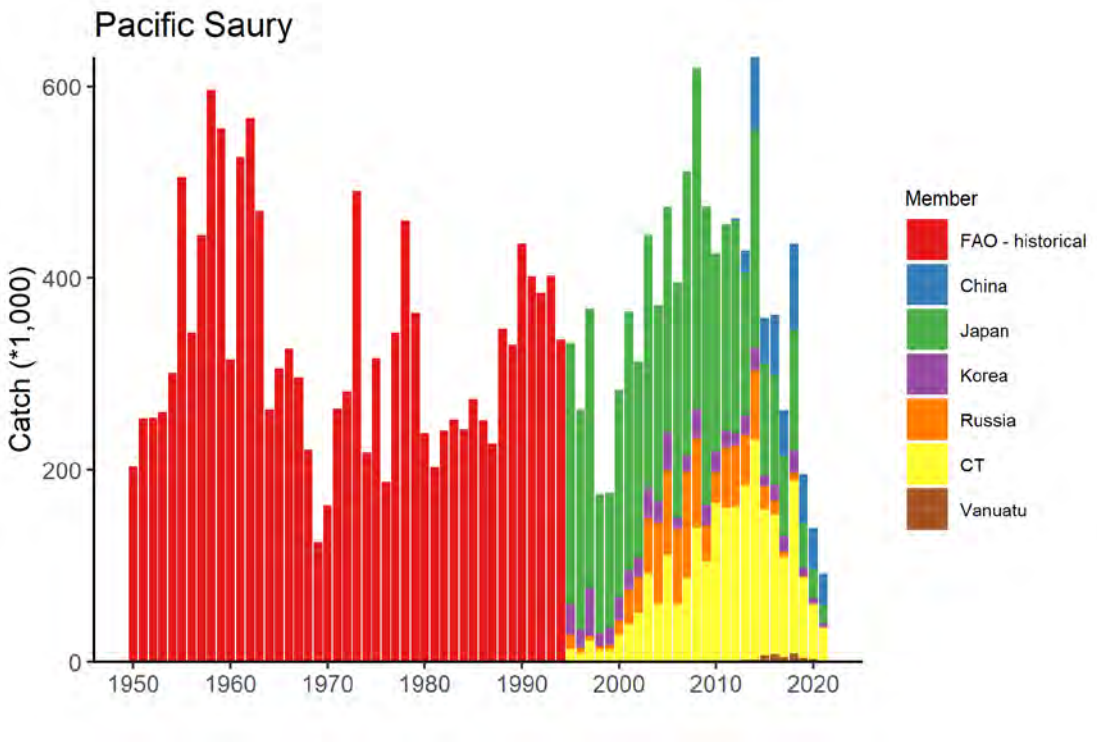


Figure 3. Historical catch of Pacific Saury.

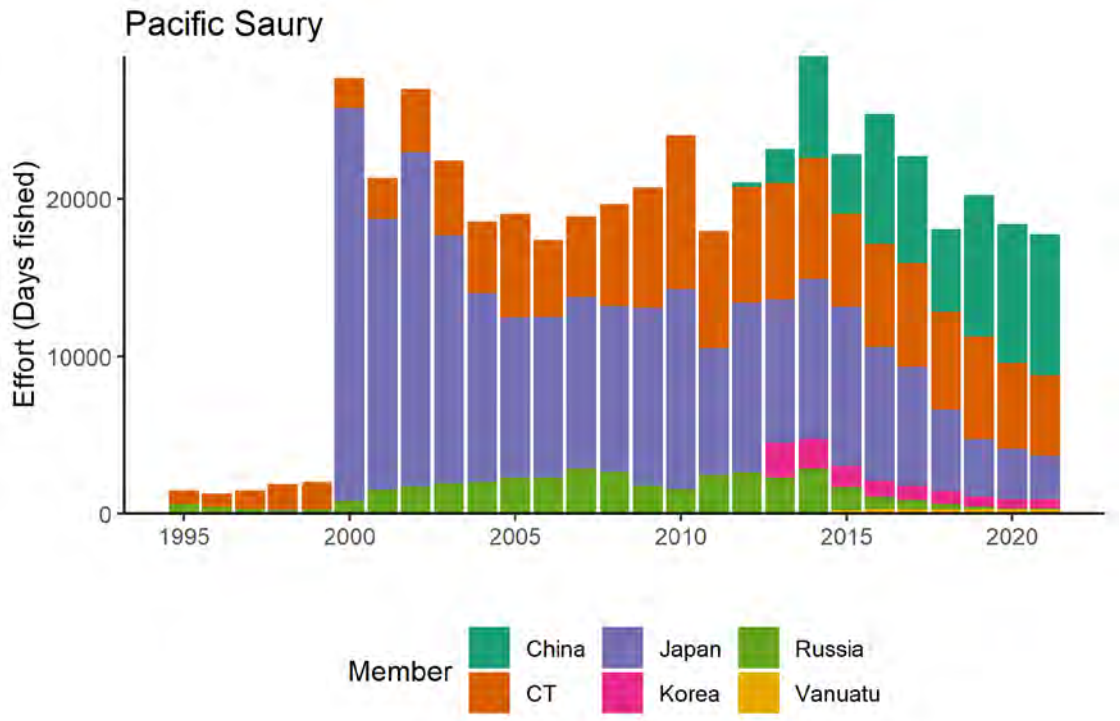


Figure 4. Historical fishing effort for Pacific saury.

Biological collections

All Members collect some size data from fishery catches of Pacific saury. These collections included length data as well as maturity and age structures from some Members.

Japan also collects length, weight, maturity and age data from the survey to support the stock assessment.

Data availability from Members regarding Pacific Saury

Data	Source	Years	Comment
Catch	China	2013-present	Catches from convention area
	Japan	1950-present	Japan<92>s time series of catch data are broken into Early (1980-1993) and Late (1994-2021) CPUE because of time-varying q in the early part of the time series
	Korea	2001-present	
	Russia	1994-	

Data	Source	Years	Comment
		present	
	Chinese Taipei	2001-present	
	Vanuatu	2011-present	
CPUE			CPUE calculated individually by China, Japan, Korea, Russian, Chinese Taipei, and Vanuatu and as a joint CPUE
Survey	Japan		Fishery-independent biomass survey
Length data	All Members		Fishery-independent biomass survey (Japan), fishery data
	Japan		Commercial catch
Maturity/fecundity	Japan		Fishery-independent biomass survey
Age	Japan		Fishery-independent biomass survey

Special Comments

None

Biological Information

Distribution

Pacific saury (*Cololabis saira* Brevoort, 1856) has a wide distribution extending in the subarctic and subtropical North Pacific Ocean from inshore waters of Japan and the Kuril Islands to eastward to the Gulf of Alaska and southward to Mexico. Pacific saury is a commercially important fish in the western North Pacific Ocean (Parin 1968; Hubbs and Wisner 1980). In recent years, the age-0 fish have mainly been distributed in the eastern region east of 170°E in June and July.

Life history

Pacific saury are short-lived and fast growing. Based on analysis of daily otolith increments, Pacific saury reaches approximately 20 cm in knob length (distance from the tip of lower jaw to the posterior end of the muscular knob at the base of a caudal peduncle; hereafter called body length) in 6 or 7 months after hatching (Watanabe et al. 1988; Suyama et al. 1992). There is some variation in growth rate depending on the hatching month during this long spawning season (Kurita et

al. 2004) and geographical differences (Suyama et al. 2012b). The maximum lifespan is 2 years (Suyama et al. 2006). The age 1 fish grow to over 27 cm in body length in June and July when Japanese research surveys are conducted and reach over 29 cm in the fishing season between August and December (Suyama et al. 2006). The spawning season of Pacific saury is relatively long, beginning in September and ending in June of the following year (Watanabe and Lo 1989). Pacific saury spawns over a vast area from the Japanese coastal waters to eastern offshore waters (Baitaliuk et al. 2013). The main spawning grounds are considered to be located in the Kuroshio-Oyashio transition region in fall and spring and in the Kuroshio waters and the Kuroshio Extension waters in winter (Watanabe and Lo 1989). The minimum size of maturity of Pacific saury has been estimated at about 25 cm in the field (Hatanaka 1956) or rearing experiments (Nakaya et al. 2010). In rare cases, saury have been found to mature at 22 cm (Sugama 1957; Hotta 1960). Under rearing experiments, Pacific saury begins spawning 8 months after hatching, and spawning activity continues for about 3 months (Suyama et al. 2016). Batch fecundity is about 1,000 to 3,000 eggs (Kosaka 2000). Pacific saury is a highly migratory species that migrates extensively between the northern feeding grounds in the Oyashio waters around Hokkaido and the Kuril Islands in summer and the spawning areas in the Kuroshio waters off southern Japan in winter (Fukushima 1979; Kosaka 2000). Pacific saury in offshore regions (east of 160°E) also migrate westward toward the coast of Japan after October every year (Suyama et al. 2012a). Genetic evidence suggests there are no distinct stocks in the Pacific saury population based on 141 individuals collected from five distant locales (East China Sea, Sea of Okhotsk, northwest Pacific Ocean, central North Pacific Ocean, and northeast Pacific Ocean) (Chow et al. 2009). The Pacific saury larvae prey on the nauplii of copepods and other small-sized zooplankton. As they grow, they begin to prey on larger zooplankton such as krill (Odate 1977). The Pacific saury is preyed on by large fish ranked higher in the food chain, such as *Thunnus alalunga* (Nihira 1988) and coho salmon, *Oncorhynchus kisutsh* (Sato and Hirakawa 1976) as well as by animals such as minke whales *Balaenoptera acutorostrata* (Konishi et al. 2009) and sea birds (Ogi 1984).

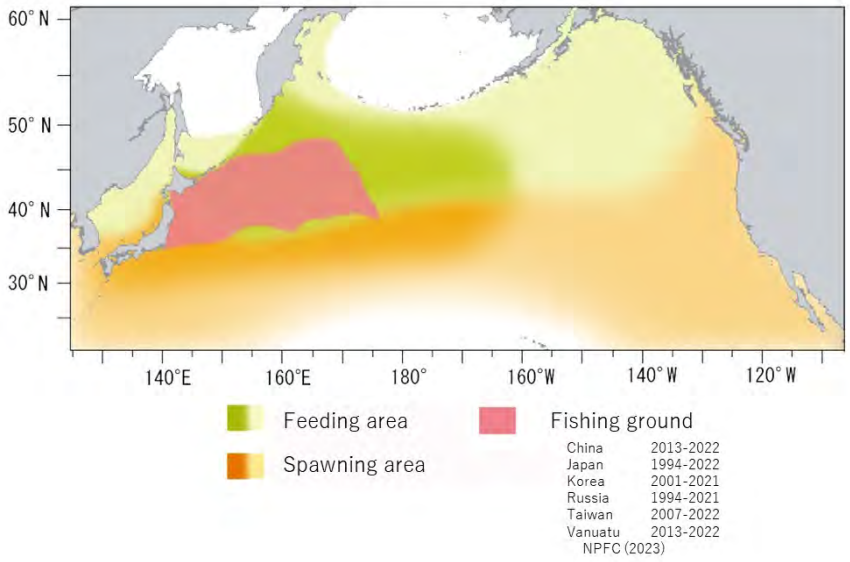


Figure 5. Map of distribution of Pacific saury in the North Pacific.

Literature cited

Baitaliuk A.A., Orlov, A.M., & Ermakov, Y.K. 2013. Characteristic features of ecology of the Pacific saury *Cololabis saira* (Scomberesocidae, Beloniformes) in open waters and in the northeast Pacific Ocean. Journal of Ichthyology 53(11): 899-913.

Chow S., Suzuki N., Brodeur R.D., Ueno Y. 2009. Little population structuring and recent evolution of the Pacific saury (*Cololabis saira*) as indicated by mitochondrial and nuclear DNA sequence data. J Exp Mar Biol Ecol 369:17–21.

Fukushima S. 1979. Synoptic analysis of migration and fishing conditions of saury in northwest Pacific Ocean. Bull. Tohoku Reg. Fish. Res. Lab. 41, 1-70.

Hashimoto M, Kidokoro H, Suyama S, Fuji T, Miyamoto H, Naya M, Vijai D, Ueno Y and Kitakado T (2020) Comparison of biomass estimates from multiple stratification approaches in a swept area method for Pacific saury *Cololabis saira* in the Northwestern Pacific Ocean, Fish. Sci 86, 445–456.

Hotta H. 1960. On the analysis of the population of the Pacific saury (*Cololabis saira*) based on the scales and the otolith characters, and their growth. Bull Tohoku Reg Fish Res Lab 16: 41–64.

Hubbs C.L., Wisner R.L. 1980. Revision of the sauries (Pisces, Scomberesocidae) with descriptions of two new genera and one new species. Fish Bull US 77: 521–566.

Konishi K., Tamura T., Isoda T., Okamoto R., Hakamada T., Kiwada H., Matsuoka K. 2009. Feeding strategies and prey consumption of three baleen whale species within the Kuroshio-Current extension. J North Atl Fish Sci 42: 27-40.

Kosaka S. 2000. Life history of the Pacific saury *Cololabis saira* in the northwest Pacific and considerations on resource fluctuations based on it. Bulletin of Tohoku National Fisheries Research Institute 63: 1–96.

Kurita Y., Nemoto Y., Oozeki Y., Hayashizaki K., Ida H. 2004. Variations in patterns of daily changes in otolith increment widths of 0+ Pacific saury, *Cololabis saira*, off Japan by hatch date in relation to the northward feeding migration during spring and summer. Fish Oceanogr 13(Suppl. 1): 54–62.

Nakaya M., Morioka T., Fukunaga K., Murakami N., Ichikawa T., Sekiya S., Suyama S. 2010. Growth and maturation of Pacific saury *Cololabis saira* under laboratory conditions. Fish Sci 76: 45–53.

Nihira A. 1988. Predator－Prey interaction Between Albacore Thunnus alalunga (Bonne terre) and Pacific Saury *Cololabis saira*, in the area of Emperor seamount Chain in the North Western Pacific Ocean. Bull. Ibaraki Pref. Fish. Exp. Stat. 26: 125-136.

Odate K. 1977. On the feeding habits of the Pacific saury, *Cololabis saira* (Brevoort). Bull. Tohoku Reg. Fish. Res. Lab. 38: 75–88.

Ogi H. 1984. Feeding ecology of the Sooty Shearwater in the western subarctic North Pacific Ocean. Marine Birds: Their Feeding Ecology and Commercial Fisheries Relationships, ed.by D.N. Nettleship et al. Canadian Wildlife Service Special Publication, Ottawa, 78-84.

Parin N.V. 1968. Scomberesocidae (Pisces, Synentognathi) of the eastern Atlantic Ocean. Atlantide Rep. 10: 275-290.

Sato T. and Hirakawa H. 1976. Studies on food habit of coho salmon in the Northwestern Pacific Ocean. Bull. Fukushima Pref. Fish. Exp. Stat. 4: 25-31.

Sugama K. 1957. Analysis of population of the saury (*Cololabis saira* Brevoort) on the basis of character of otolith-I. Bull Hokkaido Reg Fish Res Lab 16: 1–12.

Suyama S., Sakurai Y., Meguro T., and Shimazaki K. 1992. Estimation of the age and growth of Pacific saury *Cololabis saira* in the central North Pacific Ocean determined by otolith daily growth increments. Nippon Suisan Gakkaishi 58: 1607-1614.

Suyama S., Kurita Y., Ueno Y. 2006. Age structure of Pacific saury *Cololabis saira* based on observations of the hyaline zones in the otolith and length frequency distributions. Fish Sci 72: 742–749.

Suyama S., Nakagami M., Naya M., Ueno Y. 2012a. Migration route of Pacific saury *Cololabis saira* inferred from the otolith hyaline zone. Fisheries Science 78(6): 1179-1186.

Suyama S., Nakagami M., Naya M., Ueno Y. 2012b. Comparison of the growth of age-1 Pacific saury *Cololabis saira* in the Western and the Central North Pacific. Fisheries science 78(2): 277-285.

Suyama S., Shimizu A., Isu S., Ozawa H., Morioka T., Nakaya M., Nakagawa T.,·Murakami N., Ichikawa T., Ueno Y. 2016. Determination of the spawning history of Pacific saury *Cololabis saira* from rearing experiments: identification of post-spawning fish from histological observations of ovarian arterioles. Fisheries Science 82(3): 445-457.

Watanabe Y., Butler J.L., Mori T. 1988. Growth of Pacific saury, *Cololabis saira*, in the northeastern and northwestern Pacific Ocean. Fish Bull US 86: 489–498. Watanabe Y., Lo N.C.H. 1989. Larval production and mortality of Pacific saury, *Cololabis saira*, in the northwestern Pacific Ocean. Fish Bull US 87: 601–613.

Karthik Ram, Carl Boettiger, and Andrew Dyck. 2013. “Rfisheries: R Interface for Fisheries Data. R Package Version 0.1.” 2013. http://CRAN.R-project.org/package=rfisheries.

Species summary for chub mackerel

Chub mackerel (*Scomber japonicus*)

Common names:

鮐鱼, Taiyu (China)

マサバ, Masaba (Japan)

고등어, Godeungeo (Korea)

Японская скумбрия, Yaponskaya skumbriya (Russia)

白腹鯖, Bai-Fu-Qing (Chinese Taipei)

Management

Active NPFC Management Measures

The following NPFC conservation and management measure (CMM) pertains to this species:

- CMM 2023-07 For Chub Mackerel

Available from https://www.npfc.int/cmm-2023-07-chub-mackerel-effective-date-26-july-2023

Management Summary

The current conservation and management measure (CMM) for Chub mackerel does not specify catch or effort limits. The CMM states that Members and Cooperating non-Contracting Parties

currently harvesting Chub mackerel should refrain from expansion of the number of fishing vessels authorized to fish Chub mackerel in the Convention Area.

A stock assessment for Chub mackerel is conducted by Japan in Northwest Pacific since 1997 and used for management of the domestic fishery.

Convention/Management Principle	Status	Comment/Consideration
Biological reference point(s)	🔴	The TWG CMSA agreed to base its future discussions on the following candidate biological reference points: (a) F-based reference points i. F_{MSY} ii. $F_{\%SPR}$ iii. $F_{0.1}$, F_{max} (b) Biomass-based reference points (including SSB, summary biomass, etc.) i. B_{MSY} ii. $\%B_0$ iii. Certain historical level of B
Stock status	○	Status determination criteria not established.
Catch limit	🔴	Not established
Harvest control rule	🔴	Not established.
Other	🟡	Encouragement to refrain from expansion, in the Convention Area, of the number of fishing vessels.

🟢 OK 🟡 Intermediate 🔴 Not accomplished ○ Unknown

Assessment

No stock assessment on Chub mackerel has been conducted by NPFC for the Convention Area so far. The Technical Working Group on Chub mackerel Stock Assessment (TWG CMSA) agreed to use a State-space Stock Assessment Model (SAM) for stock assessment of this species (TWG CMSA 2023). After data preparatory meeting, which will be held in January 2024, the Group will conduct its first stock assessment of Chub mackerel in 2024.

Japan conducts an assessment on the Pacific stock of Chub mackerel using tuned VPA (Yukami et al. 2023).

Data

Surveys

China has been conducting a five-year scientific survey program using its fishery research vessel "Song Hang" with mid-trawl as the main survey gear in the NPFC convention area from 2021 to 2025 (Ma et al. 2023).

Japan annually conducts two mid-water trawls surveys in summer (2001-2023) and autumn (1995-2023) that serve information on recruitment abundance indices of age-0 fish to the Japanese domestic stock assessment of the Pacific stock of Chub mackerel (Table 1) (Yukami et al. 2023). The autumn mid-water trawl survey also provides age-1 fish abundance indices for the stock assessment. Japan also conducts a year-round egg survey providing egg density as index of spawning stock biomass for the stock assessment. The survey protocol can be found at Oozeki et al. (2007).

Russia has conducted a summertime acoustic-trawl survey since 2010 that examines mid-water and upper epipelagic species including Chub mackerel.

Fishery

China, Japan and Russia catch Chub mackerel (Figure 1). China harvests this species dominantly by light purse seine fishery in the NPFC Convention Area. A smaller component of the catch is taken by pelagic trawl. Chinese catch statistics on mackerels in the NPFC Convention Area are available from 2015. The Chinese mackerel fisheries in the NPFC Convention Area initiated in 2014 mainly caught the three fish species such as Chub mackerel, blue mackerel, and Japanese sardine (Zhang et al. 2023). Blue mackerel catch accounts for 6% to 15.2%, about 10% on average, in the mackerels catch up to 2021. In 2022, the proportion increased to 22.5%.

Japan's fishery for Chub mackerel occurs inside their Exclusive Economic Zone (EEZ) and is mostly conducted by large purse seine vessels (≥50% of the catch). Additional components of the fishery include set nets, dip nets and other gears. Proportion of Chub mackerel catch in mackerels catch is obtained through extensive port sampling. The Chub mackerel catch accounts for 61% to 97%, 84% on average, of the mackerels catch in 2017-2021.

The Russian fisheries catching mackerels are operated in their EEZ and is prosecuted primarily by mid-water trawling (>90% of the catch), with a smaller component of the catch coming from purse seiners and bottom trawlers. The Russian mackerels catch, comprising approximately 100% of Chub mackerel, are available in the NPFC Annual Summary Footprint since 2014.

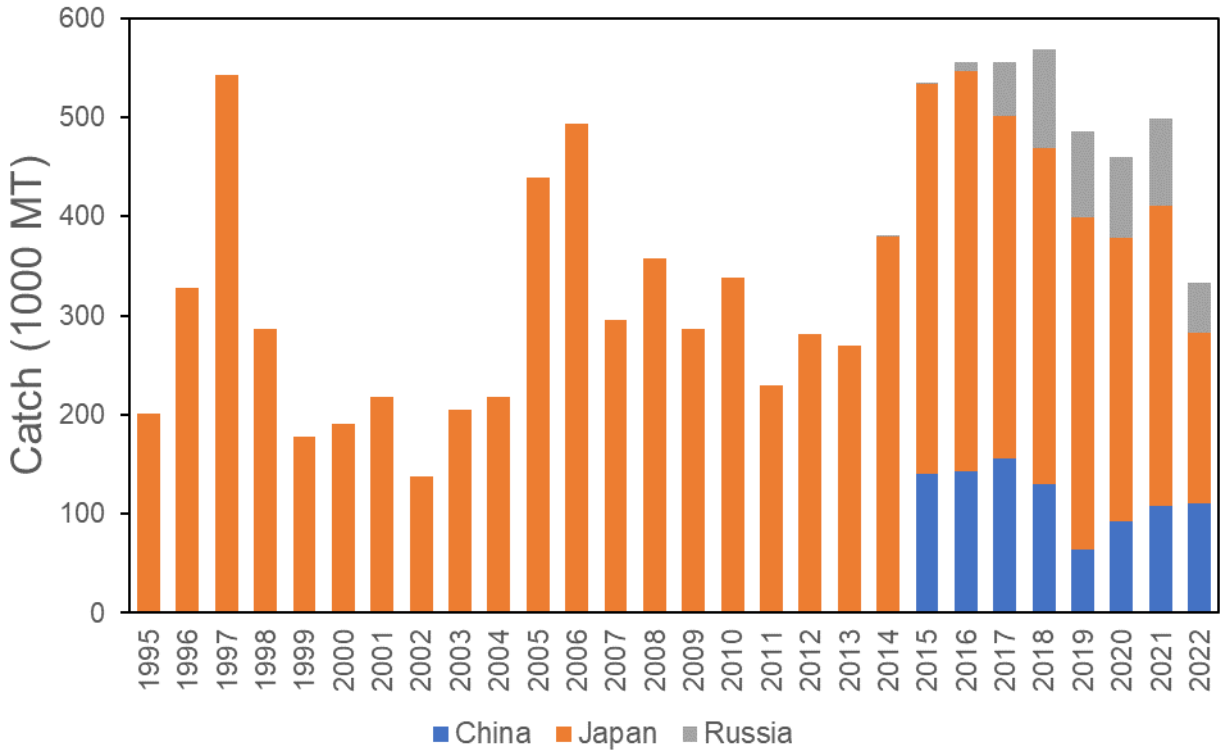


Figure 1. Historical catch of mackerels obtained from annual summery footprint of Chub and Blue mackerels.

Other NPFC Members (Canada, EU, Korea, Chinese Taipei, USA and Vanuatu) do not have Chub mackerel catch records in the NPFC Convention Area.

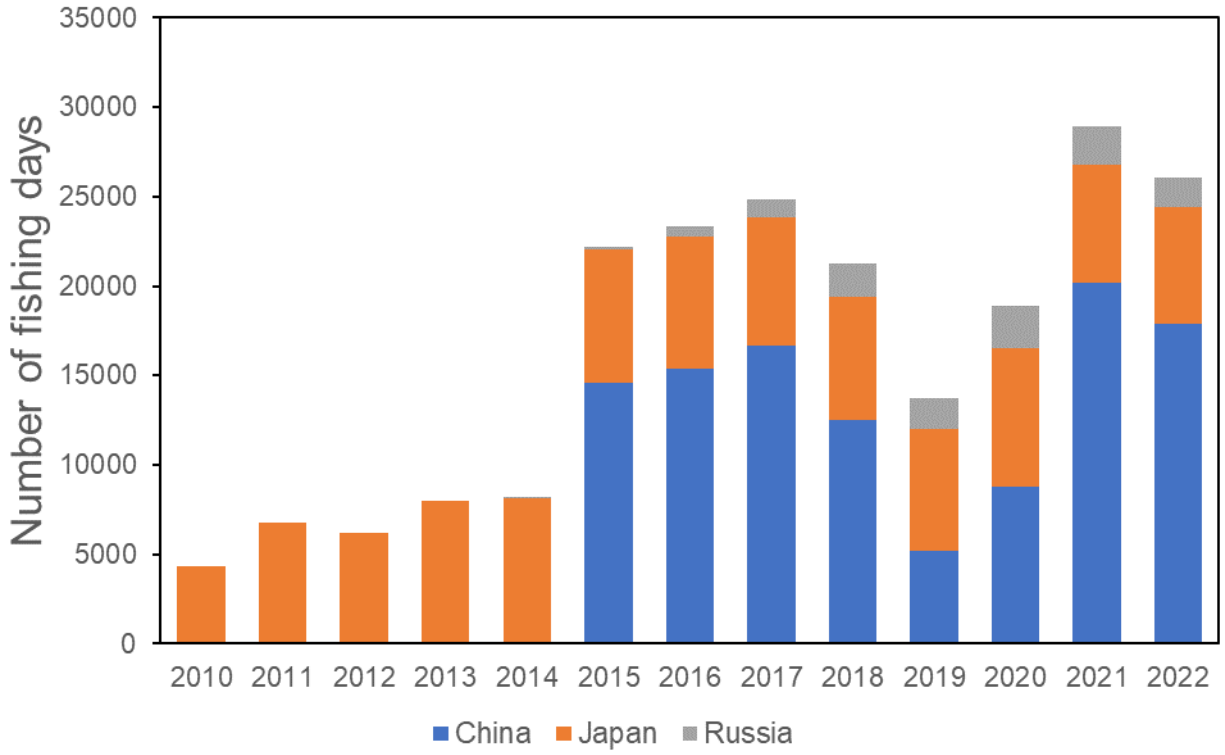


Figure 2. Historical fishing effort for mackerels obtained from annual summary footprint of Chub and Blue mackerels.

Biological collections

China has collected length frequency data of commercial catch through onboard and port samplings since 2016. Aging of the samples has been started since 2017.

Japan also collects length, weight, maturity and age data from the survey and fishery to support their stock assessment.

Russian length frequency and aging data of commercial catch are available since 2016. The length frequency data obtained through research surveys are available since 2010.

Table 1: Data availability from Members regarding Chub mackerel.

Category and data sources	Description	Years with available data	Average sample size/year or data coverage	Potential issues to be reviewed
JAPAN				
Catch statistics				
Purse seine fishery	Official statistics, reports from fisheries associations and markets	Official statistics: 1950-2022, other reports: 1970-2022	Coverage=100%	The Chub mackerel catches are estimated from Chub and blue mackerel catches based on port sampling data for purse seine and set net fisheries. No detailed information of the ratio is presented.
Dip net fishery				
Set net				
Size composition data				
Length measurements	Port sampling by 17 local fishery institutes in 17 prefectures	1970-2022	20,000-120,000 (average 40,000) fish/year (ca. 100 measurements per sampling)	Detailed information in NPFC-2020-TWG CMSA03-WP02.
Aging	Port sampling by 17 local fishery institutes in 17 prefectures	1970-2022	500-1000 fish/year	Detailed information in NPFC-2020-TWG CMSA03-WP02.
Catch at age (CAA)	Estimate CAA from the above data	1970-2022	Age-length keys are created approximately by quarter and local regions	Evaluate uncertainty of catch at age; Changes of growth depending on recruitment

				abundance is reviewed in NPFC-2022-TWG CMSA05-IP06 and published as Kamimura et al (2022, https://doi.org/10.1093/icesjms/fsab191)
Abundance indices (survey)				
Spring survey for recruitment	Mainly for sardine and Chub mackerel of pre-recruits. This research is conducted for biological research of early life history. Mid-water trawl	1995-2022	30-60 stations/year	Too early for the use of abundance index
Summer survey for recruitment	Mainly for saury, mid-water trawl	2001-2022	60-80 stations/year	Detailed information on data and standardization is in NPFC-2022-TWG CMSA06-WP11 (Rev.1). Detailed sampling design and method are shown in Hashimoto et al. (2020, https://doi.org/10.1007/s12562-020-01407-3).
Autumn survey for recruitment and age 1 fish	Mainly for sardine and Chub mackerel, mid-water trawl	1995-2022	30-60 stations/year	Detailed information on data and standardization for recruitment is in NPFC-2022-TWG CMSA06-WP11

				(Rev.1). That for age 1 has not been presented.
Year-round for egg density	Almost all local fishery institutes join this survey program. NORPAC net. Not only for Chub mackerel.	1978-2022 (2005-, species identification between Chub and blue mackerel)	ca. 6000 stations in total, 1000-4000 stations with Chub mackerel eggs/year	Detailed information on data and standardization is in NPFC-2022-TWG CMSA06-WP10
Abundance indices (commercial)				
Dip net fishery	Log book data are collected from fishermen in Kanagawa prefecture since 2003 and Shizuoka prefecture since 2013 (ca. 10 and 90% of total dip net catch in 2017, respectively)	2003-2022	10-100/year	Detailed information on its data and standardization is in NPFC-2022-TWG CMSA06-WP09
RUSSIA				
Catch statistics				
Purse seine fishery	Official statistics, reports from fisheries associations	Official statistics: 1980-1993, 2015-2022, 1994-2014 (no data available); publications: 1970-2022	Coverage 1980-1993 ?%; Coverage 2015-2022 =100%	Data coverage details to be reviewed
Pelagic trawl fishery				
Size composition data				
Length measurements	Sampling from commercial fishing vessels. Sampling during research surveys.	2016-2022 2010-2022	1,000-10,000 fish/year (ca. 100 measurements per sampling)	Data coverage details to be reviewed

Aging	Sampling during research surveys and from commercial fishing vessels	2016-2022	300-500 fish/year	Details to be reviewed
Catch at age (CAA)	Estimate CAA from the above data	2016-2022	Age-length keys are to be developed	Evaluate uncertainty of catch at age, especially on changes of growth depending on recruitment abundance
Abundance indices (survey)				
Summer trawl and acoustic (echointegration) surveys to assess pelagic fish abundance and recruitment	Mid-water upper epipelagic surveys	2010-2022 (June-July) 2015-2022 (July-August)	60-80 stations/year 60-80 stations/year	Changes in abundance and migration patterns; development survey protocol and conduct standardization
Abundance indices (fishery)				
Daily reports of catch by each vessel	Target (>50%) Mid-water trawls	2015-2022 September-December		Test the effect of targeting
CHINA				
Catch statistics				
Purse seine fishery	Official statistics, reports from annual report	Official statistics：2014-2022	Coverage=100%	The Chub mackerel catches are from the fishing catch provided by the fishery company
Trawl fishery	Official statistics, reports from annual report	Official statistics: 2014-2022	Coverage=100%	Catches are from the fishing catch provided by the fishery company
Size composition data				

Length measurements	Port sampling by Institute and technology group.	2016-2022	550-800 fish/year	Details to be reviewed
Length measurements	Purse seine vessel sampling from commercial vessel	2016-2022	530-1050 fish/year	Details to be reviewed
Aging	Sampling during research surveys and from commercial fishing vessels	2017-2022	30-180 fish/year	Details to be reviewed
Abundance indices (commercial)				
Purse seine fishery	Purse seine logbook (Technical group for Chub mackerel Fishery, Distant-water Fishery Society of China)	2014-2022 April-November	10-105/year	Review survey protocol and conduct standardization

Special Comments

None

Biological Information

Distribution

The Pacific stock of Chub mackerel is distributed from the southern coastal waters on the Pacific side of Japan to offshore area off the Kuril Islands (Figure 3). This stock corresponding to straddling one is harvested in both national waters of Japan and Russia and the NPFC Convention Area. Adult fish spawn in Izu Islands waters in spring and then engage northward feeding migration to waters of Sanriku to east Hokkaido from summer to autumn.

Life history

Longevity of Chub mackerel is estimated to be 7 or 8 years old. There was the oldest record of 11 years old. It is known that growth of this stock could be changed according to recruitment abundance and oceanic environment (Watanabe and Yatsu 2004). Recent decrease in mean weight by age was highly likely induced by feeding competition in conjunction with intra-/inter-specific increase of density resulted from biomass increases of Chub mackerel and Japanese sardine

(Kamimura et al. 2021). Adult female spawns more than once during a spawning season. Maturity at age was changed depending on changes in growth (Watanabe and Yatsu 2006).

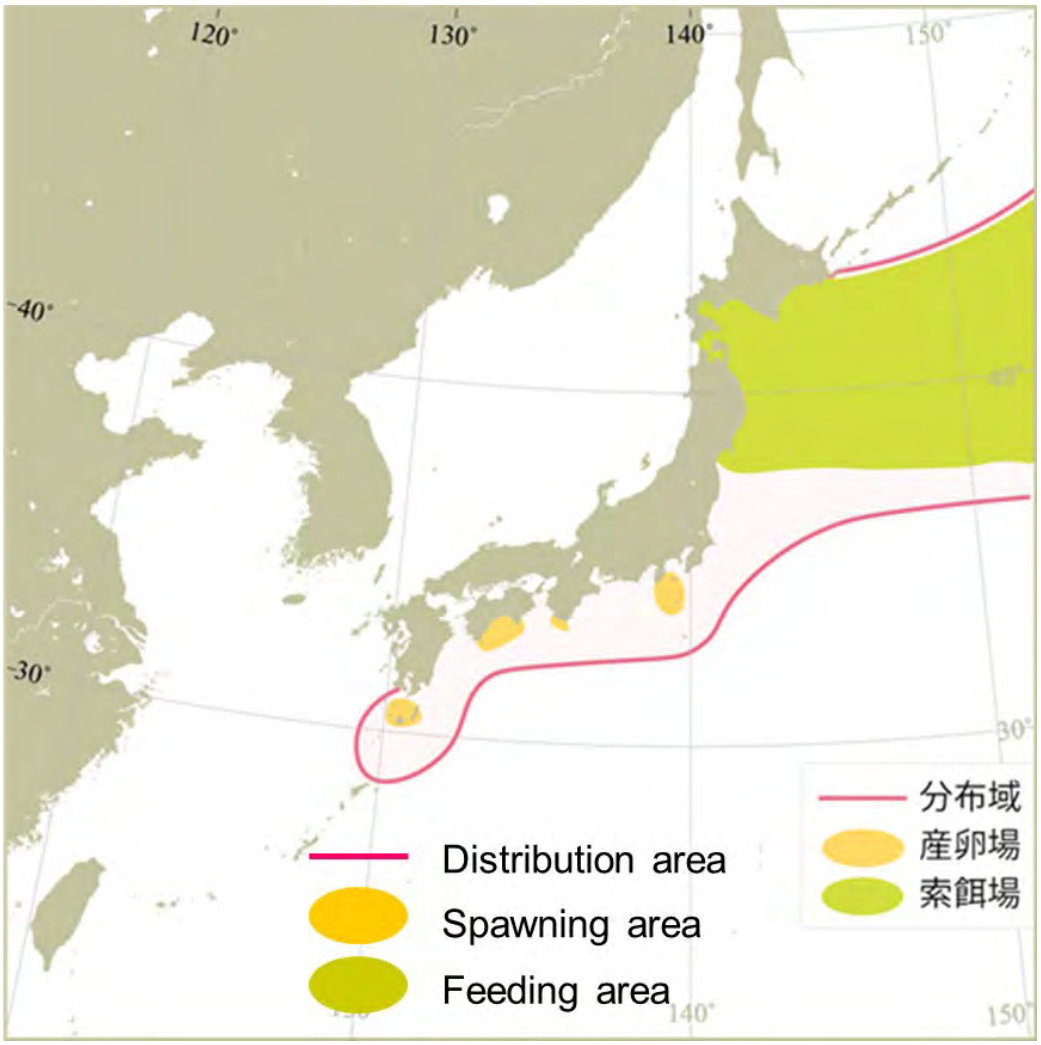


Figure 3. Map of distribution of Chub mackerel in the North Pacific (Yukami et al. 2023)

Literature cited

Kamimura, Y., M. Taga, R. Yukami, C. Watanabe and S. Furuichi (2021) Intra- and inter specific density dependence of body condition, growth, and habitat temperature in chub mackerel (*Scomber japonicus*). ICES J. Mar. Sci., 78, 3254-3264.

Ma, Q., Liu, B. and Dai, L. (2023) Overview surveys from 2021 to 2023 by Chinese research vessel "Song Hang" in the NPFC convention area. NPFC-2023-SC08-WP12. 10pp. https://www.npfc.int/system/files/2023-12/NPFC-2023-SC08-WP12%20Chinese%20surveys%202021-2023%20by%20Song%20Hang%20in%20NWP.pdf

Oozeki, Y., A. Takasuka, H. Kubota and M. Barange (2007) Characterizing spawning habitats of Japanese sardine (*Sardinops melanostictus*), Japanese anchovy (*Engraulis japonicus*), and Pacific round herring (*Etrumeus teres*) in the northwestern Pacific. CalCOFI Reports, 48, 191-203.

Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA) (2023) Report of 7th Meeting of the Technical Working Group on Chub Mackerel Stock Assessment, NPFC-2023-TWG CMSA07-Final Report, 53pp. https://www.npfc.int/system/files/2023-10/TWG%20CMSA07%20Report.pdf

Watanabe, C. and A. Yatsu (2004) Effects of density-dependence and sea surface temperature on inter-annual variation in length-at-age of chub mackerel (*Scomber japonicus*) in the Kuroshio-Oyashio area during 1970–1997. Fish. Bull., 102, 196-206.

Watanabe, C. and A. Yatsu (2006) Long-term changes in maturity at age of chub mackerel (*Scomber japonicus*) in relation to population declines in the waters off northeastern Japan. Fish. Res., 78, 323-332.

Yukami, R., Nishijima, S., Kamimura, Y., Isu, S., Furuichi, S., Watanabe, R., Higashiguchi, K., Saito, R. and Ishikawa, K. (2023). Stock assessment and evaluation for Chub Mackerel Pacific stock (fiscal year 2022). In Marine Fisheries Stock Assessment and Evaluation for Japanese Waters (fiscal year 2022/2023). Japan Fisheries Agency and Fisheries Research and Education Agency of Japan. Tokyo, 79pp. https://abchan.fra.go.jp/wpt/wp-content/uploads/2023/04/details_2022_05.pdf

Zhang, H., Han, H., Sun, Y., Xiang, X., Li, Y. and Shi, Y. (2023) Data description on fisheries bycatch in the chub mackerel fisheries in China. NPFC-2023-TWG CMSA07-WP12 (Rev. 1). 3pp. https://www.npfc.int/system/files/2023-09/NPFC-2023-TWG%20CMSA07-WP12%28Rev%201%29%20Data%20description%20on%20fisheries%20bycatch%20in%20CM%20fisheries%20in%20China.pdf

Annex N

Terms of Reference for data sharing of catch and effort data for depletion analysis of North Pacific armorhead

1. The SSC BF-ME03 tasked the SWG NPA-SA to explore alternative approaches to assess the status of North Pacific armorhead (NPA) stock, given the difficulty of applying life history based approaches to NPA.
2. The SWG NPA-SA agreed to conduct depletion analysis, which was applied to NPA during the Scientific Working Group in the Preparatory Conference of NPFC, to estimate past recruitment, harvest rate and spawning stock biomass.
3. All Members with fishing activities that catch NPA since 2013 will contribute available data on NPA catch and effort. Shared data should also include date, seamount, fishing gear and target (if available).
4. The SWG NPA-SA participants will collaborate on any analyses of these data.
5. The provided data will be used for the purposes of the above-mentioned analysis and will not be shared, distributed, or used for other purposes without the consent of the data provider.

Annex O

Template for data sharing of catch and effort data for depletion analysis of North Pacific armorhead

ID	Member	Date start	Date end	Gear	Source	Seamount	Catch live weight kg	Effort	Effort unit
shot1	Japan	1/1/2030	1/1/2030	trawl	fishery	Colahan	180	100	minutes
shot2	Russia	1/1/2030	1/1/2030	trawl	survey	Milwaukee	100	115	minutes
daily	Korea	2/1/2030	2/1/2030	gillnet	fishery	Suiko	200	280	panels
weekly	Japan	3/1/2030	3/7/2030	longline	fishery	Koko	50	5000	hooks

Effort description	Intended target species	Intended target species FAO code
Duration of the estimated period of seabed contact	North Pacific armorhead	EDJ
Duration of the estimated period of seabed contact	NA	NA
Number of net panels retrieved	Splendid alfonsino	BYX
Number of hooks retrieved	Skilfish	ESZ

Annex P

Revised CMM 2023-05 - Conservation and Management Measure for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the Northwestern Pacific Ocean

CMM 2023-05

(Entered into force 26 July 2023)

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,~~ black corals (Antipatharia), ~~Gorgonaceagorgonians~~, ~~and~~ pennatulaceans, stony corals (Scleractinia), soft corals, the classes of Demospongiae and Hexactinellida 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 or sponges more than 350~~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 nautical mile, 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 shall, within one business day, 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. 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 five~~four~~ groups of cold water corals, specifically ~~Alcyonacea,~~ black corals (Antipatharia), ~~Gorgonaceagorgonians~~, pennatulaceans, ~~and~~ stony corals (Scleractinia), and soft corals.~~,~~ The VME indicator taxa also include ~~and~~ the classes of Demospongiae and Hexactinellida in the phylum Porifera.

H. 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.

I. 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).

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

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

L. 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.

M. 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.

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

O. 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. 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. 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. 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. 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 paragraph 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.

Annex 1

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.

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

Annex 2

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

[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.

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 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 nfor 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)

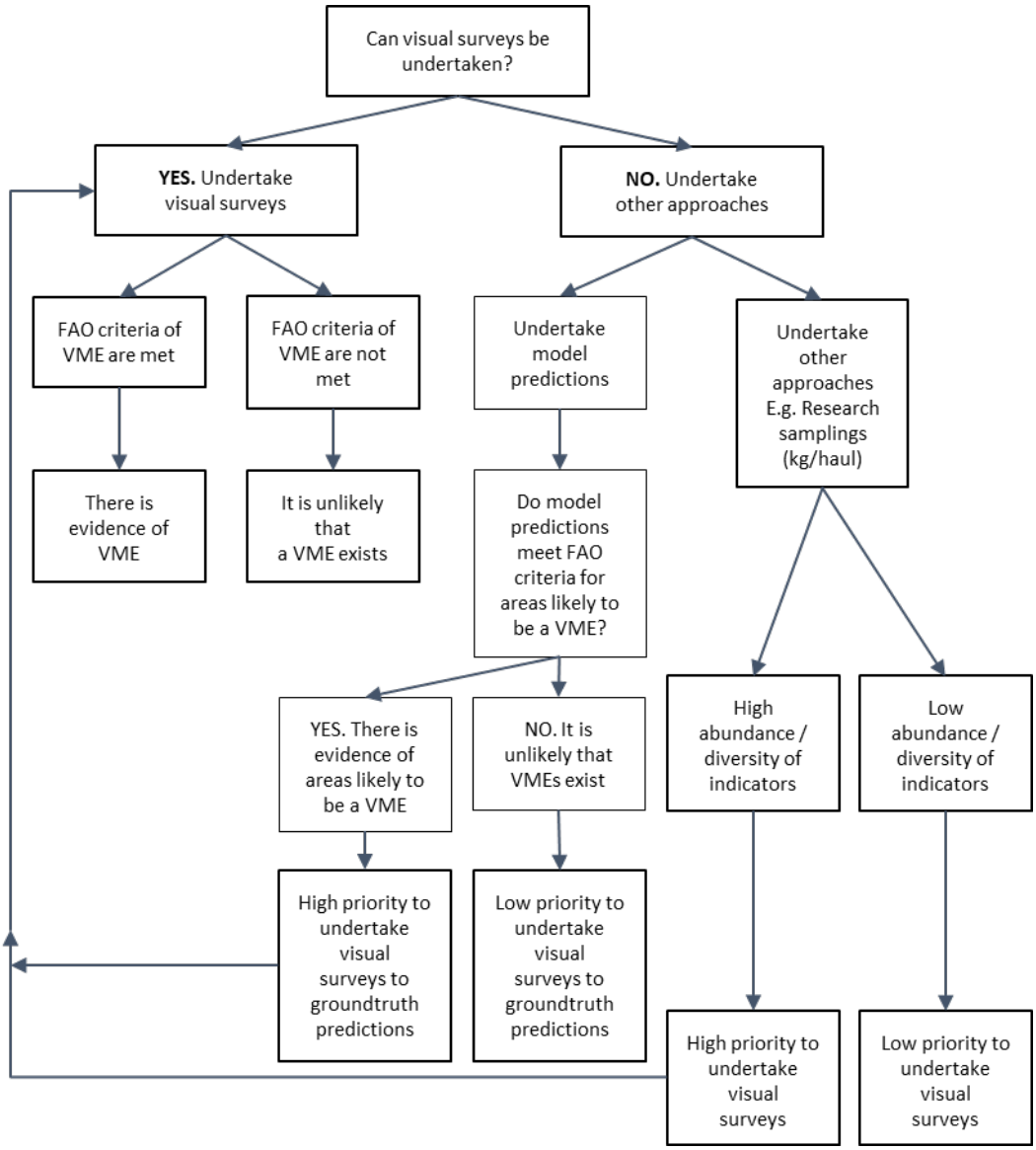
(5) Total catch by species

(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).

Annex 2.3

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



Annex 3

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.

Annex 4

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.

Annex 5

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.

Annex 6

Implementation of the Adaptive Management for North Pacific armorhead

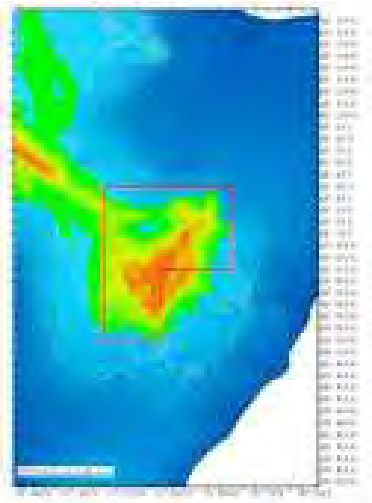
1. Monitoring survey for the detection of strong recruitment of North Pacific armorhead

(1) Location of monitoring surveys

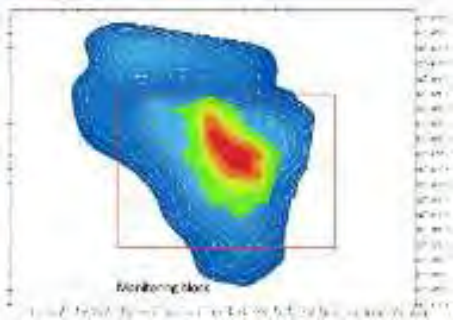
Monitoring surveys for the detection of strong recruitment of North Pacific armorhead will be conducted by trawl fishing vessels in the pre-determined four (24) monitoring blocks of Koko (South eastern), Yuryaku, Kammu (North western) and/or Colahan seamounts.

Monitoring blocks

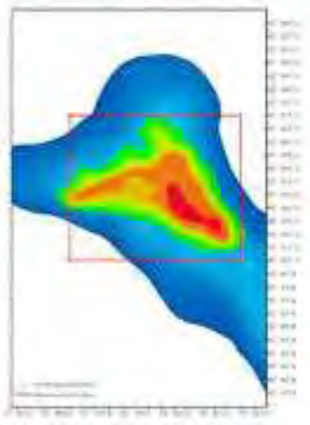
(1) Koko seamount (34°51’ –35°04’N, 171°49’ –172°00’ E)



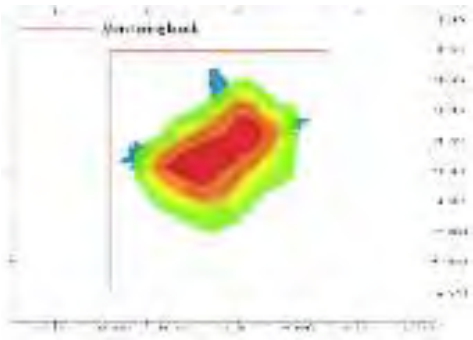
(2) Yuryaku seamount (32°35’ –32°45’N, 172°10’ –172°24’E)



(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.

2. 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.

Annex Q

Revised CMM 2023-06 - Conservation and Management Measure for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the Northeastern Pacific Ocean

CMM 2023-06

(Entered into force 26 July 2023)

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 taxa: ~~*Alcyonacea,*~~ black corals (Antipatharia), ~~Gorgonacea~~gorgonians, ~~and~~ pennatulaceans, stony corals (Scleractinia), soft corals, the classes of Demospongiae and Hexactinellida 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 with pot gear,

cold water corals that exceed 2~~50~~Kg or sponges (Demospongiae and Hexactinellida) that exceed ~~5005~~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 the course of fishing operations with all other gears, cold water corals that exceed 50Kg or sponges (Demospongiae and Hexactinellida) that exceed 350Kg 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 nautical mile, 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 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. 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,*~~ black corals (Antipatharia), ~~Gorgonacea~~gorgonians, pennatulaceans, ~~and~~ stony corals (Scleractinia), and soft corals. The VME indicator taxa also include ~~and~~ the classes of Demospongiae and Hexactinellida in the phylum Porifera.

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.

~~k.~~l. Prohibit bottom fishing vessels from fishing in the following areas in order to achieve sustainable protection of VMEs in the eastern part of the Convention Area:

Area	Latitude	Longitude
Northwestern Cobb Seamount	46.8178 N	130.872 W
	46.7703 N	130.861 W
	46.8277 N	130.825 W
	46.7802 N	130.814W
Northeastern Cobb Seamount	46.7759 N	130.735 W
	46.7675 N	130.694 W
	46.7482 N	130.756 W
	46.7399 N	130.716 W

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.

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.

Annex 1

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

Annex 2

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

[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.

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 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

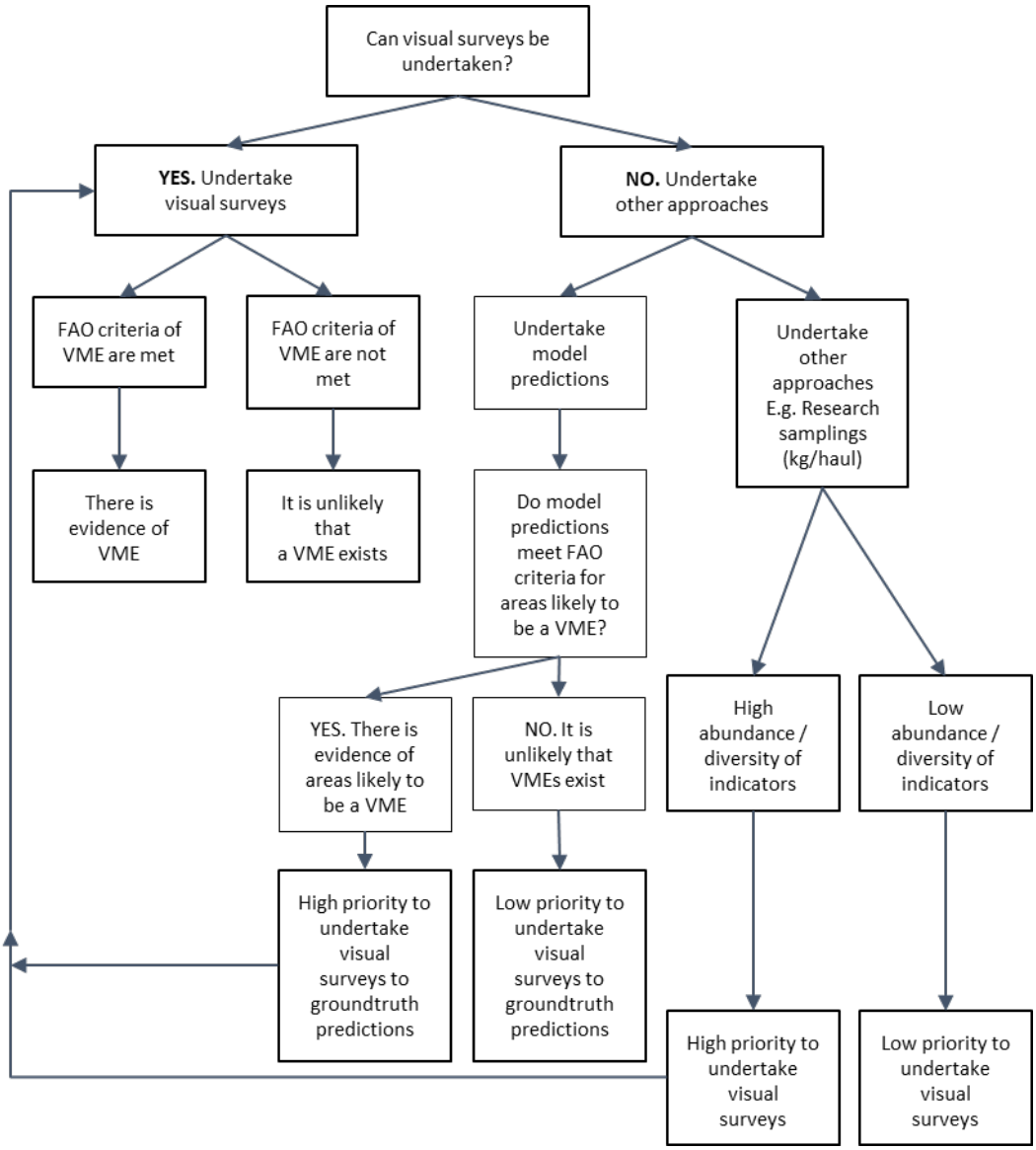
(2) Results of analysis

(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).

Annex 2.3

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



Annex 3

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.

Annex 4

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.

Annex 5

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
- 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.

Annex R

Revised Terms of Reference of the SSC BF-ME

Terms of Reference for the Small Scientific Committee on Bottom Fish and Marine Ecosystems (SSC BF-ME)

(revised in December 2023)

The SSC BF-ME shall work to ensure the long-term sustainable use of the bottom fisheries resources in the Convention Area while conserving the associated marine ecosystems (including vulnerable marine ecosystems (VME)) of the North Pacific Ocean in which these resources occur. The SSC BF-ME shall also help the Scientific Committee fulfill its functions as specified in the Convention by providing scientific advice and by proposing revision of Conservation and Management Measures as required.

1. Review fishery and research data
    a. Annually compile and share target catch and bycatch data (including VME indicator taxa) as required by Conservation and Management Measures for Bottom Fisheries and Protection of Vulnerable Marine Ecosystems in the Northwestern and Northeastern Pacific Ocean
        i. Define list and spatial resolution of catch data to be shared
        ii. Define list and spatial resolution of multibeam bathymetry to be shared
        iii. Define list and spatial resolution of visual observations or other relevant data to be shared
        iv. Map the combined fishing footprint and annual effort for bottom fisheries
        v. Define data sharing protocols and develop a shared data repository
    b. Annually review members research activities regarding benthic ecosystems (including VME)
2. Develop shared ID guides for bottom fish and for VME indicator species in the western Pacific Ocean
    a. Review and update NPFC VME indicator taxa and bycatch lists on a routine basis
3. Review approaches applicable for stock assessment of target bottom species and investigate various management strategies
    a. Identification of data needs and establishment of activities to fill data gaps

b. Further development of the Adaptive Management approach for North Pacific armorhead and splendid alfonsino and mechanism for its implementation
    i. Assess and monitor the status of the priority species stocks
    ii. Develop harvest control rules to conserve priority species abundance

4. Assess significant and adverse impacts (SAI) on VMEs
    a. Explore a data or model-based approach for defining VME's
    b. Undertake research to determine the gear-specific effects of bottom fishing on benthic ecosystems
    c. Define post-encounter measures for VME for both routine fishing activities (within the current fishery footprint) and exploratory fishing (outside the current fishery footprint)
    d. Explore a data or model-based approach for assessing SAI on VMEs
        i. Explore the design of model and data based approaches to spatial management strategies to maximize bottom fish harvest while minimizing impacts to VMEs (e.g. analyses of trade-off between potentially competing objectives)
        ii. If appropriate define management objectives for recovering VME sites
5. Assess the ecology and ecosystem considerations of bottom fisheries resources and other benthic organisms including both hard-bottom and soft-bottom seafloor
    a. Examine relationships between environmental conditions and recruitment for bottom fisheries resources
    b. Conduct other research that may be useful to adaptive management or indicating future population status of bottom fisheries resources (e.g. alternative survey methodologies such as acoustic surveys)
    c. Conduct relevant research on benthic ecology as it pertains to bottom fisheries resources

Annex S

Revised Terms of Reference of the SSC PS

Terms of Reference for the Small Scientific Committee on Pacific Saury (SSC PS)
(revised in December 2023)

1. To review fishery data
   - Catch series
   - Age/size composition data
   - Others
2. To review fishery-dependent and fishery-independent indices
   - Review/update the existing CPUE Standardization Protocol
   - Review/update the indices
   - Evaluate the quality of the indices
   - Recommendation for future work
3. To review and update biological information/data
   - Stock structure
   - Growth
   - Reproduction and maturity schedule
   - Natural mortality
   - Migration pattern
   - Others
4. To explore the impact of climate change on Pacific saury stock assessment and fishery performance, including stock assessment data inputs with respect to shifting species and fisheries distribution, life history characteristics, phenology, biological reference points and relevant parameters
5. To update the stock assessment using “provisional base models” (i.e. Bayesian state-space production models)
   - Review the existing Stock Assessment Protocol
   - Simple update (including projection and evaluation of reference points as well as diagnosis)
   - Consideration of scenarios (for base and sensitivity)
   - Assessment of uncertainties and the implications for management
   - Evaluation/improvement (if necessary) of the models
   - Recommendation of the research for future work
6. To explore stock assessment models other than existing “provisional base models”
   - Data invention/availability (including the identification of potential covariates)
   - Initial (and continued) discussion on age-/size/stage-structure models
   - Identification of lack of information/data gaps and limitations

- Recommendation of the research for future work

7. To facilitate data- and code- sharing processes
8. To review/improve the presentation of stock assessment results (including stock status summary reports in a format to be determined by the Working Group)
9. To support the technical work related to the Management Strategy Evaluation.

Annex T

Revised Stock Assessment Protocol for Pacific Saury

Stock assessment protocol for Pacific Saury
(revised in December 2023)

(1) Identify the data that will be available to the stock assessment;

(2) Evaluate data quality and quantity and potential error sources (e.g., sampling errors, measurement errors, and associated statistical property (e.g., biased or random errors, statistical distribution) to ensure that the best available information is used in the assessment;

(3) Select population models describing the dynamics of PS stock and observational models linking population variables with the observed variables;

(4) Develop base case scenarios and alternative scenarios for sensitivity analyses;

(5) Compile input data and prior distributions for the model parameterization for the base case and alternative scenarios;

(6) For each scenario, fit the model to the data, diagnostics of model convergence, plot and evaluate residual patterns, compare prior and posterior distributions for key model parameters, and evaluate biological implications of the estimated parameters;

(7) Develop retrospective analysis to verify whether any possible systematic inconsistencies exist among model estimates of biomass and fishing mortality;

(8) Identify final model configuration and model runs for each scenario;

(9) For each scenario, estimate and plot exploitable stock biomass and fishing mortality (and their relevant credibility distributions) over time;

(10) For each scenario, estimate biological reference points (e.g., MSY, Bmsy, Fmsy) and its associated uncertainty;

(11) Identify target and limit reference points for stock biomass and fishing mortality;

(12) Have the Kobe plot for each scenario;

(13) Determine if the stock is “overfished” and “overfishing” occurs for the base and sensitivity scenarios;

(14) Finalize the base-case scenario;

(15) Develop alternative ABCs for the projection (e.g., 5-year projection);

(16) Conduct risk analysis for each level of ABC defined in Step (15) for the base-case scenario;

(17) Develop decision tables with alternative state of nature;

(18) Determine optimal ABCs based on decision tables developed in Step (17);

(19) Provide scientific advice on stock status and appropriate catch level to SC through SSC PS;

(20) Include relevant ecosystem considerations regarding the stock in future assessment documents, including data and results from other scientific studies regarding potential impacts on the stock [assessment] due to climate change, non-stationary population and fisheries processes, predator-prey dynamics, or impacts of distribution and phenological changes on assessment data.

Stock assessment report for Pacific saury

EXECUTIVE SUMMARY

Data used in the assessment modeling

Data are included from the NPFC Convention Area and Members' Exclusive Economic Zones (EEZs). Pacific saury (*Cololabis saira*) is widely distributed from the subarctic to the subtropical regions of the North Pacific Ocean. The fishing grounds are west of 180º E but differ among Members (China, Japan, Korea, Russia, Chinese Taipei, and Vanuatu). Figure 1 shows the historical catches of Pacific saury by Member. Figure 2 shows CPUE and Japanese survey biomass indices used in the stock assessment. Appendix 1 shows data used for the updated stock assessment.

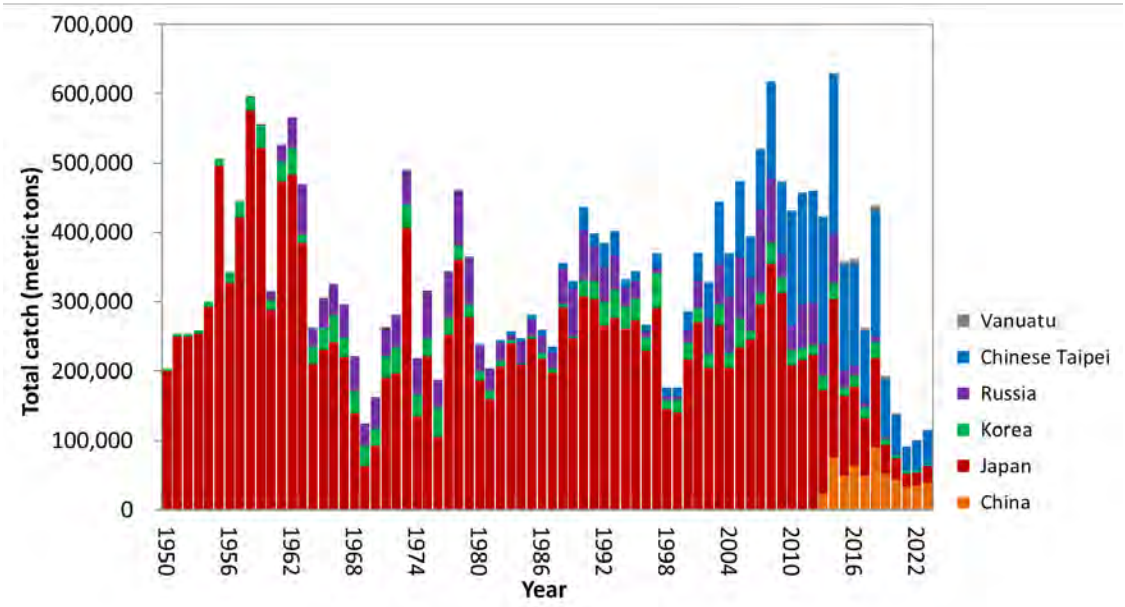


Figure 1. Time series of catch by Member during 1950-2023. The catch data for 1950-1979 are shown but not used in stock assessment modeling. Catch data in 2023 are preliminary (as of 2 December 2023) and not used in the assessment.

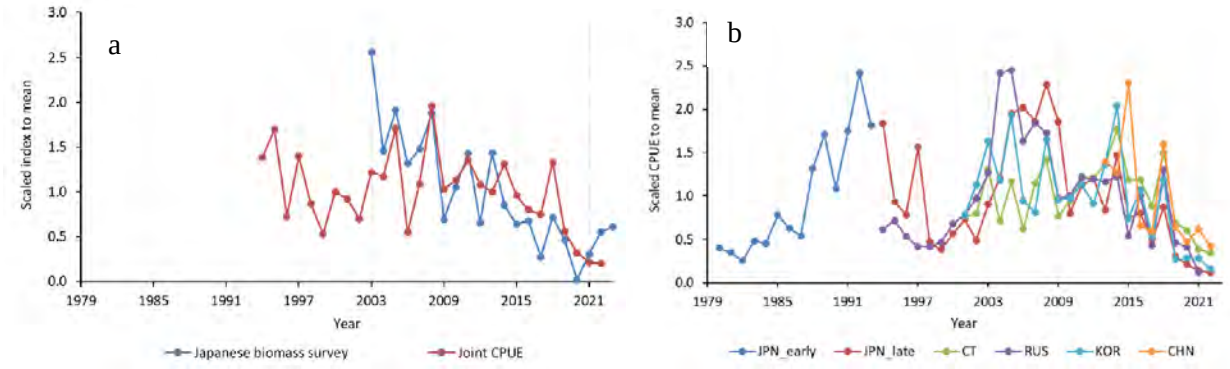


Figure 2. Time series of (a) Japanese survey biomass index and joint CPUE and (b) Member's standardized CPUE indices used in the assessment modeling.

Brief description of specification of analysis and models

A Bayesian state-space production model (BSSPM) used in previous stock assessments was employed as an agreed provisional stock assessment model for Pacific saury during 1980-2023. Scientists from three Members (China, Japan and Chinese Taipei) each conducted analyses following the agreed specification which called for two base case scenarios and two sensitivity scenarios (see Annex F, SSC PS09 report for more details). The two base case scenarios differ in using each Member's standardized CPUEs (base case B1) or standardized joint CPUEs (base case B2). For the two sensitivity cases with Japanese early CPUE (1980-1994), time-varying catchability was assumed to account for potential increases in catchability. A higher weight was given to the Japanese biomass survey estimates than to Members' CPUEs in B1 while comparable weights were given to the Japanese biomass survey estimates and the joint CPUEs in B2. The CPUE data were modeled as nonlinear indices of biomass. Members used similar approaches with some differences in the assumption of the time-varying catchability and prior distributions for the free parameters in the model.

Summary of stock assessment results

The SSC PS considered the BSSPM results and noted the agreement in trends among Members' results for each base case model. However, there was a marked difference in the biomass level between B1 and B2 due to the different CPUE trends used. The SSC PS discussed and recognized that the results covered a wide range of uncertainties in data, model and estimation, and it therefore concluded the outcomes of MCMC runs could be aggregated over the 6 models (2 base case models x 3 Members) as in the previous assessments. The aggregated results for assessing the overall median values and their associated 80% credible intervals are shown in Table 1. The graphical presentations for times series of a) biomass (B), b) B-ratio (=B/B_{MSY}), c) harvest rate (F), d) F-ratio (F/F_{MSY}) and e) B/K are shown in Figure 3. The Kobe plot with time trajectory using aggregated model outcomes is shown in Figure 4. Time series of median estimated values for biomass, harvest rate, B-ratio, F-ratio and depletion level relative to K are shown in Table 2.

Table 1. Summary of estimates of reference quantities. Median and credible intervals for the aggregated results are presented. In addition, median values of Member's combined results (over B1 and B2) are shown.

	Median	Lower10%	Upper10%	Median_CHN	Median_JPN	Median_CT
C_2022 (10000 t)	10.009	10.009	10.009	10.009	10.009	10.009
AveC_2020_2022	11.066	11.066	11.066	11.066	11.066	11.066
AveF_2020_2022	0.337	0.141	0.621	0.328	0.376	0.316
F_2022	0.245	0.113	0.426	0.231	0.270	0.237
FMSY	0.314	0.108	0.576	0.305	0.350	0.297
MSY (10000 t)	39.657	30.473	48.874	40.434	39.856	38.940
F_2022/FMSY	0.806	0.519	1.436	0.810	0.799	0.809
AveF_2020_2022/FMSY	1.111	0.770	1.748	1.159	1.106	1.079
K (10000 t)	264.054	147.520	702.181	285.000	251.768	260.100
B_2022 (10000 t)	40.820	23.503	88.382	43.290	37.073	42.300
B_2023 (10000 t)	54.940	33.227	108.300	57.340	52.284	55.320
AveB_2021_2023	42.410	25.270	90.015	44.623	39.042	43.883
BMSY (10000 t)	128.100	74.289	317.407	136.900	118.580	130.150
BMSY/K	0.481	0.389	0.604	0.469	0.469	0.506
B_2022/K	0.155	0.089	0.233	0.150	0.151	0.163
B_2023/K	0.209	0.105	0.341	0.200	0.210	0.214
AveB_2021_2023/K	0.163	0.092	0.244	0.156	0.160	0.170
B_2022/BMSY	0.316	0.195	0.474	0.306	0.316	0.323
B_2023/BMSY	0.426	0.227	0.698	0.412	0.441	0.424
AveB_2021_2023/BMSY	0.331	0.201	0.496	0.320	0.336	0.337

Table 2. Time series of median estimated values for biomass, harvest rate, B-ratio, F-ratio and depletion level relative to K. The unit of biomass is 10,000 tons.

Year	Biomass	HarvestRate	Bratio	Fratio	Depletion
1980	146.700	0.163	1.123	0.562	0.545
1981	153.700	0.133	1.209	0.447	0.588
1982	165.132	0.148	1.311	0.492	0.641
1983	169.033	0.153	1.348	0.501	0.662
1984	172.600	0.143	1.373	0.468	0.675
1985	177.200	0.159	1.402	0.522	0.689
1986	178.100	0.146	1.397	0.484	0.689
1987	181.400	0.130	1.418	0.431	0.699
1988	186.000	0.192	1.448	0.638	0.714
1989	176.079	0.188	1.363	0.628	0.673
1990	173.523	0.251	1.340	0.845	0.660
1991	159.300	0.250	1.228	0.849	0.604
1992	151.500	0.253	1.171	0.867	0.572
1993	145.000	0.277	1.118	0.961	0.544
1994	135.100	0.246	1.044	0.862	0.503
1995	130.900	0.263	0.993	0.947	0.476
1996	121.800	0.219	0.911	0.805	0.436
1997	126.300	0.293	0.915	1.121	0.437
1998	113.500	0.155	0.821	0.598	0.392
1999	124.400	0.142	0.886	0.551	0.423
2000	140.074	0.204	1.018	0.768	0.486
2001	145.600	0.255	1.091	0.912	0.526
2002	151.000	0.218	1.156	0.747	0.563
2003	182.400	0.244	1.392	0.814	0.690
2004	167.100	0.221	1.277	0.738	0.632
2005	179.300	0.264	1.353	0.888	0.672
2006	155.488	0.254	1.184	0.847	0.584
2007	163.168	0.319	1.236	1.067	0.614
2008	159.200	0.388	1.190	1.312	0.594
2009	116.400	0.406	0.894	1.355	0.438
2010	117.900	0.365	0.890	1.232	0.440
2011	122.470	0.373	0.912	1.269	0.453
2012	108.500	0.424	0.825	1.419	0.407
2013	113.500	0.374	0.847	1.259	0.424
2014	104.500	0.602	0.798	1.971	0.398
2015	74.330	0.483	0.561	1.612	0.281
2016	67.220	0.538	0.509	1.786	0.254
2017	53.971	0.487	0.415	1.610	0.205
2018	59.390	0.734	0.450	2.397	0.226
2019	37.252	0.524	0.282	1.754	0.141
2020	30.510	0.458	0.233	1.530	0.115
2021	31.037	0.297	0.238	0.989	0.117
2022	40.820	0.245	0.316	0.806	0.155
2023	54.940		0.426		0.209

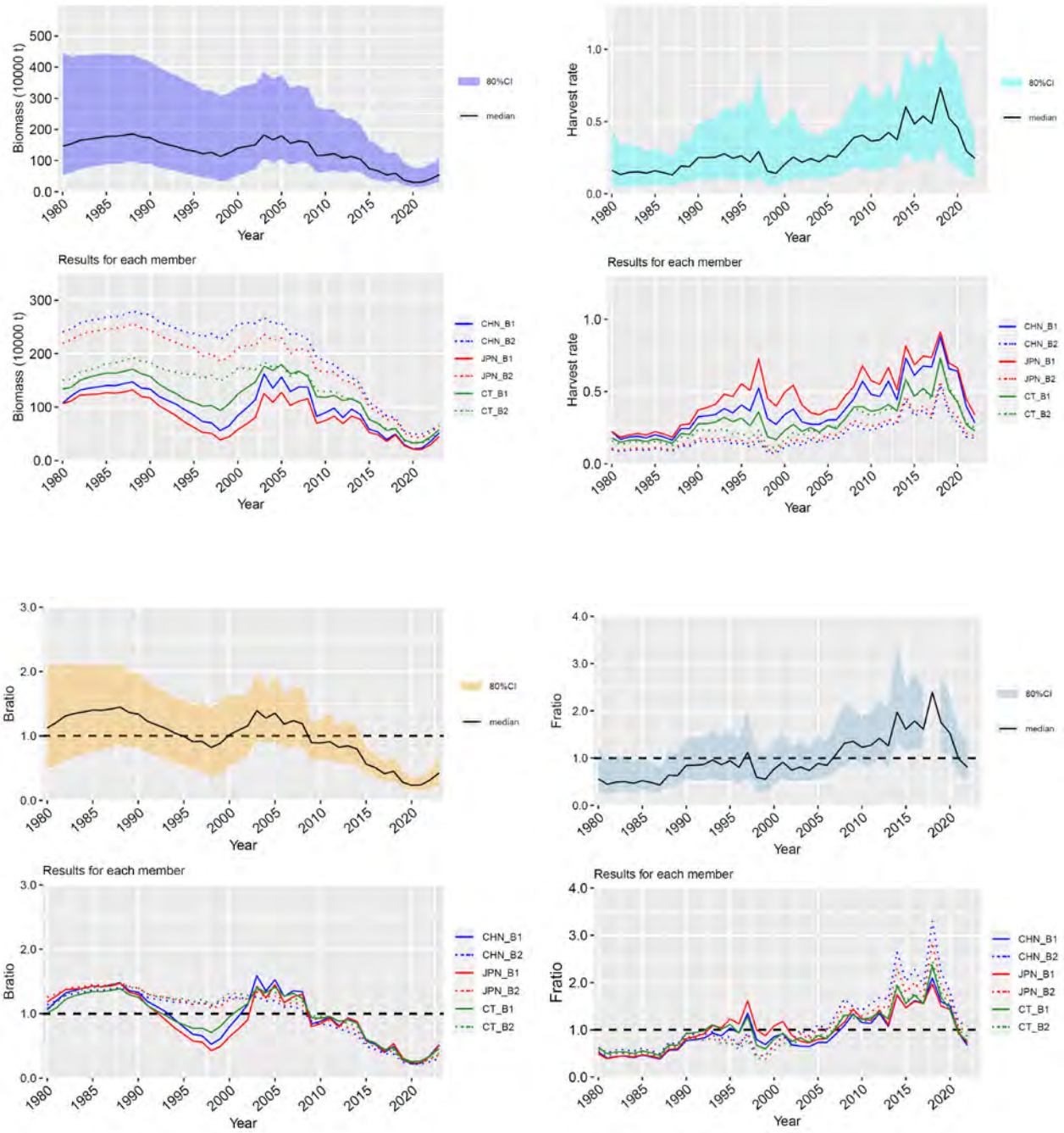


Figure 3. Time series of median estimated values of six runs for biomass, harvest rate, B-ratio, F-ratio and depletion level relative to K. The solid and shaded lines correspond to B1 and B2, respectively.

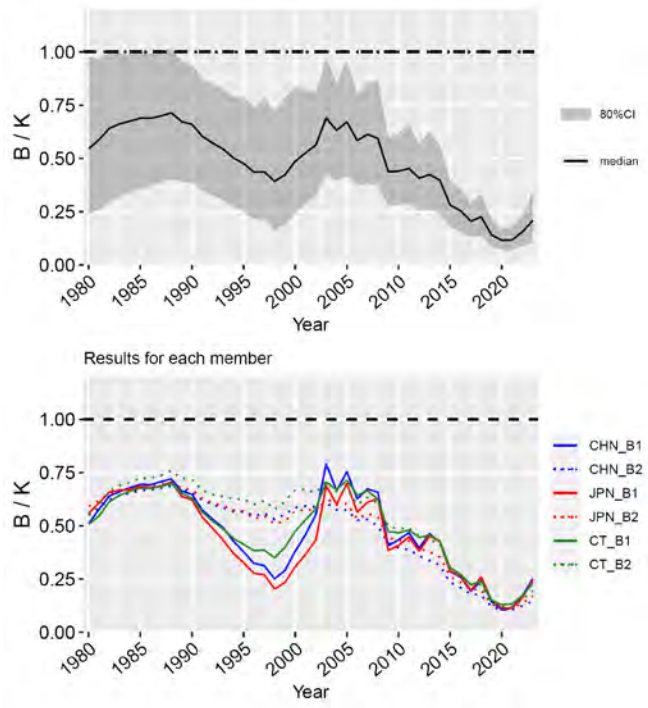


Figure 3 (Continued).

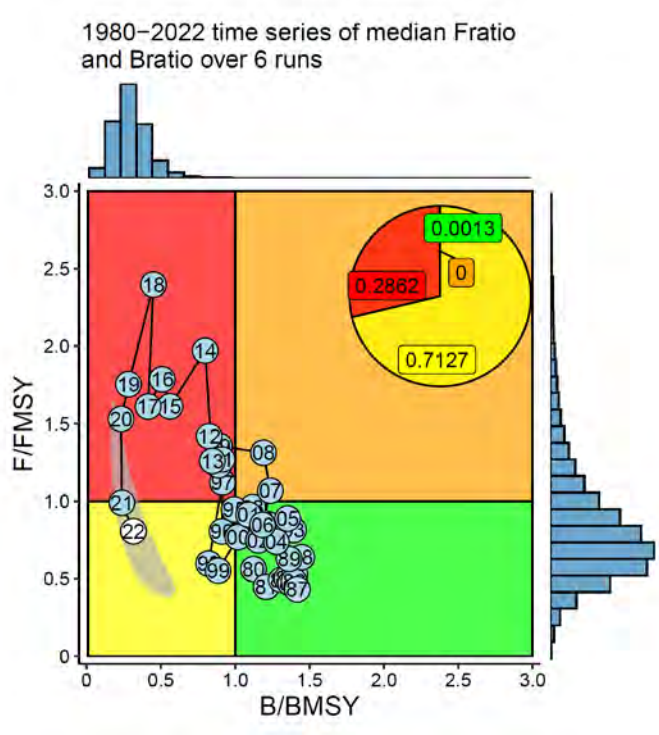


Figure 4. Kobe plot with time trajectory. The data are aggregated across 6 model results (2 base-case models by 3 Members).

Current stock condition and management advice

Summary of stock status

Results of all Members' and combined model estimates indicate that the stock declined with an interannual variability from near carrying capacity in the mid-2000's after a period of high productivity to current low levels. Combined results show that average B was below B_{MSY} during 2021-2023 (median average B/B_{MSY} during 2021-2023 = 0.331, 80%CI=0.201-0.496) and average F was above F_{MSY} (average F/F_{MSY} during 2020-2022 = 1.111, 80%CI= 0.770-1.748). Thus, stock biomass remained at low levels in recent years. The evidence is mixed but biomass may have increased modestly during 2022-2023 based on unstandardized CPUE for 2023 and higher recruitment that may be evident in the Japanese fishery size composition data. There was an increase in the Japanese biomass survey between 2021 and 2023. Ignoring the 2020 survey result (as the 2020 survey was incomplete), the Japanese survey varied without trend at historically low levels during 2015-2023. Standardized CPUE declined to low levels in 2022 but nominal data for 2023 show higher catch rates in 2023 for most Members (Figure 5). Effective fishing effort in the entire fishery remains high with decreases by most Members offset by increases in fishing effort for other Members. Harvest rates declined from a peak in 2018 and were lower but near F_{MSY} during 2021-2022. Reductions in harvest rate and increases in nominal CPUE during 2022-2023 are positive signs but data and recent estimates are variable, CPUE, survey data and biomass are still low, and fishing effort remains high. As described below, management approaches that reduce exploitation at current low biomass levels are more likely to take advantage of any recent increases in stock productivity and help rebuild the fishery and Pacific saury population.

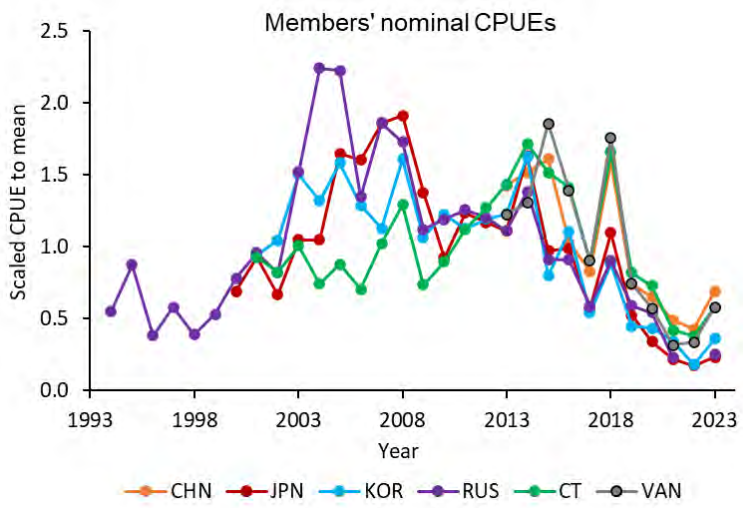


Figure 5. Time series of Member's nominal CPUE indices. Data in 2023 are preliminary (as of November 2023).

The retrospective patterns were modest or not identified and reduced from the previous assessment. There was some scale uncertainty that was examined by Members and determined to be the result of differing prior assumptions. Fortunately, the trends in relative exploitation and relative biomass were robust and consistent.

Management advice

The Commission has responsibility for choosing the TAC and the TAC approach for the Pacific saury fishery. The method used by the Commission in 2019 to set the 2020 TAC for saury was F_{MSY} * B, which is a standard approach used previously in many fisheries. However, it was noted in the previous stock assessment that the original method is seldom used in modern fishery management because it maintains a high (F_{MSY}) fishing mortality level as stock biomass becomes low, as is currently the case for Pacific saury. Simulation studies for

many fisheries show better performance (higher average catch and less frequent low biomass conditions) using harvest control rules such as a new standard approach now used in many fisheries. The newer standard reduces fishing mortality in a simple linear fashion when stock size falls below B_{MSY} to help rebuild stocks at low biomass and increase catches (Figure 6). It gives the same F and same TAC for stocks at biomass levels B_{MSY} and higher (the original and new approaches are identical when stock biomass is at least B_{MSY}). The new approach is generally regarded as better on technical grounds at maintaining productive stock levels, avoiding low biomass conditions and obtaining relatively high long-term catch. Both approaches are based on the same underlying reference points (F_{MSY} and B_{MSY}) that are estimable for Pacific saury in the BSSPM and likely future models. Both approaches use robust trend-based stock status measures and reference points.

TAC calculations were carried out in this assessment for illustrative purposes using the original and newer standard approaches (Figure 7). Such calculations may serve as a means for communication between scientists and managers, provide another approach to calculate TAC on an interim manner, or as a basis for further work. Results show that the newer approach results in TAC for 2024 ($B_{2023}*F_{MSY}*(B_{2023}/B_{MSY})$ = 73,490 tons) that is smaller to the 2023 catch (102,003 tons, preliminary as of 2 December 2023). Results for the original approach yield TAC for 2024 ($B_{2023}*F_{MSY}$ = 172,512 tons), which is substantially higher than recent catches.

The current annual catch limit for 2023-2024 specified in CMM 2023-08 for Pacific saury (250,000 tons) based on historical catch is much larger than a TAC that would be based on the F_{MSY} catch approach 172,512 tons. The current biomass is much lower than B_{MSY} and the TAC for 2023-2024 may not reduce fishing mortality in those years. A harvest control rule that reduces F when biomass is low may increase the probability of achieving long-term sustainable use of Pacific saury (i.e. higher long-term catch closer to MSY of around 396,570 tons). A reduction to the TAC for 2023-2024 would increase the probability of higher biomass and catch levels in the Pacific saury stock.

The HCR used in the second calculation above is a relatively simple approach widely used in many fisheries, but only one example from the range of potential harvest control rules of the same or other types. Note the performance of the above HCRs is in the process of being evaluated.

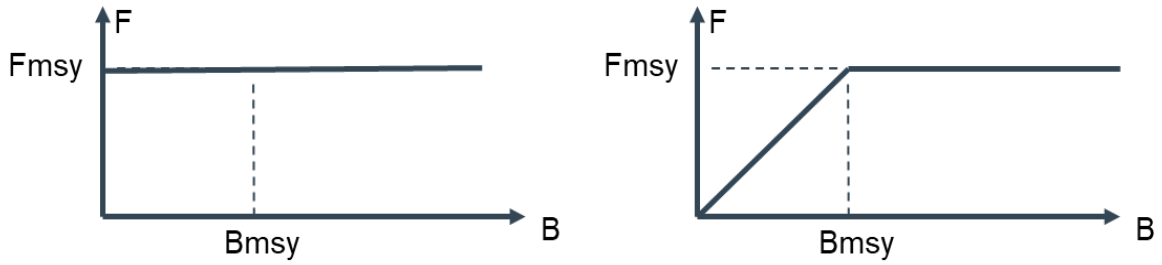


Figure 6. Shapes of harvest rates used in the 2019 Commission meeting for setting the TAC for 2020 (left) and a standard HCR (right).

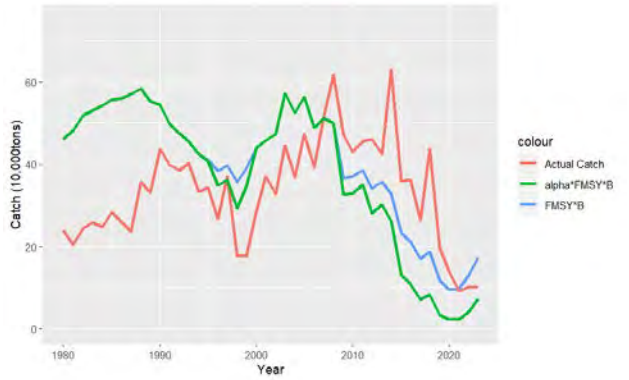


Figure 7. Median time series of F_{MSY}*B, min(1, B/B_{MSY})*F_{MSY}*B, and the actual catch. The first calculation was used by the Commission in 2019 and the second calculation is a common HCR used elsewhere that reduces F when biomass falls below B_{MSY}. Note that the catch in 2023 is a preliminary number as of 2 December 2023. Note that these two calculations are the same when B > B_{MSY}. Also, the second calculation is shown as an example application of an HCR.

Special comments regarding the procedures and stock assessment results

The SSC PS worked collaboratively to produce this consensus stock assessment, which includes significant technical improvements.

1) Standardized CPUE data were assumed to change more slowly than biomass and were down-weighted relative to the Japanese survey in the first base case (B1), which used CPUE from individual Members. In B1, a single non-linear parameter was used for the CPUEs for each Member. Model results support this decision.

2) Potential Covid-19 effects on CPUE and catches were not considered in this assessment but may be important. Members should consult fishermen regarding possible impacts of COVID-19 on the fishery.

3) Retrospective analyses have shown that BSSPM model projections are not suitable for use by managers and they have therefore been omitted by most Members (see discussion in the 2019 assessment (NPFC-2019-SSC PS04-Final Report)). Projections are problematic because recruits and older Pacific saury are not distinguished in the model, environmental effects are important but not predictable and because the species is short-lived.

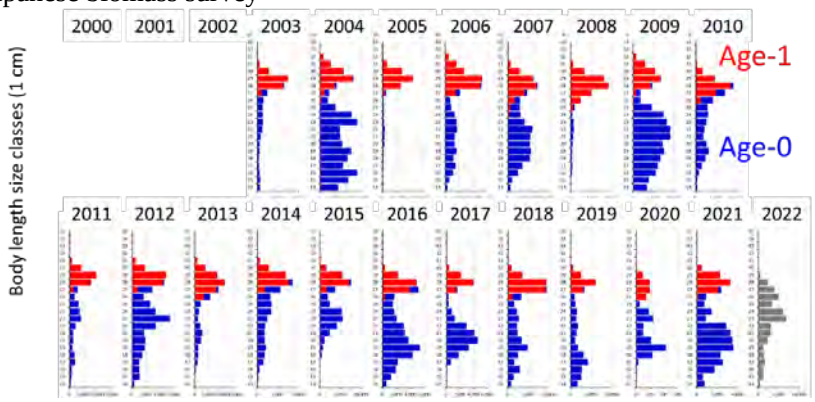
4) The 2020 biomass index from the Japanese survey has large uncertainties due to incomplete survey coverage and complicates interpretation of recent trends. It may be better to disregard the 2020 observation when evaluating recent trends visually.

5) The relative importance of fishing and environmental factors on the population dynamics of Pacific saury is unknown and an important area for research. However, changing environmental conditions may have contributed to the decline and current low stock size of Pacific saury. Oceanographic or biological factors responsible for changes in productivity have not yet been determined. Development of modeling procedures to incorporate environmental change is an important area for future research. The work should include refinements to stock assessment models to better reflect and estimate environmental effects on recruitment and biology. This work should be coordinated among Members and folded into the development of age-structured and improved BSSPM models.

6) The Commission should consider defining overfishing and overfished status and identify actions taken when such conditions occur in the future.

7) Time series of size and age composition data from the Japanese survey and fishery (Figures 8 and 9) showed the occurrence of weak year classes (i.e. 2005, 2008) consistently. Such consistency will facilitate application of new age and/or size structured model.

(a) Japanese biomass survey



(b) Japanese commercial fishery between August and November

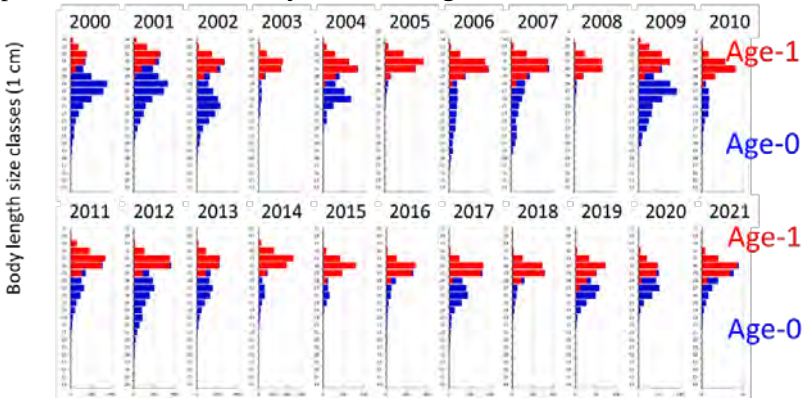


Figure 8. Time series of age and length composition of samples taken from the Japanese survey and commercial fishery (August-November) in Japan.

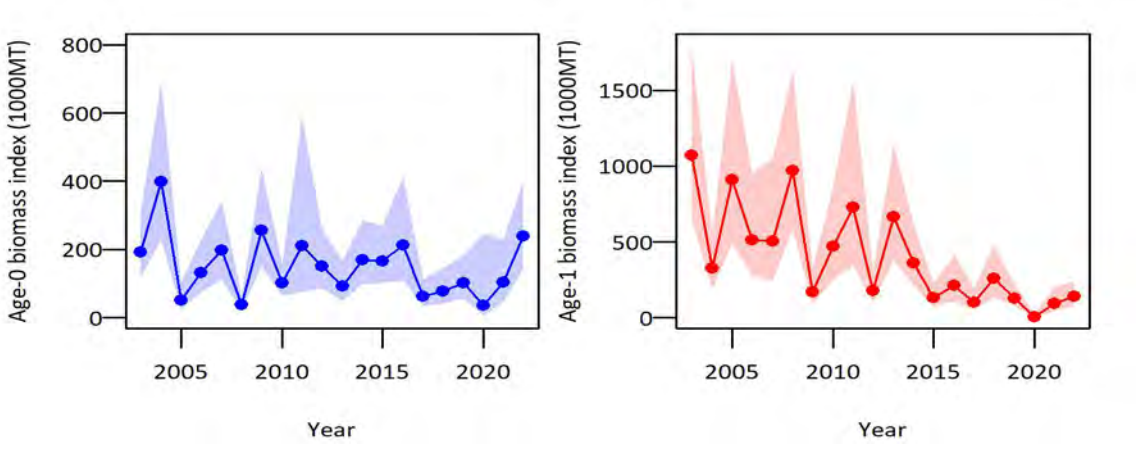


Figure 9. Time series of Japanese survey biomass index by age.

STOCK ASSESSMENT REPORT FOR PACIFIC SAURY

1. INTRODUCTION

1.1 Distribution

Pacific saury (*Cololabis saira* Brevoort, 1856) has a wide distribution extending in the subarctic and subtropical North Pacific Ocean from inshore waters of Japan and the Kuril Islands to eastward to the Gulf of Alaska and southward to Mexico. Pacific saury is a commercially important fish in the western North Pacific Ocean (Parin 1968; Hubbs and Wisner 1980).

1.2 Migration

Pacific saury migrates extensively between the northern feeding grounds in the Oyashio waters around Hokkaido and the Kuril Islands in summer and the spawning areas in the Kuroshio waters off southern Japan in winter (Fukushima 1979; Kosaka 2000). Pacific saury in offshore regions (east of 160°E) also migrate westward toward the coast of Japan after October every year (Suyama et al. 2012).

1.3 Population structure

Genetic evidence suggests there are no distinct stocks in the Pacific saury population based on 141 individuals collected from five distant locales (East China Sea, Sea of Okhotsk, northwest Pacific, central North Pacific, and northeast Pacific) (Chow et al. 2009).

1.4 Spawning season and grounds

The spawning season of Pacific saury is relatively long, beginning in September and ending in June of the following year (Watanabe and Lo 1989). Pacific saury spawns over a vast area from the Japanese coastal waters to eastern offshore waters (Baitaliuk et al. 2013). The main spawning grounds are considered to be located in the Kuroshio-Oyashio transition region in fall and spring and in the Kuroshio waters and the Kuroshio Extension waters in winter (Watanabe and Lo 1989).

1.5 Food and feeding

The Pacific saury larvae prey on the nauplii of copepods and other small-sized zooplankton. As they grow, they begin to prey on larger zooplankton such as krill (Odate 1977). The Pacific saury is preyed on by large fish ranked higher in the food chain, such as *Thunnus alalunga* (Nihira 1988) and coho salmon, *Oncorhynchus kisutsh* (Sato and Hirakawa 1976) as well as by animals such as minke whales *Balaenoptera acutorostrata* (Konishi et al. 2009) and sea birds (Ogi 1984).

1.6 Age and growth

Based on analysis of daily otolith increments, Pacific saury reaches approximately 20 cm in knob length (distance from the tip of lower jaw to the posterior end of the muscular knob at the base of a caudal peduncle; hereafter as body length) in 6 or 7 months after hatching (Watanabe et al. 1988; Suyama et al. 1992). There is some variation in growth rate depending on the hatching month during this long spawning season (Kurita et al. 2004) and geographical differences (Suyama et al. 2012b). The maximum lifespan is 2 years (Suyama et al. 2006). The age 1 fish grow to over 27 cm in body length in June and July when Japanese research surveys are conducted and reach over 29 cm in the fishing season between August and December (Suyama et al. 2006).

1.7 Reproduction

The minimum size of maturity of Pacific saury has been estimated at about 25 cm in the field (Hatanaka 1956) or rearing experiments (Nakaya et al. 2010). In rare cases, saury have been found to mature at 22 cm (Sugama 1957; Hotta 1960). Under rearing experiments, Pacific saury begins spawning 8 months after hatching, and spawning activity continues for about 3 months (Suyama et al. 2016). Batch fecundity is about 1,000 to 3,000 eggs per saury (Kosaka 2000).

2. FISHERY

2.1 Overview of fisheries

Western North Pacific

In Japan, the stick-held dip net fishery for Pacific saury was developed in the 1940s. Since then, the stick-held dip net gears have become the dominant fishing technique to catch Pacific saury in the northwest Pacific Ocean. Since 1995, more than 97% of Japan's total catch is caught by the stick-held dip net. The annual catch of Pacific saury for stick-held dip net fishery has fluctuated. Maximum and minimum catches of 355 thousand tons and 18 thousand tons were recorded in 2008 and 2022, respectively.

Pacific saury fisheries in Korea have been operated with gillnet since the late 1950s in Tsushima Warm Current region. Korean stick-held dip net fishery started from 1985 in the Northwest Pacific Ocean. The largest catch of 50 thousand tons was recorded in 1997 (Gong and Suh 2013).

Russian fishery for Pacific saury has been conducted using stick-held dip nets in the northwest Pacific Ocean in the area that includes national waters (mainly within the Russian EEZ) and adjacent NPFC Convention Areas. Russian catch statistics for saury fishery exists, beginning from 1956, and standardized CPUE indices from that fishery were calculated since 1994. Saury fishery traditionally occurred from August to November; however, in recent years, the onset of fishing for saury shifted to the early summer period. Peak catch of saury of over 100 thousand tons was in 2007. Since then, the annual catch has been decreasing, and was about 610 tons in 2021.

China commenced its exploratory saury fishing using stick-held dip nets in the high seas in 2003, but only started to develop this fishery in 2012. The fishing seasons mainly cover the period from June-November.

Chinese Taipei's Pacific saury fishery can date back to 1975 and had its first commercial catch in 1977. Over the past decade, the number of active Pacific saury fishing vessels has been increasing from 68 to 91 and the catch has fluctuated between 39,750 tons and 229,937 tons since 2001. Aside from Pacific saury fishery, most of the Pacific saury fishing vessels also conduct flying squid jigging operations in the Northwest Pacific Ocean.

Vanuatu commenced its development of Pacific saury fishery by using stick-held dip net in the high seas in 2004. Currently there are four vessels operating in the Northwest Pacific targeting saury, but the total accumulative number of its authorized Pacific saury fishing vessels from 2004 to 2020 is 16. The fishing season mainly covers the period from July to November each year.

Eastern North Pacific

Although Pacific saury occur in the Canada EEZ, there is no targeted fishery for the species. There is no historical record of Canadian participation in international fisheries for saury. Domestic fisheries sometimes capture saury as bycatch in pelagic and bottom trawls and there are a handful of records from other gear types including commercial longlines. The most recently compiled estimates indicate around 300 kg of saury were captured by Canadian commercial fisheries over 17 years from 1997-2013 (Wade and Curtis 2015; NPFC-2022-SSC PS09-IP01). There are also records of saury catches from research trawls (surface, pelagic and bottom trawls) in Canadian waters, but the catches have been minimal.

Management plans developed by the United States' National Marine Fisheries Service currently prohibit targeted fishing on marine forage species including the Pacific saury. In the 1950's to mid-1970's there were sporadic attempts to commercially fish for Pacific saury off of California with limited success using purse seines and light attraction (Kato 1992). Catches from 1969-1972 averaged 450 tons. Currently landings are only "occasionally" reported as bycatch in fisheries on the US west coast. Landings of Pacific saury as bycatch on the US west coast averaged 5.5 kg per year from 2011-2015 (NOAA Fisheries National Bycatch Report Database System, https://www.st.nmfs.noaa.gov/, accessed March 8, 2019)

Historically, Japanese and Russian vessels operated mainly within their own EEZs, but they have shifted into the Convention Area in recent years. Chinese, Korean and Chinese Taipei vessels operate mainly in the high seas of the North Pacific (Figure 1).

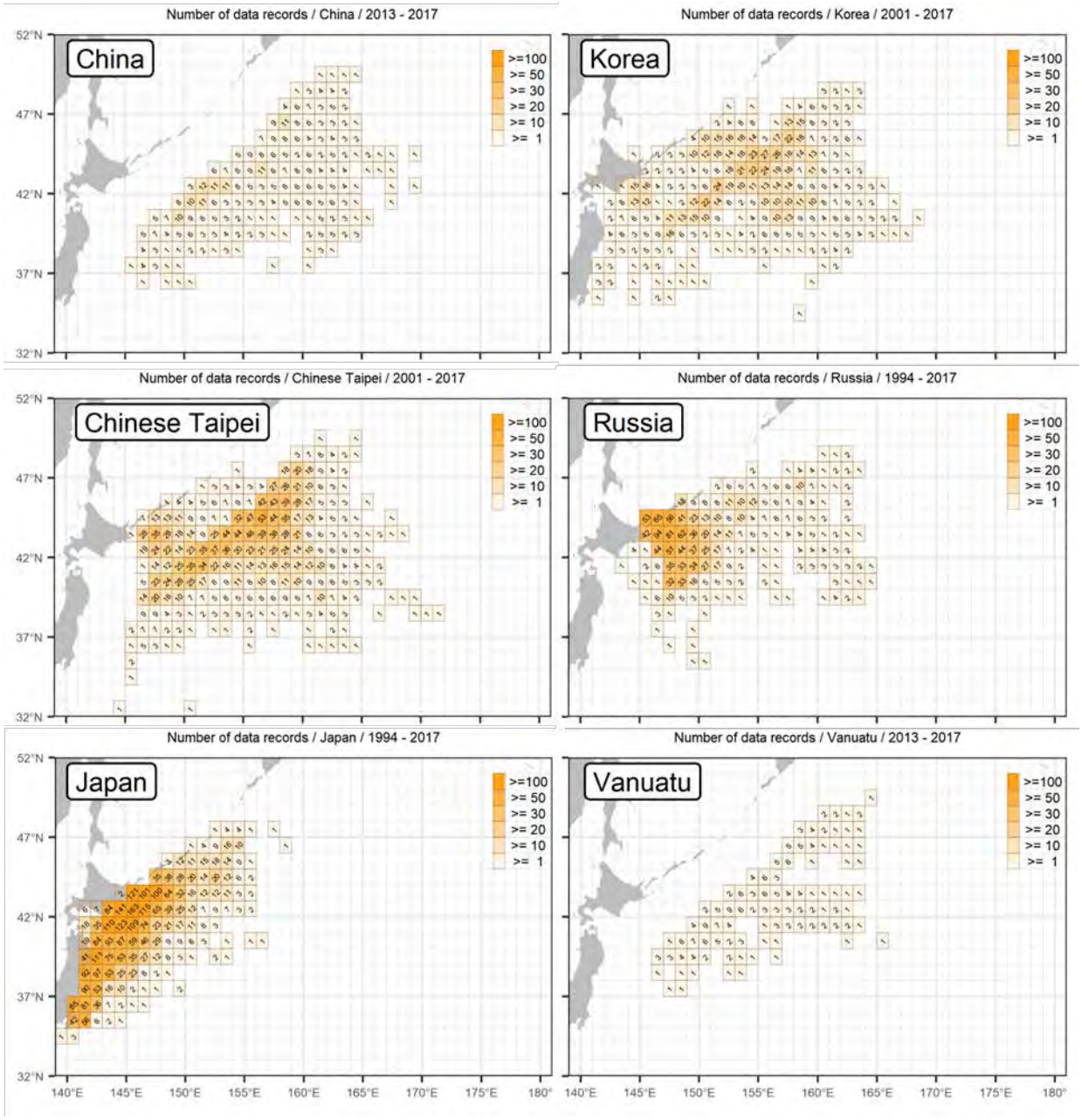


Figure 1 (a). Main fishing grounds for Pacific saury by fishing members in the western North Pacific Ocean during 1994-2017. The legend shows the number of data records. This figure is based on the data shared by the Members for the development of a joint CPUE index

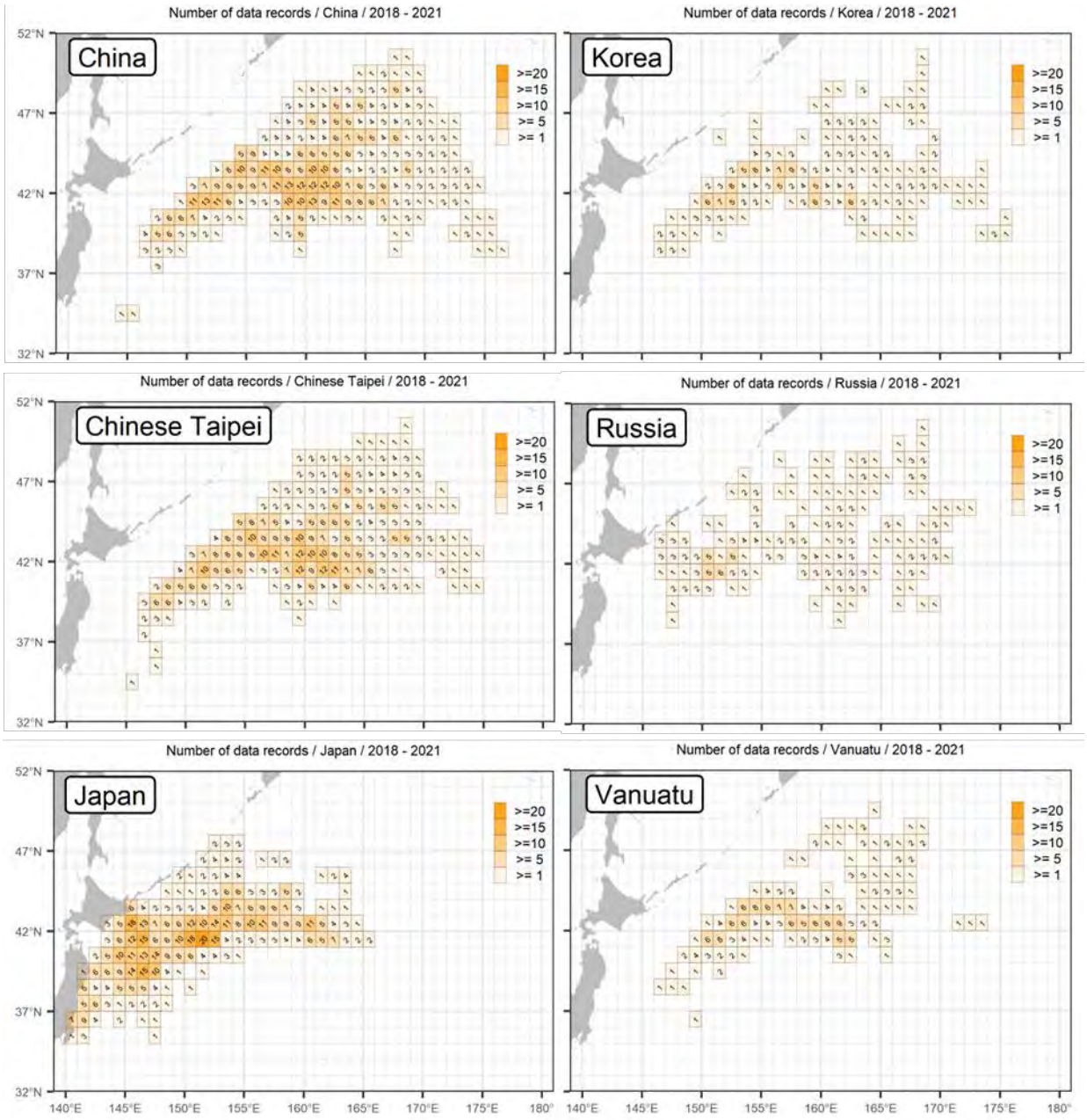


Figure 1 (b). Main fishing grounds for Pacific saury by fishing members in the western North Pacific Ocean during 2018-2021. The legend shows the number of data records. This figure is based on the data shared by the Members for the development of a joint CPUE index

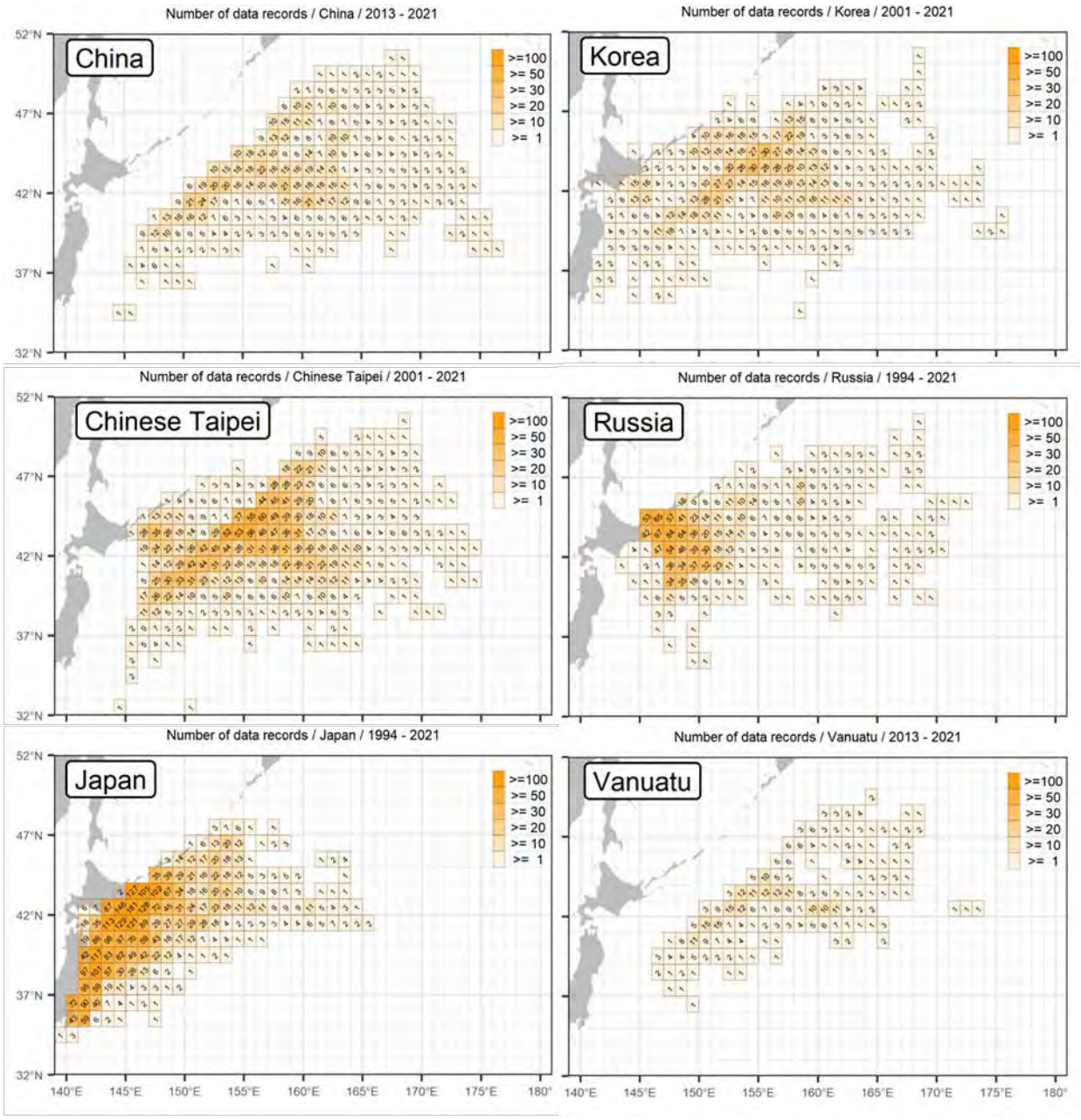


Figure 1 (c). Main fishing grounds for Pacific saury by fishing members in the western North Pacific Ocean during 1994-2021. The legend shows the number of data records. This figure is based on the data shared by the Members for the development of a joint CPUE index

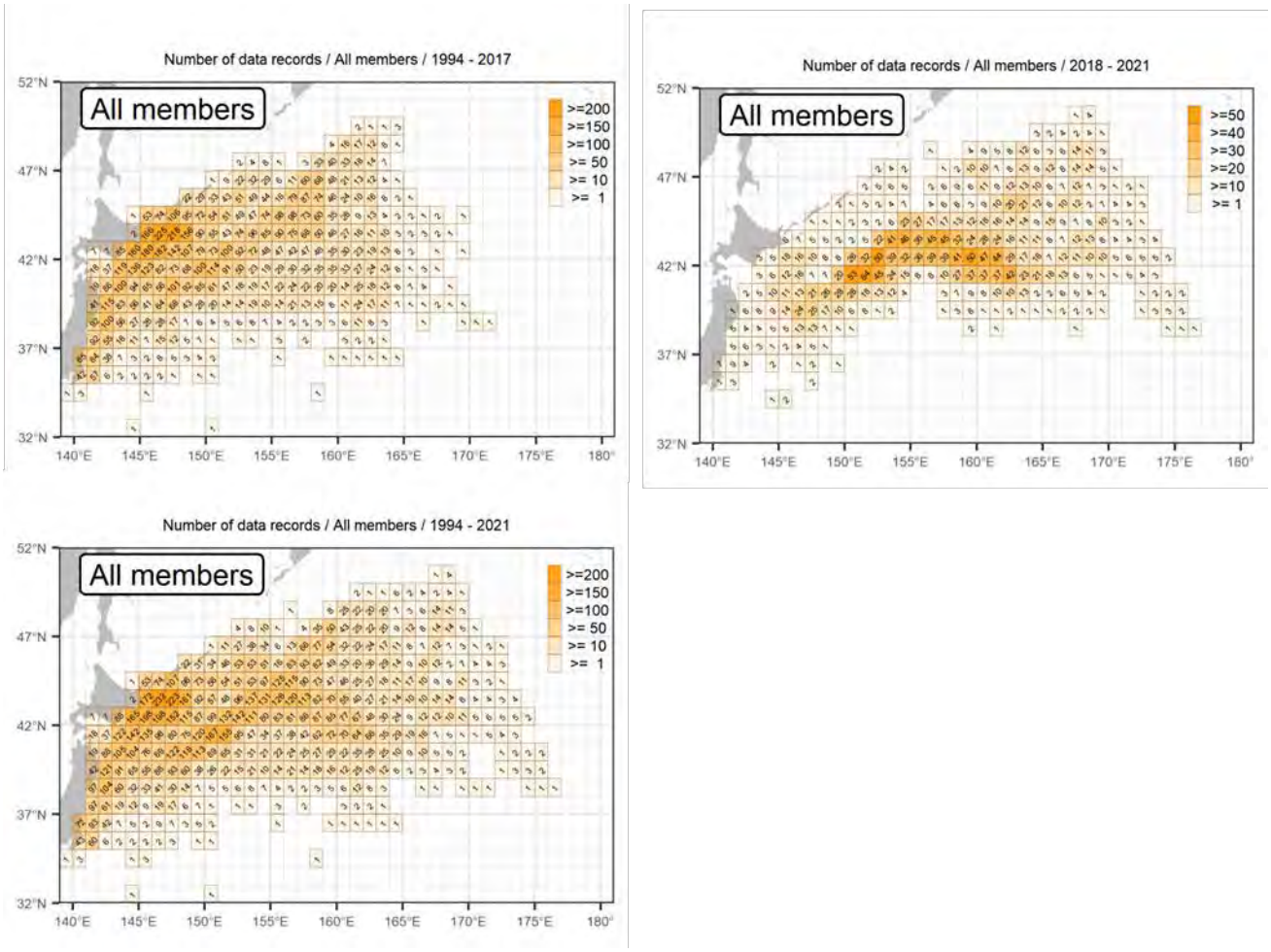


Figure 1 (d). Main fishing grounds for Pacific saury in the western North Pacific Ocean. The legend shows the number of data records. This figure is based on the data shared by the Members for the development of a joint CPUE index

2.2 Catch records

Figure 2 shows the historical catches of Pacific saury in the northwest Pacific Ocean by Member.

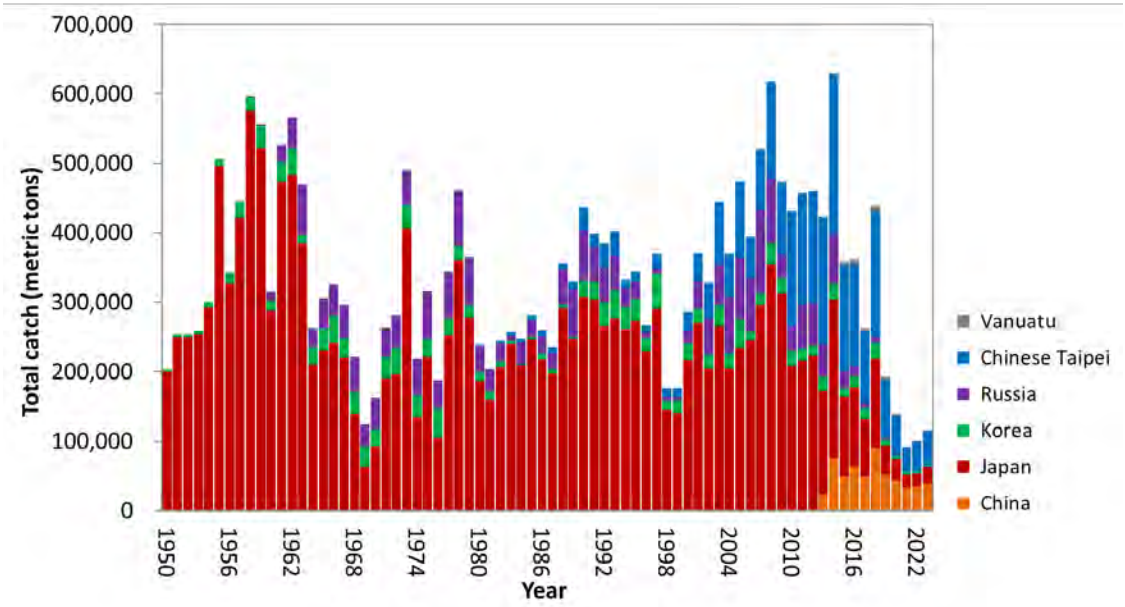


Figure 2. Time series of catch by Member during 1950-2023. The catch data for 1950-1979 are shown but not used in stock assessment modeling. Catch data in 2023 are preliminary (as of 2 December 2023) and not used in the assessment.

3. SPECIFICATION OF STOCK ASSESSMENT

A Bayesian state-space production model (BSSPM) used in previous stock assessments was employed as an agreed provisional stock assessment model for Pacific saury during 1980-2023. Scientists from three Members (China, Japan and Chinese Taipei) each conducted analyses following the agreed specification which called for two base case scenarios and two sensitivity scenarios (see Annex F, SSC PS09 report for more details). The two base case scenarios differ in using each Member's standardized CPUEs (base case B1) or standardized joint CPUEs (base case B2). For the two sensitivity cases with Japanese early CPUE (1980-1994), time-varying catchability was assumed to account for potential increases in catchability. A higher weight was given to the Japanese biomass survey estimates than to Members' CPUEs in B1 while comparable weights were given to the Japanese biomass survey estimates and the joint CPUEs in B2. The CPUE data were modeled as nonlinear indices of biomass. Members used similar approaches with some differences in the assumption of the time-varying catchability and prior distributions for the free parameters in the model.

3.1 Bayesian state-space production model

The population dynamics is modelled by the following equations:

$$B_t = \{B_{t-1} + B_{t-1} f(B_{t-1}) - C_{t-1}\} e^{u_t}, \quad u_t \sim N(0, \tau^2)$$

$$f(B_t) = r\left[1 - \left(\frac{B_t}{K}\right)^z\right]$$

where

B_t : the biomass at the beginning of year *t*

C_t : the total catch of year *t*

u_t : the process error in year *t*

$f(B)$: the production function (Pella-Tomlinson)

r : the intrinsic rate of natural increase

K : the carrying capacity
z: the degree of compensation (shape parameter; different symbols were used by the 3 members)

The multiple biomass indices are modelled as follows:

Survey biomass estimate

$$I_{t,biomass} = q_{biomass} B_t \, exp(\, v_{t,biomass}), \qquad \text{where} \quad v_{t,biomass} \sim N\left(0, \sigma^2_{biomass}\right)$$

where

$q_{biomass}$: the relative bias in biomass estimate
$v_{t,biomass}$: the observation error term in year *t* for survey biomass estimate
$\sigma^2_{biomass}$: the observation error variance for survey biomass estimate

CPUE series

$$I_{t,f} = q_f B_t^b \, exp(\, v_{t,f}), \qquad \text{where} \quad v_{t,f} \sim N\left(0, \sigma_f^2\right)$$

where

$I_{t,f}$: the biomass index in year *t* for biomass index *f*

q_f : the catchability coefficient for biomass index *f*

b: the hyper-stability/depletion parameter
$v_{t,f}$: the observation error term in year *t* for biomass index *f*
σ_f^2: the observation error in year *t* for biomass index *f*

For the estimation of parameters, Bayesian methods were used with Member-specific differences in preferred assumptions for the prior distributions for the free parameters. MCMC methods were employed for simulating the posterior distributions. For the assumptions of uniform priors used in China and Japan, see documents NPFC-2023-SSC PS12-WP05 and NPFC-2023-SSC PS12-WP09; for the non-uniform priors used in Chinese Taipei, see document NPFC-2023-SSC PS12-WP06.

3.2 Agreed scenarios

Table 1. Definition of scenarios

	Base case (NB1)	**Base case (NB2)**	**Sensitivity case (NS1)**	**Sensitivity case (NS2)**
Initial year	1980	1980	1980	1980
Biomass survey	$I_{t,bio} = q_{bio}\, B_t e^{v_{t,bio}}$ $v_{t,bio} \sim N(0, cv_{t,bio}^2 + \sigma^2)$ $q_{bio} \sim$ U(0,1) (2003-2023)	Same as left	Same as left	Same as left
CPUE	CHN(2013-2022) JPN_late(1994-2022) KOR(2001-2022) RUS(1994-2022) CT(2001-2022) $I_{t,f} = q_f B_t^b e^{v_{t,f}}$ $v_{t,f} \sim N(0, \sigma_f^2)$ $\sigma_f^2 = c \cdot (ave(cv_{t,bio}^2) + \sigma^2)$, where $ave(cv_{t,bio}^2)$ is computed except for 2020 survey (c = 5)	Joint CPUE (1994-2022) $I_{t,joint} = q_{joint} B_t^b e^{v_{t,joint}}$ $v_{t,joint} \sim N(0, cv_{t,joint}^2 + \sigma^2)$	CHN(2013-2022) JPN_early(1980-1993, time-varying q) JPN_late(1994-2022) KOR(2001-2022) RUS(1994-2022) CT(2001-2022) $I_{t,f} = q_f B_t^b e^{v_{t,f}}$ $v_{t,f} \sim N(0, \sigma_f^2)$ $\sigma_f^2 = c \cdot (ave(cv_{t,bio}^2) + \sigma^2)$, where $ave(cv_{t,bio}^2)$ is computed except for 2020 survey (c = 6)	JPN_early(1980-1993, time-varying q) $I_{t,JE} = q_{t,JE} B_t^b e^{v_{t,JE}}$ $v_{t,JE} \sim N(0, \sigma_{JE}^2)$ $\sigma_{JE}^2 = c\ ave(cv_{t,joint}^2 + \sigma^2)$ Joint CPUE (1994-2022) $I_{t,joint} = q_{joint} B_t^b e^{v_{t,joint}}$ $v_{t,joint} \sim N(0, cv_{t,joint}^2 + \sigma^2)$
Hyper-depletion / stability	A common parameter for all fisheries with a prior distribution, $b \sim U(0, 1)$	$b \sim U(0, 1)$	A common parameter for all fisheries but JPN_early, with a prior distribution, $b \sim U(0, 1)$ [b for JPN_early is fixed at 1]	$b \sim U(0, 1)$ for joint CPUE. [b for JPN_early is fixed at 1]
Prior for other than q_{bio}	Own preferred options	Own preferred options	Own preferred options	Own preferred options

Table 2. Description of symbols used in the stock assessment

Symbol	Description
C_{2022}	Catch in 2022
$AveC_{2020\text{-}2022}$	Average catch for a recent period (2020–2022)
$AveF_{2020\text{-}2022}$	Average harvest rate for a recent period (2020–2022)
F_{2022}	Harvest rate in 2022
F_{MSY}	Annual harvest rate producing the maximum sustainable yield (MSY)
MSY	Equilibrium yield at F_{MSY}
F_{2022}/F_{MSY}	Average harvest rate in 2022 relative to F_{MSY}
$AveF_{2020\text{-}2022}/F_{MSY}$	Average harvest rate for a recent period (2020–2022) relative to F_{MSY}
K	Equilibrium unexploited biomass (carrying capacity)
B_{2022}	Stock biomass in 2022 estimated in the model
B_{2023}	Stock biomass in 2023 estimated in the model
$AveB_{2021\text{-}2023}$	Stock biomass for a recent period (2021–2023) estimated in the model
B_{MSY}	Stock biomass that will produce the maximum sustainable yield (MSY)
B_{MSY}/K	Stock biomass that produces the maximum sustainable yield (MSY) relative to the equilibrium unexploited biomass[a]
B_{2022}/K	Stock biomass in 2022 relative to K[a]
B_{2023}/K	Stock biomass in 2023 relative to K[a]
$B_{2021\text{-}2023}/K$	Stock biomass in the latest time period (2021-2023) relative to the equilibrium unexploited stock biomass[a]
B_{2022}/B_{MSY}	Stock biomass in 2022 relative to B_{MSY}[a]
B_{2023}/B_{MSY}	Stock biomass in 2023 relative to B_{MSY}[a]
$B_{2021\text{-}2023}/B_{MSY}$	Stock biomass for a recent period (2021–2023) relative to the stock biomass that produces maximum sustainable yield (MSY) [a]

[a]calculated as the average of the ratios.

4 SOME AGGREGATED RESULTS FOR VISUALIZATION PURPOSE

4.1 Visual presentation of results

The graphical presentations for times series of biomass (B), B-ratio (B/B_{MSY}), exploitation rate (F), F-ratio (F/F_{MSY}) and B/K are shown in Figure 3.

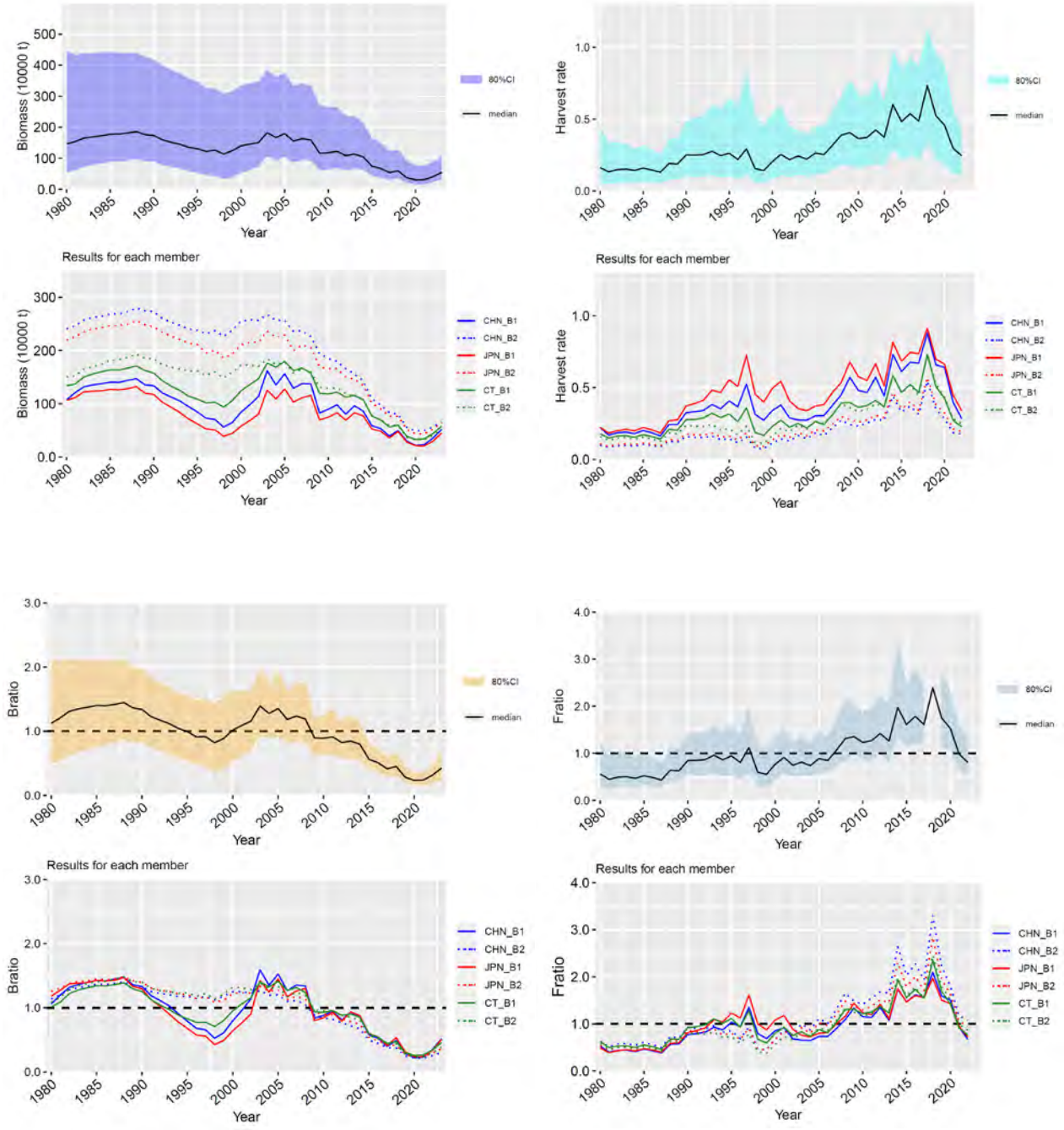


Figure 3. Time series of median estimated values of six runs for biomass, harvest rate, B-ratio, F-ratio and depletion level relative to K. The solid and shaded lines correspond to B1 and B2, respectively.

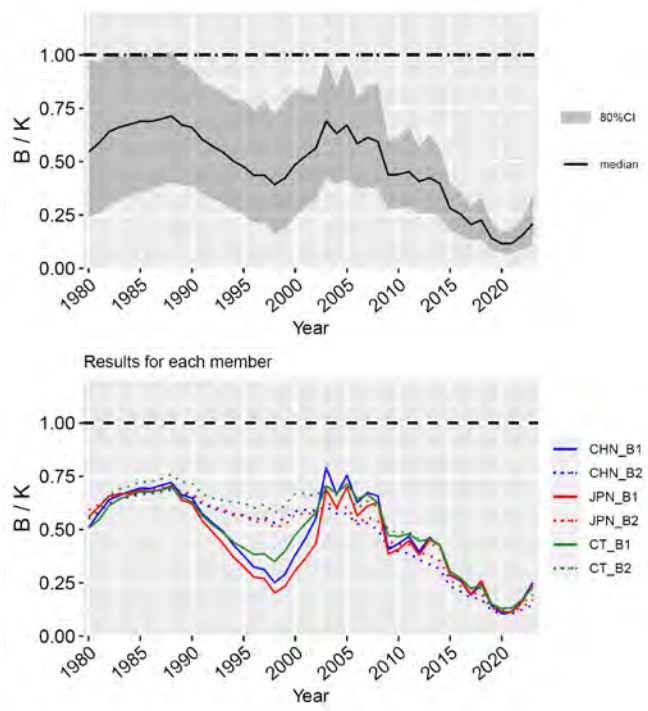


Figure 3 (Continued).

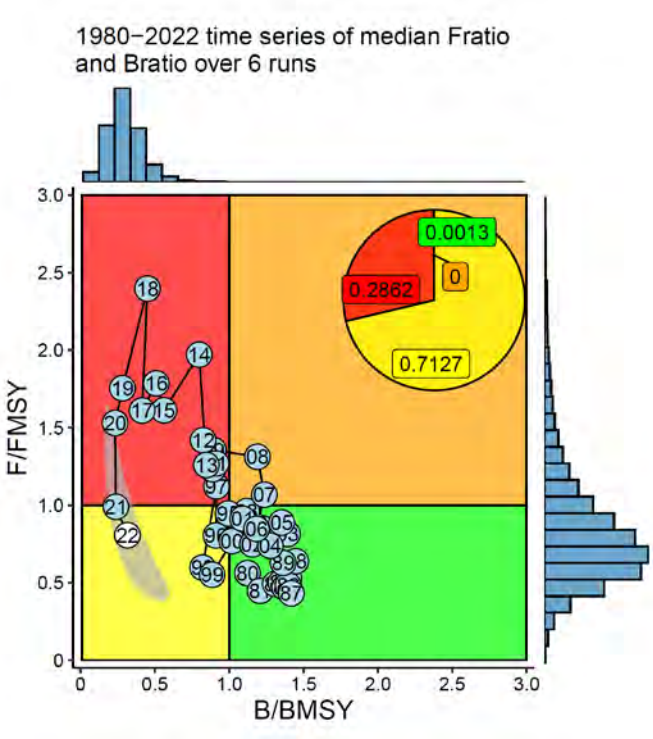


Figure 4. Kobe plot with time trajectory. The data are aggregated across 6 model results (2 base-case models by 3 Members).

4.2 Summary table

Table 3. Summary of estimates of reference quantities. Median and credible interval for the aggregated results are presented. In addition, median values of Member's combined results (over B1 and B2) are shown.

	Median	Lower10%	Upper10%	Median_CHN	Median_JPN	Median_CT
C_2022 (10000 t)	10.009	10.009	10.009	10.009	10.009	10.009
AveC_2020_2022	11.066	11.066	11.066	11.066	11.066	11.066
AveF_2020_2022	0.337	0.141	0.621	0.328	0.376	0.316
F_2022	0.245	0.113	0.426	0.231	0.270	0.237
FMSY	0.314	0.108	0.576	0.305	0.350	0.297
MSY (10000 t)	39.657	30.473	48.874	40.434	39.856	38.940
F_2022/FMSY	0.806	0.519	1.436	0.810	0.799	0.809
AveF_2020_2022/FMSY	1.111	0.770	1.748	1.159	1.106	1.079
K (10000 t)	264.054	147.520	702.181	285.000	251.768	260.100
B_2022 (10000 t)	40.820	23.503	88.382	43.290	37.073	42.300
B_2023 (10000 t)	54.940	33.227	108.300	57.340	52.284	55.320
AveB_2021_2023	42.410	25.270	90.015	44.623	39.042	43.883
BMSY (10000 t)	128.100	74.289	317.407	136.900	118.580	130.150
BMSY/K	0.481	0.389	0.604	0.469	0.469	0.506
B_2022/K	0.155	0.089	0.233	0.150	0.151	0.163
B_2023/K	0.209	0.105	0.341	0.200	0.210	0.214
AveB_2021_2023/K	0.163	0.092	0.244	0.156	0.160	0.170
B_2022/BMSY	0.316	0.195	0.474	0.306	0.316	0.323
B_2023/BMSY	0.426	0.227	0.698	0.412	0.441	0.424
AveB_2021_2023/BMSY	0.331	0.201	0.496	0.320	0.336	0.337

5 CONCLUDING REMARKS

See the Executive Summary.

REFERENCES

Baitaliuk A.A., Orlov, A.M., & Ermakov, Y.K. 2013. Characteristic features of ecology of the Pacific saury *Cololabis saira* (Scomberesocidae, Beloniformes) in open waters and in the northeast Pacific Ocean. Journal of Ichthyology 53(11): 899-913.

Chow S., Suzuki N., Brodeur R.D., Ueno Y. 2009. Little population structuring and recent evolution of the Pacific saury (*Cololabis saira*) as indicated by mitochondrial and nuclear DNA sequence data. J Exp Mar Biol Ecol 369:17–21.

Fukushima S. 1979. Synoptic analysis of migration and fishing conditions of saury in northwest Pacific Ocean. Bull. Tohoku Reg. Fish. Res. Lab. 41, 1-70.

Gong Y., Suh Y.S. 2013. Effect of climate-ocean changes on the abundance of Pacific saury. J Environ Biol. 34(1): 23-30.

Hotta H. 1960. On the analysis of the population of the Pacific saury (*Cololabis saira*) based on the scales and the otolith characters, and their growth. Bull Tohoku Reg Fish Res Lab 16: 41–64.

Hubbs C.L., Wisner R.L. 1980. Revision of the sauries (Pisces, Scomberesocidae) with descriptions of two new genera and one new species. Fish Bull US 77: 521–566.

Kato S. 1992. Pacific saury. In W.S. Leet, C.M. Dewees, and C.W. Haugen (eds.). Californias living marine resources and their utilization. California Sea Grant Extension Publication UCSGEP-92-12, Davis, CA. P. 199-201.

Konishi K., Tamura T., Isoda T., Okamoto R., Hakamada T., Kiwada H., Matsuoka K. 2009. Feeding strategies and prey consumption of three baleen whale species within the Kuroshio-Current extension. J North Atl Fish Sci 42: 27-40.

Kosaka S. 2000. Life history of the Pacific saury *Cololabis saira* in the northwest Pacific and considerations on resource fluctuations based on it. Bulletin of Tohoku National Fisheries Research Institute 63: 1–96.

Kurita Y., Nemoto Y., Oozeki Y., Hayashizaki K., Ida H. 2004. Variations in patterns of daily changes in otolith increment widths of 0+ Pacific saury, *Cololabis saira*, off Japan by hatch date in relation to the northward feeding migration during spring and summer. Fish Oceanogr 13(Suppl. 1): 54–62.

Nakaya M., Morioka T., Fukunaga K., Murakami N., Ichikawa T., Sekiya S., Suyama S. 2010. Growth and maturation of Pacific saury *Cololabis saira* under laboratory conditions. Fish Sci 76: 45–53.

Nihira A. 1988. Predator－Prey interaction Between Albacore Thunnus alalunga (Bonne terre) and Pacific Saury *Cololabis saira*, in the area of Emperor seamount Chain in the North Western Pacific Ocean. Bull. Ibaraki Pref. Fish. Exp. Stat. 26: 125-136.

Odate K. 1977. On the feeding habits of the Pacific saury, *Cololabis saira* (Brevoort). Bull. Tohoku Reg. Fish. Res. Lab. 38: 75–88.

Ogi H. 1984. Feeding ecology of the Sooty Shearwater in the western subarctic North Pacific Ocean. Marine Birds: Their Feeding Ecology and Commercial Fisheries Relationships, ed.by D.N. Nettleship et al. Canadian Wildlife Service Special Publication, Ottawa, 78-84.

Parin N.V. 1968. Scomberesocidae (Pisces, Synentognathi) of the eastern Atlantic Ocean. Atlantide Rep. 10: 275-290.

Sato T. and Hirakawa H. 1976. Studies on food habit of coho salmon in the Northwestern Pacific Ocean. Bull. Fukushima Pref. Fish. Exp. Stat. 4: 25-31.

Sugama K. 1957. Analysis of population of the saury (*Cololabis saira* Brevoort) on the basis of character of otolith-I. Bull Hokkaido Reg Fish Res Lab 16: 1–12.

Suyama S., Sakurai Y., Meguro T., and Shimazaki K. 1992. Estimation of the age and growth of Pacific saury *Cololabis saira* in the central North Pacific Ocean determined by otolith daily growth increments. Nippon Suisan Gakkaishi 58: 1607-1614.

Suyama S., Kurita Y., Ueno Y. 2006. Age structure of Pacific saury *Cololabis saira* based on observations of the hyaline zones in the otolith and length frequency distributions. Fish Sci 72: 742–749.

Suyama S., Nakagami M., Naya M., Ueno Y. 2012a. Migration route of Pacific saury *Cololabis saira* inferred from the otolith hyaline zone. Fisheries Science 78(6): 1179-1186.

Suyama S., Nakagami M., Naya M., Ueno Y. 2012b. Comparison of the growth of age-1 Pacific saury *Cololabis saira* in the Western and the Central North Pacific. Fisheries science 78(2): 277-285.

Suyama S., Shimizu A., Isu S., Ozawa H., Morioka T., Nakaya M., Nakagawa T.,·Murakami N., Ichikawa T., Ueno Y. 2016. Determination of the spawning history of Pacific saury *Cololabis saira* from rearing experiments: identification of post-spawning fish from histological observations of ovarian arterioles. Fisheries Science 82(3): 445-457.

Wade J., and Curtis J.M.R. 2015. A review of data sources and catch records for Pacific Saury (*Cololabis saira*) in Canada. Can. Manuscr. Rep. Fish. Aquat. Sci. 3058: iv + 20 p.

Watanabe Y., Butler J.L., Mori T. 1988. Growth of Pacific saury, *Cololabis saira*, in the northeastern and northwestern Pacific Ocean. Fish Bull US 86: 489–498.

Watanabe Y., Lo N.C.H. 1989. Larval production and mortality of Pacific saury, *Cololabis saira*, in the northwestern Pacific Ocean. Fish Bull US 87: 601–613.

Appendix 1

Updated total catch, CPUE standardizations and biomass estimates for the stock assessment of Pacific saury

Year	Total catch (metric tons)	Biomass JPN (VAST, 1000 metric tons)	CV (%)	CPUE CHN (metric tons/ vessel/ day)	CPUE JPN_early (metric tons/ net haul)	CPUE JPN_late (metric tons/ net haul)	CPUE KOR (metric tons/ vessel/ day)	CPUE RUS (metric tons/ vessel/ day)	CPUE CT (metric tons/ net haul)	Joint CPUE (VAST)	CV (%)
1980	238510				0.72						
1981	204263				0.63						
1982	244700				0.46						
1983	257861				0.87						
1984	247044				0.81						
1985	281860				1.4						
1986	260455				1.13						
1987	235510				0.97						
1988	356989				2.36						
1989	330592				3.06						
1990	435869				1.95						
1991	399017				3.13						
1992	383999				4.32						
1993	402185				3.25						
1994	332509					4.13		0.747		1.39	0.29
1995	343743					2.11		0.869		1.70	0.30
1996	266424					1.77		0.646		0.73	0.29
1997	370017					3.52		0.501		1.40	0.30
1998	176364					1.05		0.501		0.87	0.32
1999	176498					0.87		0.568		0.53	0.35
2000	286186					1.28		0.822		1.00	0.32
2001	370823					1.65	7.84	0.947	1.57	0.92	0.19
2002	328362					1.11	11.28	1.172	1.63	0.70	0.18
2003	444642	1348.7	23.9			2.04	16.32	1.526	2.67	1.22	0.18
2004	369400	769.8	20.5			2.72	11.78	2.914	1.45	1.17	0.18
2005	473907	1012.2	30.7			4.40	19.33	2.963	2.39	1.71	0.16
2006	394093	696.6	30.0			4.55	9.45	1.975	1.27	0.55	0.15

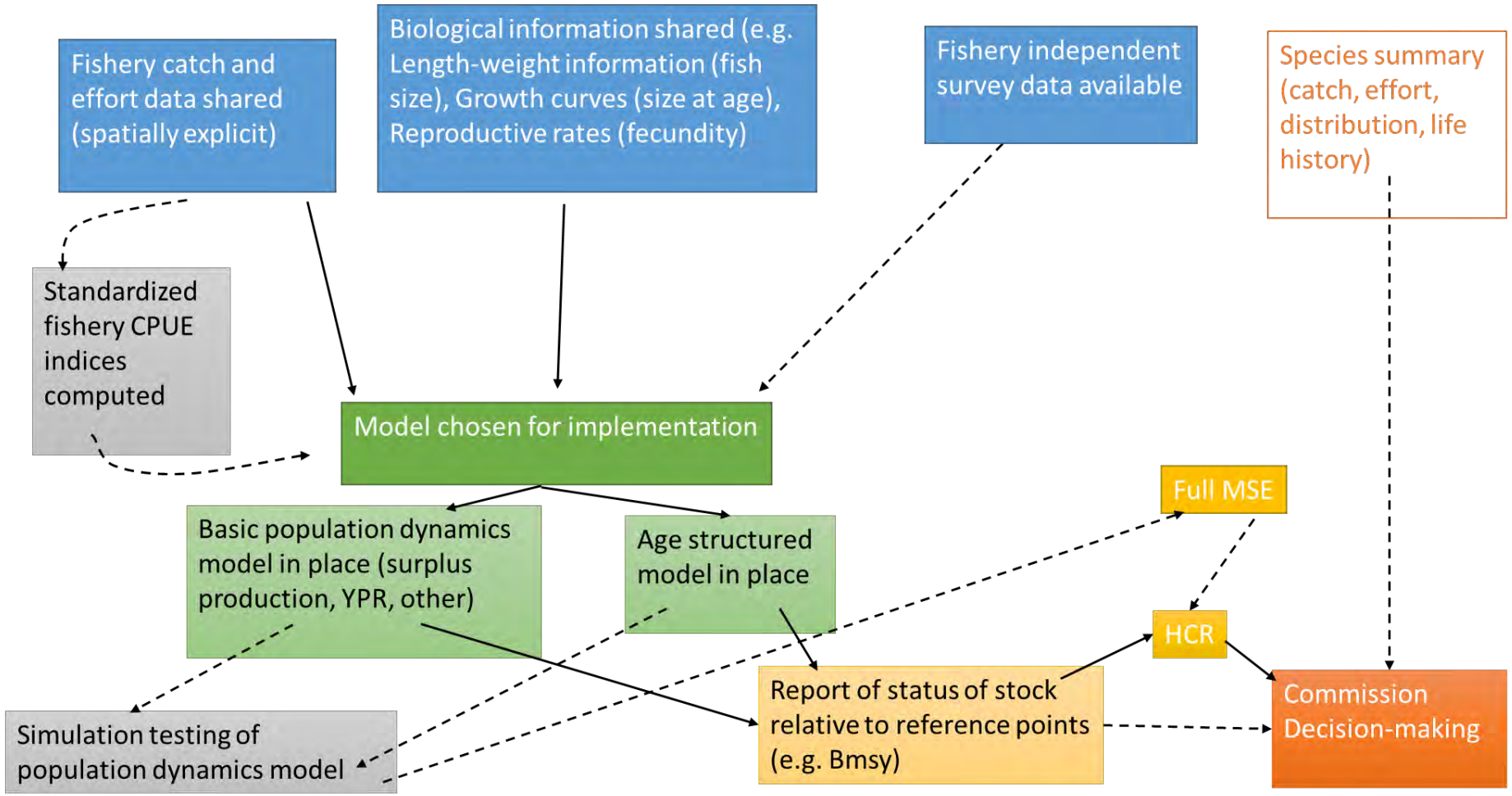
2007	520207	782.0	36.9		4.19	8.12	2.231	2.35	1.09	0.17
2008	617509	989.6	26.5		5.15	16.56	2.083	2.90	1.96	0.19
2009	472177	367.4	20.0		4.18	9.60	1.175	1.57	1.03	0.17
2010	429808	554.9	26.4		1.80	9.75	1.224	1.94	1.13	0.17
2011	456263	756.4	35.3		2.52	11.32	1.467	2.51	1.36	0.20
2012	460544	346.4	21.1		2.72	9.19	1.442	2.47	1.08	0.17
2013	423790	758.8	26.6	14.02	1.89	13.61	1.407	2.80	1.00	0.16
2014	629576	448.7	21.7	12.77	3.31	20.42	1.479	3.62	1.31	0.14
2015	358883	337.2	21.4	23.10	1.69	7.41	0.652	2.42	0.96	0.18
2016	361688	358.1	24.4	6.57	1.81	10.76	1.208	2.43	0.80	0.15
2017	262640	145.7	27.3	5.97	1.12	5.40	0.525	1.82	0.75	0.16
2018	435881	378.9	28.7	16.05	1.96	11.89	1.577	3.07	1.33	0.17
2019	195251	247.5	23.4	6.40	0.70	2.75	0.558	1.41	0.56	0.16
2020	139779	12.1	115.7	4.80	0.48	2.85	0.497	1.23	0.32	0.18
2021	92117	161.2	27.0	6.21	0.33	2.83	0.141	0.79	0.22	0.18
2022	100085	290.6	20.4	4.24	0.27	1.62		0.71	0.20	0.16
2023		323.7	26.3							

Annex V

Summary of the current assessment status for NPFC priority species and sablefish, skilfish, and rougheye and blackspotted rockfishes

	Activity or milestone	Pacific saury	Chub mackerel	Japanese sardine	Japanese flying squid (winter)	Neon flying squid	Blue mackerel	North Pacific Armorhead	Splendid alfonsino		Sablefish	REBS rockfish	Skilfish
	Species summary completed (catch, effort, distribution, life history)	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	**SC09**
Catch data	Fishery catch and effort data shared (spatially explicit)	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	N
	Standardized fishery CPUE indices computed	Y	Y	N	N	N	N	N	N		--	N	N
Abundance data	Fishery independent survey data available	Y	--	--	--	--	Y	--	--		Y	--	--
Biology data	Biological information shared (NPFC CA)	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	N
Modeling	Model (or models) chosen for implementation	Y	Y	N	N	N	N	N	N		Y	N	N
	Basic population dynamics model in place (surplus production, YPR, other)	Y	--	--	Y	Y	--	**SC09?**	**SC09**		--		
	Age structured model in place	**SC09**	**SC09**	Y	--	--	Y	--			Y		
	Simulation testing of population dynamics model	Y	Y	N	N	N					Y		
	MSE	**SWGMSE 05**		N	N	N	N				Y		
Rules and advice	HCR	**SWGMSE 05**		Could link HCR to Japanese assessment?	Could link HCR to Japanese assessment?	Could link HCR to Chinese assessment?	Could link HCR to Japanese assessment?				**SC09 - linked to Canadian assessment**		
	Advice integrated into Commission Decision-making	**COM08**											
Comment				Japanese domestic assessment includes NPFC data	Japanese domestic assessment includes NPFC data	Chinese domestic assessment includes only NPFC data	Japanese domestic assessment includes NPFC data				Domestic assessments in place		

Generic process for management advice in the NPFC



Annex W

Table of tasks for the SWG JFS, the SWG JS, the SWG BM, and the SSC NFS in 2024

Tasks	SSC NFS	SWG JFS	SWG JS	SWG BM
Update species summary	X	X	X	X
(a) Share data, including unpublished data if possible	X	X	X	X
Update catch and effort data	X	X	X	X
(a) Discuss potential data sharing needs	X	X	X	X
(b) Data standardization - CPUE and abundance data	X			
Distinguish between CM and BM				
(a) Continue to collect data and undertake analyses on catch composition of BM and chub mackerel				X
(b) Review historical catch and estimate the proportion of BM and chub mackerel, if possible				X
(c) Continue to explore options for distinguishing BM and chub mackerel catch				X
(d) Review the feasibility of calculating the proportion of BM and chub mackerel catch by gear				X
(e) Explore similarity and dissimilarity in populations and fishery dynamics				X
(f) Collect data on size and/or age composition of BM and chub mackerel, if possible				X
Footprint and effort data				
(a) Discuss the possibility of linking footprint and effort data on NFS using GIS tools				
(b) Evaluate the influence of environmental variables on the life history, biology, and population dynamics	X	X	X	X
Stock Assessment				
(a) Calculate nominal CPUE	X			
(b) Explore the application of existing stock assessment models or develop new stock assessment models for NFS	X			
(c) Conduct other research that may contribute to the provision of management advice	X			
(d) Share code for developing a stock assessment model for NFS	X			

(e) Observe domestic stock assessments by Members	X	X	X	X
Other				
(a) Write terms of reference (TOR)	X			
(b) Draft a rolling 5 year work plan	X			

Annex X

Revised Regulations for Management of Scientific Data and Information

Regulations for Management of Scientific Data and Information

(revised in December 2023)

These Regulations are intended to govern the security of, exchange of, access to and dissemination of scientific data and computer code (referred to as code hereafter) held by, or accessed by Members of the Commission, its subsidiary bodies, the Secretariat, and by service providers, contractors, or consultants acting on their behalf or others so authorized for access by the Secretariat. These Regulations supplement the NPFC Data Sharing and Data Security Protocol which is an overall Commission's policy for data management and security.

I. Guidance for Management of Scientific Data and Code

1. Objectives

The objectives of this Guidance are (1) to support stock assessments, ecosystem assessments and accumulation of scientific knowledge of fisheries resources under the Commission's jurisdiction, (2) to encourage cooperation on scientific analyses among Members, and (3) to establish a guidance on handling scientific data and code.

2. Scientific Data included in Members' Annual Reports

Scientific data (e.g., catch amount, number of vessels, number of fishing days and so on) included in Members' Annual Reports should be uploaded to the public section of the NPFC website for public access and use. In order not to reveal the individual activities of any vessel, catch and effort data in the public domain shall be made up of observations from a minimum of three vessels, unless the owner of the data decides otherwise.

3. Other scientific data and code, not included in Members' Annual Reports, submitted for use in stock assessments and ecosystem assessments

The Secretariat should not disclose Members' scientific data or code submitted by means other than Members' Annual Reports or meeting documents open for the public in accordance with paragraph 4.

Members may cite and/or use such data or code when working on matters under consideration by the Scientific Committee and its subsidiary bodies, including informal working groups.

If a Member or cooperating non-contracting Party (CNCP) wishes to cite and/or use these data or code for work that is intended to be conducted or shared outside of the NPFC, such Member or CNCP should consult with the provider(s) of the data or code through the Secretariat, stating 1) the data or code subject to the request, and 2) the purpose for which the data or code is intended

to be used. The Secretariat should immediately notify the provider(s) of the request. The provider(s) should inform the Secretariat within 30 calendar days whether to accept or reject the request. If the provider(s) reject the request, the provider(s) should state the reason(s) for the rejection. If the provider(s) accept the request, the provider(s) may request an agreed-upon credit line in any subsequently-created product. Those who cited/used data or code should not distribute the data or code further nor use it for the purpose not declared.

II. Regulations for management of scientific meeting documents, meeting reports and intersessional communications on the NPFC website

4. Working Papers, Meeting Info Papers, Information Papers, Reference Documents/Papers, Observer Papers

To enhance and encourage collaborations with researchers, scientists, RFMOs, and science organizations, and to encourage transparency of the NPFC processes, the SC recommends making the above named documents available to the public through the NPFC website. The default rule would be that all the above named documents would be released to the public 45 days (inclusive of weekends and holidays) following the closure of the meeting to which they were submitted. All meeting papers submitted to any NPFC scientific meetings through the Secretariat should indicate how they should be cited in accordance with the NPFC Document Rules. If the document author(s) or submitting Member do not authorize the release of the document, they must indicate that clearly on the cover page or first page of the document, OR they may request to the Secretariat in writing of their desire to not release the document during the 44 days prior to document publication on the website.

5. SC Meeting Reports, SC Subsidiary Body Reports (SSC, TWG) and Other Scientific Reports (Workshop)

5.1. The SC recommends that the above named documents be released to the public after acceptance by the Commission Members within 45 days in accordance with the procedures stated in Paragraph 8.2 of Rules of Procedure.

5.2. For SC subsidiary body reports: If there are portions of the report which are deemed by the subsidiary body to be too sensitive to release prior to the SC report, the specific sensitive portions may be redacted, and the report released as described in #5.1 above. Following the SC meeting, the entire report (inclusive of redacted portions) will be released in conjunction with the SC report. If the report as a whole is deemed too sensitive to release, the report may be held and released to the public in conjunction with the SC Meeting Report. Decisions about which portion or whether the whole report is to be redacted shall be made during the subsidiary body meeting.

6. Intersessional Communication using the NPFC Collaboration website

The NPFC has made available a web-based tool to facilitate discussion of its subsidiary bodies, informal working groups, discussion groups, and other temporary groups on a project-by-project basis. Access to this tool is restricted to members of a specific project/topic. Following the completion of the discussion, the group facilitator/chair may summarize the discussions to make them available and accessible to the appropriate Commission body (TCC, SC, SWG MSE PS, Commission). At the conclusion of the discussions of the group and after summary is complete, the discussion text and documents will be archived by the Secretariat but not maintained on the website except for a summary made by the group facilitator/chair.

7. Redaction or withdrawal of Working Papers, Meeting Info Papers, Information Papers, Reference Documents/Papers, Observer Papers which were submitted to workshop or meeting

Documents of the types listed above may not be redacted or withdrawn from the public or Member-only area of the website by a Member or the Secretariat once it has been published unless notification is provided to all Members which details the reason for the withdrawal request. If an error is identified in a publicly available document, the member responsible for the document submission can submit a cover letter or document text which describes the error and the resolution to be prepended to the original document. Errors identified in documents prior to publication on the public website or during meetings or workshops can be revised or documents withdrawn before or during the meeting, but other members or meeting participants must be notified of the specifics of the changes as soon as possible.

Annex Y

Scientific projects

#	Project	Time	Status	Next step: activities, required funds
1	Pacific saury stock assessment meeting (meeting costs)	Every year	*TWG PSSA meetings: Feb 2017, Dec 2017, Nov 2018, Mar 2019.* *SSC PS meetings: Nov 2019, Aug 2023.*	SSC PS13 meeting. Aug 2024. *2024 FY: virtual, no funds required.*
2	Chub mackerel stock assessment meeting (meeting costs)	Every year	*TWG CMSA meetings: Dec 2017, Mar 2019, Sep 2023.*	TWG CMSA09 meeting. Jul 2024. *2024 FY: 1.5mil JPY (10,000USD)* *Source: SC fund.* TWG CMSA10. Early 2025. *2024 FY: virtual or hosted by members, no funds required.*
3	Invited expert to support TWG CMSA (consultancy fee and travel costs)	2020-	An external expert has been contracted for TWG CMSA08 and 09 meetings using the voluntary contribution from the USA. The proposed project covers TWG CMSA10 and 11.	*2024 FY: 2,25mil JPY (15,000USD)* *Source: SC fund.*
4	Invited expert to support SSC PS (consultancy fee and travel costs)	2019-	An external expert has been contracted to support SSC PS and its subsidiary WG NSAM.	*2024 FY: 3mil JPY (20,000USD)* *Source: SC fund.*
5	Invited expert to support SSC NFS (consultancy fee and travel costs)	2024-	An external expert will be contracted to support SSC NFS.	*2024 FY: 2.25mil JPY (15,000USD)* *Source: SC fund.*

6	PICES Annual meeting	Every year	Travel support to a participant of the SC or its subsidiary bodies to attend PICES Annual meeting.	*2024 FY: 1mil JPY (7,000USD)* *Source: SC fund.*
7	Other science meetings / capacity development	2024	Training for capacity building or travel support to attend other relevant science meetings.	*2024 FY: 1.5mil JPY (10,000USD)* *Source: SC fund.*
	Total			*2024 FY: 11.5mil JPY* *Source: SC fund.*

** The recurrent projects should be funded annually from the SC Fund allocated by the Commission. If total costs exceed the SC Fund, the SC may propose to use the Special Project Fund subject to the decision by the Commission.*

Past projects

#	Project	Time	Status
P1	NPFC/FAO VME workshop	2018-2019	*Concluded.*
P2	Workshop to address data requirements and data sharing for SAI assessment and other tasks identified in the Work Plan by SSC VME and SSC BF	2018	*Concluded.*
P3	Workshop on biological reference points (BRP), harvest control rule (HCR) and management strategy evaluation (MSE)	2019	*Concluded.*
P4	Literature review of target and limit reference points used in pelagic species fisheries by other general RFMOs and other fishery management bodies	2018	*Done.* *Available on the NPFC website.*

P5	Joint PICES-NPFC workshop (W11) on *The influence of environmental changes on the potential for species distributional shifts and subsequent consequences for estimating abundance of Pacific saury*	2019	*Concluded.*
P6	VME taxa identification guide	2017-2022	*Concluded.* VME taxa ID guide has been printed out and distributed to Members.
P7	International Course for NPFC observers for VME indicator taxa identification (consultant fees and travel costs for two lecturers, meeting costs)	2022	*Postponed until further notice.*
P8	PICES-ICES-FAO Small Pelagic Fish Symposium, 7-11 November 2022, Lisbon, Portugal.	2022	*Concluded.* NPFC contributed 15,000USD to the organizers for the symposium logistics.
P9	GIS database/module as a part of NPFC database management system for spatial management of bottom fisheries and VMEs	2018-	*Regular update.* *Fund source: Database management.*
P10	Joint spatial/temporal map of Members' catch and effort on Pacific saury with a spatial resolution of one-degree grids and a temporal resolution of one month.	2018-	*Regular update.* *Fund source: Database management.*
P11	Expert to review Pacific saury stock assessment (consultant fee and travel costs)	TBD	*Removed. May be revisited in future.*
P12	Observer Program	2018-	*Removed. May be revisited in future.*
P13	Promotion of cooperation with NPAFC including macro-scale multinational survey in the North Pacific in 2022	2021-	*Completed.* The NPAFC reported on the 2022 IYS Winter High Seas Research Expedition which was co-sponsored by NPFC.

P14	Standardization of bycatch species list and fish species identification guides (translation of the existing fish ID guide from Japanese to additional languages)	2019-2023	*Completed.*
P15	PICES 2023 session on Seamount Ecology and VME Identification	2023	*Completed.*
P16	Understanding the basis by which other RFMOs' VME encounter thresholds were determined by taxa and gear-type	2023	*Completed.*

Annex Z

Five-Year Research Plan and Work Plan of the Scientific Committee

North Pacific Fisheries Commission
Scientific Committee
2023-2027 Research Plan

1.0 BACKGROUND

Article 10, Section 4(a) of the *Convention on the Conservation and Management of High Seas Fisheries Resources in the North Pacific Ocean* states that the Scientific Committee (SC) will "recommend to the Commission a research plan including specific issues and items to be addressed by the scientific experts or by other organizations or individuals, as appropriate, and identify data needs and coordinate activities that meet those needs."

An initial draft of this research and accompanying work plan was presented for review during the 4th Preparatory Conference and a subsequent discussion was held by a small working group to establish science priorities for the NPFC. This plan draws on those discussions and was updated by the SC Chair based on the progress made by the NPFC since that Conference.

The development of multi-year science research or work plans is common across regional fisheries management organizations as well as domestic fisheries science agencies. This draft plan draws on such examples, and has been developed for consideration by the SC before it may be adopted by the Commission.

2.0 OBJECTIVES

The research plan is intended to guide the work of the Scientific Committee by identifying key research priorities and associated areas of work to be undertaken or maintained. The plan should also serve to: ensure efficient utilization of scarce resources within the Commission; inform Parties' domestic research planning as a means of complementing the Commission's science activities; and help the Commission identify potential sources of external funding.

It is not intended as an exhaustive plan describing all research activities that may be carried out by Parties, nor is it intended to preclude work already taking place. The plan should support the Commission's primary objective (*Article 2* in the Convention), which 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". The plan should also help the Scientific Committee fulfill its functions as specified in the Convention.

3.0 PRIORITY RESEARCH AREAS

In addition to discussions held during the Preparatory Conference (referenced above) followed by the Commission and Scientific Committee after their establishment, the identification of priority research areas draws largely from the Commission's Convention, which outlines specific functions for the Scientific Committee in *Article 10, Section 4*. These priority research areas are subject to the approval of the Commission, and may be revisited and/or revised as deemed appropriate by the Commission. Proposed rolling five-year work plans for each priority area are available in the attached (Annex 1).

The proposed priority research areas are:
1. Stock assessments for target fisheries and bycatch species
2. Ecosystem approach to fisheries management
3. Data collection, management and security

At its 7th meeting, the Commission adopted a resolution on climate change and tasked the SC to identify relevant data availability and needs and integrate analyses of climate change relevant to NPFC fisheries into its work plan. The resolution also requires SC to include climate change as a standing agenda item of its meetings.

3.1 Stock Assessments

Rationale

Accurate stock assessments are critical in helping to ensure the long-term conservation and sustainable use of fisheries resources in the Convention Area. One of the primary functions of the Commission is setting total allowable catch or total allowable level of fishing effort, and as per *Article 7-1(b)*, this is to be in "accordance with the advice and recommendations of the Scientific Committee".

Consistent with this, *Article 10-4(b)* states that one of the functions of the Scientific Committee is to "regularly plan, conduct and review the scientific assessments of the status of fisheries resources in the Convention Area, identify actions required for their conservation and management, and provide advice and recommendations to the Commission".

Finally, *Article 10-4(i)* states that the Scientific Committee shall also "develop rules and standards,

for adoption by the Commission, for the collection, verification, reporting, and the security of, exchange of, access to and dissemination of data on fisheries resources, species belonging to the same ecosystem, or dependent upon or associated with the target stocks and fishing activities in the Convention Area".

The Scientific Committee should endeavor to understand the current status and trends in production of populations of priority species as agreed by the 2nd Commission meeting in 2016, as well as factors that may affect future trends.

Areas of work

• Development of baseline assessment of the status of priority stocks
• Review of existing data standards in relation to stock assessments (e.g. Annual Report template, NPFC's vessel monitoring system)
• Stock delineation of important commercial species for the purpose of providing advice for the determination of management units
• For each commercial species, determination of data requirement, including data availability and data gaps; identification, where possible, of strategies to fill the data gaps, including for bycatch
• Development of a standardized method to provide advice to the Commission
• Development of assessment models by species and research as required to determine various assessment parameters

3.1.1. Pelagic fish stock assessment

Rationale

Pelagic fish and squids are primary fisheries resources for NPFC Members. They comprised more than 99% of total catch of species covered by the Convention. Many of them are migratory species with wide geographical distributions which include both EEZs of the North Pacific Rim countries and High Seas. Management of such stocks requires close cooperation among Members concerned to ensure sustainable use and conservation of fisheries resources.

Four fish species and two squid species were recognized by the Scientific Committee as priority species: Pacific saury *Cololabis saira*, Chub mackerel *Scomber japonicus*, Blue mackerel *Scomber australasicus*, Japanese sardine *Sardinops melanostictus*, Neon flying squid *Ommastrephes bartramii*, Japanese flying squid *Todarodes pacificus*.

Areas of work

• Completion of stock assessment for Pacific saury and development of the framework and timeline for its regular improvement and update
• Conducting stock assessment for Chub mackerel and other priority species considering their top-down prioritization (Spotted mackerel - Japanese sardine - Neon flying squid – Japanese flying squid) and available funds and capacity
• Identification of data gaps, determination of activities to address those gaps and development of standards and mechanisms for data collection and verification

• Develop a management strategy evaluation (MSE) for Pacific saury in collaboration with NPFC's Commission, Small Working Group on Management Strategy Evaluation for Pacific Saury (SWG MSE PS), Technical and Compliance Committee (TCC), fishery managers, fishers, stakeholders, and observers.

3.1.2. Bottom fish stock assessment

Rationale

Data used for traditional stock assessment are sparse for bottom fish, and it is unlikely that traditional methods will be applicable for most deepwater species in the Convention Area. In addition, some bottom species have unique life cycles, sporadic recruitment patterns and irregular spawning-recruitment relationships that also makes difficult accurate stock assessment. All these require specific approaches for management and sustainable use of bottom fisheries resources. More than ten bottom species have been exploited by fisheries in the Convention Area during the last two decades. Two fish are recognized as priority species: North Pacific armorhead (NPA) *Pentaceros wheeleri* and splendid alfonsino (SA) *Beryx splendens*.

Areas of work

• Review of approaches applicable for stock assessment of target bottom species and investigate various management strategies
• Further development of the Adaptive Management approach for NPA and mechanism for its implementation
• Identification of data needs and establishment of activities to fill data gaps

3.2 Ecosystem Approach to Fisheries Management

Rationale

Article 3 (c) in the Convention states that: “In giving effect to the objective of this Convention, the following actions shall be taken individually or collectively as appropriate: (c) adopting and implementing measures in accordance with the precautionary approach and an ecosystem approach to fisheries, and in accordance with the relevant rules of international law, in particular as reflected in the 1982 Convention, the 1995 Agreement and other relevant international instruments”.

Article 7-1 (c,d) in the Convention states that the Commission shall: “adopt, where necessary, conservation and management measures for species belonging to the same ecosystem or dependent upon or associated with the target stocks”; and, “adopt, where necessary, management strategies for any fisheries resources and for species belonging to the same ecosystem or dependent upon or associated with the target stocks, as may be necessary to achieve the objective of this Convention.”

Article 10-4 (d) states that the Scientific Committee shall “assess the impacts of fishing activities on fisheries resources and species belonging to the same ecosystem or dependent upon or associated with the target stocks.”

Areas of work

• Formulation of a work plan on how to implement the ecosystem approach to fisheries management in the Convention Area
• Vulnerable Marine Ecosystems
• Understand ecological interactions among species
• Ecosystem modelling
• Evaluate impacts of fishing on fisheries resources and their ecosystem components, including bycatch species
• Other issues related to marine ecosystems including marine debris and pollution

3.2.1 Vulnerable Marine Ecosystems

Rationale

The identification of vulnerable marine ecosystems is a necessary precursor to implementing measures to protect these ecosystems, and such measures that are explicitly called for in the

Convention (e.g. *Article 7-1(e)*).

Article 10-4 (e) states that the Scientific Committee shall "develop a process to identify vulnerable marine ecosystems, including relevant criteria for doing so, and identify, based on the best scientific information available, areas or features where these ecosystems are known to occur, or are likely to occur, and the location of bottom fisheries in relation to these areas or features, taking due account of the need to protect confidential information."

Article 7-1 (e) states that the Commission shall "adopt conservation and management measures to prevent significant adverse impacts on vulnerable marine ecosystems in the Convention Area, including but not limited to: measures for conducting and reviewing impact assessments to determine if fishing activities would produce such impacts on such ecosystems in a given area; measures to address unexpected encounters with vulnerable marine ecosystems in the course of normal bottom fishing activities; and as appropriate, measures that specify locations in which fishing activities shall not occur."

To date, Japan, Russia, Korea, the US and Canada have completed a report on identification of VMEs and an assessment of impacts caused by bottom fishing activities on VMEs and marine species. The Scientific Committee may build on these reports, which will be kept up to date by respective Parties.

Areas of work

• Review existing NPFC standards on VME data collection, including guidelines set forth in the CMMs for bottom fisheries and protection of vulnerable marine ecosystems in the northwestern and northeastern Pacific Ocean (CMM 2023-05 and CMM 2023-06), and determine if any modifications to these standards are needed in the short-term and/or longer term
• Review of Encounter Protocol for bottom fisheries on Vulnerable Marine Ecosystems
• Determination of data requirements and identification of what data may be collected through commercial fishing operations
• Develop consensus on criteria used to identify VMEs and how this might be applied in the NPFC (note that guidelines from the FAO are already referenced in Annex 2 of the CMM 2023-05 and CMM 2023-06)
• Analysis of known or suspected VMEs in the Convention Area
• Visual surveys of VMEs for data collection
• Development of a framework to conduct assessments of Impacts of Bottom Fishing Activities on

Vulnerable Marine Ecosystems

3.2.1.1 Review of Encounter Protocol for bottom fisheries on Vulnerable Marine Ecosystems

Rationale

The purposes of VME encounter protocols in NPFC Convention Area include:
• Ensuring early detection and protection of potential VMEs within an existing fishing area;
• Ensuring early detection and protection of potential VME within an unfished area;
• Documenting information on known occurrences of VME indicators within the Convention Area.

Development of the Encounter Protocol progressed through Scientific Committee meetings as well as intersessional activities. VME encounter protocols are incorporated in the CMMs for bottom fisheries and protection of vulnerable marine ecosystems in the northwestern and northeastern Pacific Ocean, specifically in Para 4(g) and 3(j), respectively.

Areas of Work

Consideration of the following subjects of research and analyses are recommended to further refine encounter protocols in the Convention Area (as notified in Appendix C, NPFC01-2016-SSCVME01- Final Report):

• Other taxa, topographical, geographical and geological features that may indicate the presence of VMEs;
• Taxon-specific encounter thresholds and reporting;
• Framework for evaluating the effectiveness of encounter protocols;
• Tiered approach with different encounter protocols associated with different thresholds;
• Gear-specific thresholds to reflect differences in catchability;
• Gear-specific move-on distances to reflect type of gear;
• Different reporting requirements for different catches;
• Tiered approach to reporting bycatch of VME indicator taxa;
• Different encounter protocols for existing and new fishing areas

3.3 Data collection, management and security

Rationale

Article 10, paragraph 4 (i) in the Convention states that the functions of the Scientific Committee shall be to: "develop rules and standards, for adoption by the Commission, for the collection, verification, reporting, and the security of, exchange of, access to and dissemination of data on fisheries resources, species belonging to the same ecosystem, or dependent upon or associated with the target stocks and fishing activities in the Convention Area".

Areas of work

• Review of data standards related to stock assessments and other relevant data, including VME data collection and vessel monitoring systems
• Identify data sources to meet data needs for priority areas of work above and develop programs for data collection
• Develop data security policy including data handling and sharing protocol, information confidentiality classification and access control security guideline

4.0 IMPLEMENTATION AND REVIEW

The SC will review the Research Plan and update it as necessary on an annual basis. The Research Plan will form the foundation of SC's rolling five-year Work Plan. Monitoring the implementation of this Research Plan will be the responsibility of the Chair of the Scientific Committee in collaboration with the Chairs of the Scientific Committees' subsidiary groups and the Executive Secretary. Members of the Commission and the Secretariat will share responsibility for implementation of the Research Plan.

Full implementation of the Research Plan will likely be beyond the means of the Commission's core budget. Extra-budgetary funds from voluntary contributions of Members and other sources will be required and actively sought by the Commission. Nevertheless, adoption of the Plan by the Scientific Committee and subsequent strong support from the Commission is a prerequisite to securing the necessary extra-budgetary funds.

An independent external review of the Plan may periodically be requested by the SC. The Scientific Committee will be responsible for preparing the terms of reference for the review. The Scientific Committee will present the report of the review to the next regular session of the Commission.

5.0 SCIENTIFIC COLLABORATION WITH OTHER ORGANIZATIONS

While not included as a priority, *Article 21* of the Convention addresses cooperation with other organizations or arrangements. It calls on the Commission to cooperate, as appropriate, on matters

of mutual interest with the Food and Agriculture Organization (FAO), other specialized agencies of the FAO and relevant Regional Fisheries Management Organizations (RFMOs). Further, the Commission is called on to develop cooperative working relationships, including potential agreements, with intergovernmental organizations that can contribute to its work.

Article 10 also speaks to this issue in clauses five and six, stating that the Scientific Committee may exchange information on matters of mutual interest with other relevant scientific organizations or arrangements, and that the Committee shall not duplicate the activities of other scientific organizations and arrangements that cover the Convention Area.

The impetus to collaborate is made stronger by the prospect of limited research funding in the Commission, at least in the short-term, but it is also in the best interests of the Commission to seek synergies with other organizations with mutual interests and similar membership (e.g. North Pacific Marine Science Organization (PICES) and North Pacific Anadromous Fish Commission (NPAFC)).

Activities could include:

• Evaluate reports of International Organizations that may be relevant to the functioning of the Scientific Committee
• Identify other organizations with relevant mandates and activities
• Formalize relationships with these organizations (e.g. MOUs, standing invitations to meetings)
• Identify potential funding opportunities

Five-Year Work Plan of the Scientific Committee and its subsidiary bodies

Small Scientific Committee on Pacific Saury (SSC PS)

Priority list:

1. Conduct a stock assessment update based on BSSPM analyses
2. Further investigate improvements to the BSSPM
3. Develop an age/size-structured model
4. Develop a list of plausible ranges for biological parameters
5. Develop databases to support age/size-structured models
6. Continue joint CPUE work to incorporate broader spatial and temporal coverage
7. Update the biomass estimate using the existing method (swept area method)
8. Develop spatio-temporal model for the biomass estimate
9. Further refine the catchability coefficient of the Japanese survey and characterize its variance
10. Continue exploring climate indices to explain impacts on Pacific saury stock productivity
11. Support any technical work on MSE under SWG MSE PS
12. Further evaluate the reason and the basis for the perception that total bycatch in all NPFC fisheries is low

[H] and [M] indicate high and medium priorities. Cells with "TBD" depend on the progress of data preparation and analytical works.

ITEM	2023	2024	2025	2026	2027
Regular update of inputs					
Update & improvement of biomass survey index	Continue regular review [H] of 1) survey plan 2) analytical work 3) any related issues including experiments to produce absolute biomass index and additional surveys by other Members to increase coverage	Same as on the left [H]	Same as on the left [H]	Same as on the left [H]	Same as on the left [H]
Update & improvement of CPUE indices	Continue review of outcomes of regular update and analytical works [H]	Same as on the left [H]	Same as on the left [H]	Same as on the left [H]	Same as on the left [H]
Development of joint CPUE index	Continue review of outcomes of regular update and analytical works [H]	Same as on the left [H]	Same as on the left [H]	Same as on the left [H]	Same as on the left [H]
Regular update of the existing SA					
Routine update BSSPM as a benchmark	Continue review of outcomes of regular BSSPM update [H] [1)]	Same as on the left [H] [1)]	Same as on the left [H] [1)]	Same as on the left [H][1)]	Same as on the left [H][1)]
Improvement and further investigation of BSSPM	Review any outcomes of improvements, inter alia in light of possible incorporation of environmental information [H]	Same as on the left [H]	Same as on the left [H]	Same as on the left [H]	Same as on the left [H]
Toward age/size-structured models (ASSMs)					

ITEM	2023	2024	2025	2026	2027
Data inventory (CPUE and size/age in space and time)		Explore age-specific abundance indices or recruitment indices. Conditional age at length information. Spatio-temporal variation of size composition.	TBD[2)]	TBD[2)]	TBD[2)]
Summarizing available information on PS biology		Update regularly, specifically maturity ogive and growth function	Continue	Continue	Continue
Development of models		Review preliminary models to be evaluated	Finalize development of a new stock assessment model	Test the age-structured model capabilities for Bayesian estimation, simulation testing and MSE work	External review
Uncertainty in models (possible link with OM grid under MSE)		Refine the plausible range of values of key biological parameters. Refine assumptions about prior distributions and the ranges for model parameters.	Continue	Continue	Continue

[1)] As a backup method as well as an underlying assessment method used in a management procedure, it seems sensible to keep this as one of reference assessment models.

[2)] These items might be re-structured depending on the progress of preparation of data and biological information as well as the development of models.

Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA)

Priority list:

1. Data preparation and review of biological information
2. Conduct stock assessment of chub mackerel
3. Set biological reference points
4. Provide scientific advice on the management of chub mackerel stock to the Commission
5. Explore the influence of climate changes on chub mackerel stock
6. Regularly update and refine inputs

ITEM	2023 Sep	2024 Jan	2024 summer	2025	2026	2027
Regular update of inputs						
Research survey indices	Finalize data used for the stock assessment	Finalize data used for the stock assessment		Update	Update	Update
CPUE indices	Finalized CPUE standardization	Finalized CPUE standardization		Update	Update	Update
Catch data/catch composition	• Finalize data used for the stock assessment • Submit historical annual CAA data	• Finalize data used for the stock assessment • Submit historical annual CAA data		Update	Update	Update
Biological parameters (maturity, M, weight)	Finalize assumptions for the stock assessment	Finalize assumptions for the stock assessment		Review biological parameters	Review biological parameters	Review biological parameters
Quarterly fishery data (CAA, WAA, Maturity-at-age)	• Submit quarterly fishery data • Share and standardize age-counting rule	• Submit quarterly fishery data • Share and standardize age-counting rule				
Stock assessment						

ITEM	2023 Sep	2024 Jan	2024 summer	2025	2026	2027
Benchmark stock assessment	• Determine the method for future projection • Conduct preliminary stock assessment with the selected model (intersessionally after TWG CMSA07)	• Determine the method for future projection • Conduct preliminary stock assessment with the selected model with determined specification and setting (intersessionally after TWG CMSA08)	Complete stock assessment with the selected SA model	Update SA model	Update SA model	Update SA model
Improvement and further investigation of the selected model			Review and improve, if needed, the SA model	Review and improve, if needed, the SA model	Review and improve, if needed, the SA model	Review and improve, if needed, the SA model
New stock assessment models				Explore new stock assessment models, if available	Explore new stock assessment models, if available	Explore new stock assessment models, if available
Reference points, HCR and future projections						
Set biological reference points (limit and target)	• Review RPs report • Develop a short list of reference points	Review reference points	Review reference points	Review reference points	Review reference points	Review reference points
Develop future projections		Discuss provisional scenarios of future projection	Provide preliminary results of future projection, if possible	TBD	TBD	TBD

Small Scientific Committee on Bottom Fish and Marine Ecosystems (SSC BF-ME)

Priority list:

1. NPA: Review monitoring survey
2. NPA: Conduct stock assessment and provide management advice
3. SA: Conduct stock assessment and provide management advice
4. NPA, SA and Sablefish: Develop and implement harvest control rule
5. Sablefish: Evaluate historical harvest relative to trip limits and update trip limits if necessary
6. Sablefish and VME: Conduct trade-off analysis between commercial fishing and VME protection
7. VME: Assess the relative risk of SAI for VME as a step towards standardize approach to SAI

ITEM	SSC BFME05 (2023)	SSC BFME06 (2024)	SSC BFME07 (2025)	SSC BFME08 (2026)	SSC BFME09 (2027)
North Pacific Armorhead					
Assess and monitor status of stock	Update catch data and CPUE index for NPA	Update catch data for NPA	Update catch data for NPA	Update catch data for NPA	Update catch data for NPA
	Review results of NPA monitoring surveys	Review results of NPA monitoring surveys	Review results of NPA monitoring surveys	Review results of NPA monitoring surveys	Review results of NPA monitoring surveys
	Implement alternative methods for stock status	Implement alternative methods for stock status	Implement alternative methods for stock status	Implement alternative methods for stock status	Update status of stock
	Compare CPUE and acoustic estimates	Evaluate trend in directed effort relative to NPA catch		Compare CPUE and acoustic estimates	

ITEM	SSC BFME05 (2023)	SSC BFME06 (2024)	SSC BFME07 (2025)	SSC BFME08 (2026)	SSC BFME09 (2027)
	Identify and conduct additional research on NPA	Identify and conduct additional research on NPA	Identify and conduct additional research on NPA	Identify and conduct additional research on NPA	Identify and conduct additional research on NPA
	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice
Conserve stock	Develop conservation objective(s)	Develop conservation objective(s)			
	Implement adaptive management	Implement adaptive management			
	Develop HCR and implement	Develop HCR and implement	Update data and implement HCR	Update data and implement HCR	
Splendid alfonsino					
Assess and monitor status of stock	Update catch data and CPUE index for SA	Update catch data and CPUE index for SA	Update catch data and CPUE index for SA	Update catch data and CPUE index for SA	Update catch data and CPUE index for SA
	Update comprehensive stock assessment or data limited approach,	Implement life history based approach, and provide management advice	Update life history based approach, and provide management advice	Update life history based approach, and provide management advice	Update life history based approach, and provide management advice

ITEM	SSC BFME05 (2023)	SSC BFME06 (2024)	SSC BFME07 (2025)	SSC BFME08 (2026)	SSC BFME09 (2027)
	and provide management advice				
	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice
Conserve stock	Develop conservation objective(s); Define and implement harvest control rule	Develop conservation objective(s); Define and implement harvest control rule	Update data and implement HCR	Update data and implement HCR	Update data and implement HCR
Sablefish					
Assess and monitor status of stock	Update catch data and CPUE index	Update catch data and CPUE index	Update catch data and CPUE index	Update catch data and CPUE index	Update catch data and CPUE index
	Provide an update on USA-Canada stock assessment models for Sablefish and joint research on Sablefish	Provide an update on USA-Canada stock assessment models for Sablefish and joint research on Sablefish	Provide an update on USA-Canada stock assessment models for Sablefish and joint research on Sablefish	Provide an update on USA-Canada stock assessment models for Sablefish and joint research on Sablefish	Provide an update on USA-Canada stock assessment models for Sablefish and joint research on Sablefish

ITEM	SSC BFME05 (2023)	SSC BFME06 (2024)	SSC BFME07 (2025)	SSC BFME08 (2026)	SSC BFME09 (2027)
	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice
Conserve stock	Update data and implement HCR	Design HCR specific to NPFC Sablefish (joint intersessional work with Canada and USA assessment authors	Update data and implement HCR	Update data and implement HCR	Update data and implement HCR
Other research	Update trade-off analysis for Sablefish fishing and VME protection (as new data is available)	Update trade-off analysis for Sablefish fishing and VME protection (as new data is available)			
Vulnerable marine ecosystems					
Defining and Identifying VMEs	Bring together VME indicator taxa observation data from various sources and map for NPFC area	Summarize VME indicator taxa observation data from various sources and map for NPFC area	Consolidate other potential data sources and clarify gaps and deficiencies in VME data		

ITEM	SSC BFME05 (2023)	SSC BFME06 (2024)	SSC BFME07 (2025)	SSC BFME08 (2026)	SSC BFME09 (2027)
	Review and update quantitative definition of VMEs	Review and update quantitative definition of VMEs as needed	Review and update quantitative definition of VMEs as needed	Review and update quantitative definition of VMEs as needed	Review and update quantitative definition of VMEs as needed
	Review updated taxonomy for corals relative to VME indicator taxa	Review updated taxonomy for corals and VME indicator taxa as needed (Hydrocorals)	Review updated taxonomy for corals and VME indicator taxa as needed	Review updated taxonomy for corals and VME indicator taxa as needed	Review updated taxonomy for corals and VME indicator taxa as needed
Identifying and defining SAI's	Apply the standardized approach for SAI assessments and conduct integrated SAI assessment	Determine data requirements and spatial/temporal resolution for SAI assessment and continue developing risk assessment for SAI	Assess risk of SAI for bottom fisheries	Conduct integrated SAI assessment	Conduct integrated SAI assessment
			Develop standardized and measurable metrics to assess cumulative impacts of fisheries on VME	Assess other threats to VME, such as climate change and lost fishing gear	
Quantifying interactions between fisheries and VMEs	Update spatially explicit fishing effort data	Update spatially explicit fishing effort data	Update spatially explicit fishing effort data	Update spatially explicit fishing effort data	Update spatially explicit fishing effort data

ITEM	SSC BFME05 (2023)	SSC BFME06 (2024)	SSC BFME07 (2025)	SSC BFME08 (2026)	SSC BFME09 (2027)
		Use data-based methods applied to Japan and Korea's indicator taxa bycatch to further refine encounter thresholds			
	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice	Review fisheries observer program data collection for adequacy to produce data streams to support management advice
Conserving VMEs	Develop management objectives for recovering VME sites (lower priority)	Refine framework for future monitoring of recovering VMEs	Periodic review of VME management	Periodic review of VME management	Periodic review of VME management
Other ecosystem components					
Assess the impact of fisheries on other ecosystem components		Examine discards over time (species composition, weight of discards) for bottom fisheries in CA		Work towards assessment of fishing impacts on other (non-target) ecosystem components	

Scientific Committee (SC)

Priority list

As stipulated in the Convention, Article 10, the Scientific Committee shall provide scientific advice and recommendations to the Commission which is considered the highest priority task of the SC. The following priority areas have been identified for SC:

1. Priority species summaries and stock assessments for management advice
2. Management Strategy Evaluation (MSE) for priority species
3. Ecosystem approach to fisheries management: understand ecological interactions among species and impacts of fishing on fisheries resources and their ecosystem components
4. Collaboration with other organizations
5. Regular review of the research plan and work plan
6. Data collection, management, and security

ITEM	2023	2024	2025	2026	2027	Progress
Priority Species						
Summaries of priority species	Draft summary sheets	Update summary sheets as needed	Update summary sheets as needed	Update summary sheets as needed	Update summary sheets as needed	Summary sheets are complete for all 8 priority species
Assessment of Blue (Spotted) Mackerel and associated bycatch	Collate data on Blue Mackerel Compile data on the catch composition of Chub Mackerel and	Update data on Blue Mackerel Compile data on the catch composition of Chub Mackerel and	Update data on Blue Mackerel Compile data on the catch composition of Chub Mackerel and	Update data on Blue Mackerel Compile data on the catch composition of Chub Mackerel and	Update data on Blue Mackerel Compile data on the catch composition of Chub Mackerel and	Data on Blue Mackerel have been collated Data on catch composition are

ITEM	2023	2024	2025	2026	2027	Progress
	Blue Mackerel and provide information to TWG CMSA Observe Japan's domestic stock assessment of Blue Mackerel Provide management advice to the Commission as needed.	Blue Mackerel and provide information to TWG CMSA Observe Japan's domestic stock assessment of Blue Mackerel Provide management advice to the Commission as needed. Develop data collection templates	Blue Mackerel and provide information to TWG CMSA Observe Japan's domestic stock assessment of Blue Mackerel Provide management advice to the Commission as needed.	Blue Mackerel and provide information to TWG CMSA Observe Japan's domestic stock assessment of Blue Mackerel Provide management advice to the Commission as needed. Collate data on associated bycatch species	Blue Mackerel and provide information to TWG CMSA Observe Japan's domestic stock assessment of Blue Mackerel Provide management advice to the Commission as needed. Assess impacts of fishery on dependent or associated species	compiled] [and were provided to TWG CMSA The SC observed Japan's domestic stock assessment of Blue Mackerel Stock assessment results were communicated to the Commission
Assessment of Japanese Sardine and associated bycatch	Collate data on Japanese Sardine Observe Japan's domestic stock assessment of Japanese sardine	Update data on Japanese Sardine Observe Japan's domestic stock assessment of Japanese sardine	Update data on Japanese Sardine Observe Japan's domestic stock assessment of Japanese sardine.	Update data on Japanese Sardine Observe Japan's domestic stock assessment of Japanese sardine.	Update data on Japanese Sardine Observe Japan's domestic stock assessment of Japanese sardine.	Data on Japanese Sardine have been collated The SC observed Japan's domestic stock assessment

ITEM	2023	2024	2025	2026	2027	Progress
	Provide management advice to the Commission as needed.	Provide management advice to the Commission as needed.	Provide management advice to the Commission as needed.	Provide management advice to the Commission as needed. Collate data on associated bycatch species	Provide management advice to the Commission as needed. Assess impacts of fishery on dependent or associated species	of Japanese Sardine Stock assessment results were communicated to the Commission
Assessment of Neon Flying Squid and associated bycatch	Collate data on Neon Flying Squid Develop data collection templates Determine spatial structure of stocks Observe Members' domestic stock assessment of Neon Flying Squid	N/A: SSC NFS	N/A: SSC NFS	N/A: SSC NFS	N/A: SSC NFS	Data on Neon Flying Squid have been collated A new formal subsidiary body of SC was formed to undertake stock assessment of neon flying squid – The Small

ITEM	2023	2024	2025	2026	2027	Progress
	Provide management advice to the Commission as needed.					Scientific Committee on neon flying squid (SSC NFS) The SC observed China's domestic stock assessment of Neon Flying Squid Stock assessment results were communicated to the Commission
Assessment of Japanese Flying Squid and associated bycatch	Collate data on Japanese Flying Squid Observe Japan's domestic stock assessment of Japanese Flying Squid	Update data on Japanese Flying Squid Observe Japan's domestic stock assessment of Japanese Flying Squid	Update data on Japanese Flying Squid Observe Japan's domestic stock assessment of Japanese Flying Squid	Update data on Japanese Flying Squid Observe Japan's domestic stock assessment of Japanese Flying Squid	Update data on Japanese Flying Squid Observe Japan's domestic stock assessment of Japanese Flying Squid	Data on Japanese Flying Squid have been collated The SC observed Japan's domestic stock assessment

ITEM	2023	2024	2025	2026	2027	Progress
	Provide management advice to the Commission as needed. Develop data collection templates	Provide management advice to the Commission as needed.	Provide management advice to the Commission as needed. Collate data on associated bycatch species	Provide management advice to the Commission as needed. Collate data on associated bycatch species	Provide management advice to the Commission as needed. Assess impacts of fishery on dependent or associated species	of Japanese Flying Squid Stock assessment results were communicated to the Commission
Management Strategy Evaluation (MSE)						
Pacific Saury	Support NPFC's SWG MSE PS in achieving its goals	Support NPFC's SWG MSE PS in achieving its goals	Support NPFC's SWG MSE PS in achieving its goals	Support NPFC's SWG MSE PS in achieving its goals	Support NPFC's SWG MSE PS in achieving its goals	The SC/SSC PS supported NPFC's SWG MSE PS by providing options for management objectives and reference points, made progress on developing

ITEM	2023	2024	2025	2026	2027	Progress
						operating models and conducting simulation for candidate harvest control rules
Ecosystem approach to fisheries management						
Ecological Interactions	Understand ecological interactions among species in the North Pacific Ocean	Understand ecological interactions among species in the North Pacific Ocean	Understand ecological interactions among species in the North Pacific Ocean	Understand ecological interactions among species in the North Pacific Ocean	Understand ecological interactions among species in the North Pacific Ocean	Canada reported a positive relationship between the density of NPFC's VME indicator taxa and the species richness of benthic taxa.
Impacts of fishing on ecosystem components	Evaluate impacts of fishing on fisheries resources and their ecosystem components, including bycatch	Evaluate impacts of fishing on fisheries resources and their ecosystem components, including bycatch	Evaluate impacts of fishing on fisheries resources and their ecosystem components, including bycatch	Evaluate impacts of fishing on fisheries resources and their ecosystem components, including bycatch	Evaluate impacts of fishing on fisheries resources and their ecosystem components, including bycatch	SSC BFME endorsed a flow chart for assessing the risk of SAI in the eastern and

ITEM	2023	2024	2025	2026	2027	Progress
	species and discards	species and discards	species and discards	species and discards	species and discards	western parts of the NPFC Convention Area
Climate change	Consider possible key vulnerabilities and management implications of changing oceanographic conditions resulting from climate change on NPFC fisheries resources and species belonging to the same ecosystem or dependent upon or associated with target stocks. Make recommendations to help adapt to climate change and promote resilience in NPFC	Consider possible key vulnerabilities and management implications of changing oceanographic conditions resulting from climate change on NPFC fisheries resources and species belonging to the same ecosystem or dependent upon or associated with target stocks. Make recommendations to help adapt to climate change and promote resilience in NPFC	Consider possible key vulnerabilities and management implications of changing oceanographic conditions resulting from climate change on NPFC fisheries resources and species belonging to the same ecosystem or dependent upon or associated with target stocks. Make recommendations to help adapt to climate change and promote resilience in NPFC	Consider possible key vulnerabilities and management implications of changing oceanographic conditions resulting from climate change on NPFC fisheries resources and species belonging to the same ecosystem or dependent upon or associated with target stocks. Make recommendations to help adapt to climate change and promote resilience in NPFC	Consider possible key vulnerabilities and management implications of changing oceanographic conditions resulting from climate change on NPFC fisheries resources and species belonging to the same ecosystem or dependent upon or associated with target stocks. Make recommendations to help adapt to climate change and promote resilience in NPFC	SC discussed climate change.

ITEM	2023	2024	2025	2026	2027	Progress
	fisheries	fisheries	fisheries	fisheries	fisheries	
Collaboration with other Organizations						
PICES	Review implementation of NPFC-PICES Framework for Collaboration Review ICES-PICES WGSPF activities (PICES WG43)	Review implementation of NPFC-PICES Framework for Collaboration Review ICES-PICES WGSPF activities (PICES WG43) Identify other opportunities for collaboration with PICES.	Review implementation of NPFC-PICES Framework for Collaboration Identify other opportunities for collaboration with PICES	Review implementation of NPFC-PICES Framework for Collaboration Identify other opportunities for collaboration with PICES	Review implementation of NPFC-PICES Framework for Collaboration Identify other opportunities for collaboration with PICES	SC reviewed implementation of NPFC-PICES Framework for Collaboration SC reviewed ICES-PICES WGSPF activities (PICES WG43)

ITEM	2023	2024	2025	2026	2027	Progress
		Consider renewing the NPFC-PICES Framework for Enhanced Scientific Collaboration in the North Pacific				
FAO		Review NPFC's involvement with the ABNJ Deep-sea fisheries project Review NPFC's partnership with the Fisheries and Resources Monitoring System of FAO (FIRMS)	Review NPFC's involvement with the ABNJ Deep-sea fisheries project Review NPFC's partnership with the Fisheries and Resources Monitoring System of FAO (FIRMS)	Review NPFC's involvement with the ABNJ Deep-sea fisheries project Review NPFC's partnership with the Fisheries and Resources Monitoring System of FAO (FIRMS)	Review NPFC's involvement with the ABNJ Deep-sea fisheries project Review NPFC's partnership with the Fisheries and Resources Monitoring System of FAO (FIRMS)	SC reviewed its collaboration with the ABNJ Deep-sea fisheries project SC reviewed its partnership with the Fisheries and Resources Monitoring System of FAO (FIRMS)

ITEM	2023	2024	2025	2026	2027	Progress
NPAFC	Undertake scientific activities to achieve relevant deliverables of the NPFC/NPAFC work plan	Undertake scientific activities to achieve relevant deliverables of the NPFC/NPAFC work plan	Undertake scientific activities to achieve relevant deliverables of the NPFC/NPAFC work plan	Undertake scientific activities to achieve relevant deliverables of the NPFC/NPAFC work plan	Undertake scientific activities to achieve relevant deliverables of the NPFC/NPAFC work plan	SC reviewed NPFC/NPAFC activities
Other organizations	Review collaborations with other organizations	Review collaborations with other organizations	Review collaborations with other organizations	Review collaborations with other organizations	Review collaborations with other organizations	SC was informed about the MOU with SPRFMO and progress on collaboration with ISC and WCPFC
Research and Work Plans						
Terms of Reference	Review SC's Terms of Reference, as needed	Review SC's Terms of Reference, as needed	Review SC's Terms of Reference, as needed	Review SC's Terms of Reference, as needed	Review SC's Terms of Reference, as needed	SC reviewed its TOR and agreed it did not need to be revised
Research Plan	Update SC's rolling 5-year research plan	Update SC's rolling 5-year research plan	Update SC's rolling 5-year research plan	Update SC's rolling 5-year research plan	Update SC's rolling 5-year research plan	SC updated its rolling 5-year research plan
Work Plan	Update SC's rolling 5-year work plan	Update SC's rolling 5-year work plan	Update SC's rolling 5-year work plan	Update SC's rolling 5-year work plan	Update SC's rolling 5-year work plan	SC updated its rolling 5-year

ITEM	2023	2024	2025	2026	2027	Progress
						work plan
Projects	Review completed and ongoing projects Identify and prioritize new projects and recommend sources of funding	Review completed and ongoing projects Identify and prioritize new projects and recommend sources of funding	Review completed and ongoing projects Identify and prioritize new projects and recommend sources of funding	Review completed and ongoing projects Identify and prioritize new projects and recommend sources of funding	Review completed and ongoing projects Identify and prioritize new projects and recommend sources of funding	SC reviewed its completed and ongoing projects, and recommended new projects and sources of funding
Data Management						
	Review data inventories and the status of data gaps Review data standards in relation to stock assessment of priority species Discuss need for additional sources of data for scientific analyses and associated data	Review data inventories and the status of data gaps Review data standards in relation to stock assessment of priority species Discuss need for additional sources of data for scientific analyses and associated data	Review data inventories and the status of data gaps Review data standards in relation to stock assessment of priority species Discuss need for additional sources of data for scientific analyses and associated data	Review data inventories and the status of data gaps Review data standards in relation to stock assessment of priority species Discuss need for additional sources of data for scientific analyses and associated data	Review data inventories and the status of data gaps Review data standards in relation to stock assessment of priority species Discuss need for additional sources of data for scientific analyses and associated data	SC discussed data needs, data gaps, and strategies to fill gaps SC discussed data standards in relation to stock assessment of priority species. SC discussed the need for

ITEM	2023	2024	2025	2026	2027	Progress
	management policy	management policy	management policy	management policy	management policy	additional sources of data for scientific analyses and associated data management policy
Recommendations						
Advice	Develop recommendations for the Commission, TCC, and FAC	Develop recommendations for the Commission, TCC, and FAC	Develop recommendations for the Commission, TCC, and FAC	Develop recommendations for the Commission, TCC, and FAC	Develop recommendations for the Commission, TCC, and FAC	SC made recommendations for the Commission, TCC, and FAC
Media Communication						
Press Release	Prepare and publish a press release about SC activities during its meeting	Prepare and publish a press release about SC activities during its meeting	Prepare and publish a press release about SC activities during its meeting	Prepare and publish a press release about SC activities during its meeting	Prepare and publish a press release about SC activities during its meeting	SC drafted and endorsed a press release about SC activities during its SC08 meeting