2nd Meeting of the Small Scientific Committee on Neon Flying Squid
REPORT

8-10 July 2025

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Contents

North Pacific Fisheries Commission
2nd Meeting of the Small Scientific Committee on Neon Flying Squid

8-10 July 2025
Shanghai, China

REPORT

Agenda Item 1. Opening of the Meeting

1. The 2nd Meeting of the Small Scientific Committee on Neon Flying Squid (SSC NFS02) took place in a hybrid format, with participants attending in-person in Shanghai, China or online via WebEx, and was attended by Members from Canada, China, Japan, the Republic of Korea, the Russian Federation, Chinese Taipei, the United States of America, and the Republic of Vanuatu. The Ocean Foundation and the Pew Charitable Trusts (Pew) attended as observers. An invited expert, Dr. Rujia Bi, participated in the meeting.

2. The meeting was opened by the SSC NFS Vice-Chair, Dr. Bungo Nishizawa (Japan), who led this meeting as the SSC NFS Chair, Dr. Luoliang Xu, was not able to attend the meeting in-person. The Vice-Chair welcomed the participants and thanked China for hosting this meeting.

3. On behalf of China, the host Member, Dr. Libin Dai welcomed in-person participants to Shanghai and online participants to the meeting. Dr. Dai hoped that the meeting would contribute to making meaningful progress on advancing scientific research on neon flying squid (NFS).

4. The Science Manager, Dr. Aleksandr Zavolokin, outlined the procedures for the meeting.

5. Mr. Alex Meyer was selected as rapporteur.

Agenda Item 2. Adoption of Agenda

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

Agenda Item 3. Review of previous SSC NFS01 outcomes and intersessional activities

7. The Vice-Chair provided an overview of the outcomes and recommendations of the 1st SSC NFS meeting.

8. The SSC NFS discussed the goals of the SSC NFS02 meeting and agreed that the SSC NFS

should aim to agree, if possible, on the input data, such as catch data and catch per unit effort (CPUE) data, for use in the surplus production model for NFS stock assessment.

9. To help the SSC NFS achieve its goal, Japan requested that Members provide explanations about their available NFS data.

10. The Science Manager reminded the SSC NFS that at the 9th Commission meeting, the Commission discussed the prioritization of species for stock assessment and reaffirmed that NFS is a priority species.

3.1 Overview of stock assessment methods and management measures that have been used for squids or other short-lived species

11. The invited expert presented an overview of stock assessment methods and management measures used for squids and other short-lived species (NPFC-2025-SSC NFS02-WP02). The management and assessment of squids and other short-lived species demand approaches that reflect their distinctive biological and ecological characteristics. Traditional methods developed for long-lived species often underestimate the rapid population turnover, recruitment variability, and environmental sensitivity that define short-lived species. However, a diverse toolkit tailored to the data constraints and life-history traits of these species is available, from empirical and survey-based assessments to depletion and production models. Successful stewardship of short-lived resources depends on flexible, adaptive management frameworks that can accommodate uncertainty and respond swiftly to fluctuations in stock status. This includes setting biologically relevant reference points, applying precautionary controls, and maintaining a capacity for in-season adjustments. As environmental change and data limitations persist, further integration of ecosystem considerations and development of rapid assessment methods will be essential to support sustainable exploitation and resilience in these dynamic fisheries.

12. The SSC NFS discussed appropriate stock assessment models for NFS. The SSC NFS recalled that it has agreed to work towards conducting a stock assessment using a surplus production model (SPM) as a first step. The SSC NFS noted that SPMs typically have an annual time step, but that it could be valuable to consider a more frequent time-step given that NFS has a one-year life-span. The SSC NFS noted that Members have shared monthly data at a 1x1 degree resolution, which would support such work. The SSC NFS also noted the invited expert's suggestion to explore variants of SPM, including incorporating more environmental factors that may affect carrying capacity and intrinsic growth rate.

3.2 Updates on NFS management strategy simulation work

13. Dr. Libin Dai (China) presented preliminary NFS management strategy simulation work,

using only annual data, that he conducted as part of Scientific Committee (SC) capacity building (NPFC-2025-SSC NFS02-IP06). He explained that the work was only intended to explore the possibility of developing a management strategy evaluation (MSE) framework for NFS. In collaboration with Blue Matter Science, Dr. Dai developed and conditioned an age-structured OpenMSE operating model for the autumn cohort, developed and compared catch- and effort-based harvest control rules (HCRs), and evaluated management trade-offs using the OpenMSE package. Effort control was more resilient than catch control for the NFS autumn cohort. Monthly data are needed to construct a monthly time-step operating model to make explicit choices about the biological and fishing dynamics during the year. Monthly data are helpful to simulate data on a finer time scale to evaluate in-season management and compare management approaches that use the previous year's data. Currently, it is difficult to see the value of management procedures (MPs) that use the previous year's data for a short-lived species as these data do not have any information about the abundance of the next year's cohort. OpenMSE has multi-stock modeling capability, so it could be used to develop a joint model for the autumn and winter-spring stocks to evaluate combined MPs for NFS.

14. Dr. Dai shared the input files and the code for this work on the NPFC Collaboration Site.

15. The Ocean Foundation supported development of the MSE for NFS and recommended continued support through SC capacity building.

Agenda Item 4. Updates on Members' fishery status

4.1 Member presentations prepared in advance using the provided template

16. Korea presented its NFS fishery status up to 2024 (NPFC-2025-SSC NFS02-IP02). Korea conducted exploratory fishing in the North Pacific Ocean in 2017 (1 vessel), 2021 (1 vessel) and 2022 (2 vessels). In other years, NFS was caught as a bycatch species by hand lines from stick-held dipnet vessels. In 2024, total catch of NFS was 19 MT. Except for during Korean exploratory fishing in 2017, 2021 and 2022, no catch was recorded east of 170°E and all NFS were caught west of 170°E. The number of stick-held dipnet vessels fishing for squid has gradually decreased from 14 in 2016 to 5 in 2024, with only 4 out of 5 operating vessels reporting catch of NFS. Since the NFS are caught only by hand lines, the annual catch fluctuates significantly. In the years when NFS were caught, fishing occurred in August and September, with the highest catch recorded in August.

17. Chinese Taipei presented its NFS fishery status up to 2024 (NPFC-2025-SSC NFS02-IP01 (Rev. 1)). Catch peaked at 9,022 MT in 2004 and was 6.5 MT in 2024. Catch is mainly from the Convention Area west of 170°E. Only six vessels harvested squid in 2024, down from a peak of 91 in 2019. The six vessels operated for a total of seven days from August to October. There was one vessel in the eastern region between 2016 and 2024. The nominal CPUE was

0.93 tons/day in 2024. Nominal CPUE has been higher in the area west of 170^{o}E compared to the east. The fishing grounds in 2024 were smaller than those in 2023.

18. Japan requested that Korea and Chinese Taipei distinguish between NFS caught using squid jigging and those caught using handlines when reporting NFS catch and effort in their annual summary footprints.

19. Japan presented its NFS fishery status up to 2024 (NPFC-2025-SSC NFS02-IP03). Since the entry into effect of the High Seas Driftnet Fishing Moratorium in 1992, squid jigging has become Japan’s main NFS fishery, with more than 99% of NFS caught by squid jigging. The annual catch in recent years has been relatively stable and total catch in 2024 was 4,458 MT. In general, Japanese fishing vessels mainly operate in the Convention Area east of 170^{o}E from May to July. They also operate in Japanese national waters in January and February. In 2024, most of the catch was taken in the Convention Area east of 170^{o}E. There was almost no catch in national waters because fishing vessels operating in national waters in January and February targeted Japanese flying squid. The number of vessels operating in in the Convention Area east of 170^{o}E has been stable since 2011 at around 25 vessels. The number of vessels operating in national waters has been decreasing in recent years. Nominal CPUE was 0.4 MT/day in the Convention Area west of 170^{o}E and national waters, and 2.2 MT/day in the Convention Area east of 170^{o}E.

20. China presented its NFS fishery status up to 2024 (NPFC-2025-SSC NFS02-IP04). The annual catch has remained relatively stable in recent years, with a total of 15,842 MT in 2024. Most catches occurred in the Convention Area west of 170°E. China operated 120 vessels in 2024, an increase of 34 compared to 2023. Seasonal catches from May to November showed an initial rise followed by a decline. The accumulated catch increased annually between 2022 and 2024. The nominal CPUE was 1.813 MT/day west of 170°E and 1.798 MT/day east of 170°E in the Convention Area.

21. Vanuatu informed the SSC NFS that it did not conduct its NFS fishery in 2024.

22. Russia informed the SSC NFS that it had no catches of NFS in the Convention Area or in national waters in 2024. Russia explained that for many years it has not caught NFS in the Convention Area but that in the past, NFS has sometimes been taken in national waters mostly as bycatch by Russian vessels.

23. The SSC NFS considered potential updates to the template prepared by the invited expert for presenting Members’ fisheries status information (NPFC-2025-SSC NFS02-WP01).

24. The SSC NFS agreed that it would be useful to update the template to enable provision of

catch and effort information by gear, noting that this would enable the estimation of the catchability of different gear types and more precise CPUE standardization.

25. The SSC NFS agreed on the importance of size composition data, noting that this would enable more precise separation of NFS catch data into the winter-spring or autumn cohorts and preparation of cohort-specific catch data, ideally at a monthly, 1x1 degree resolution. However, the SSC NFS also noted that some Members would have difficulty providing size information from recent years or at a more frequent resolution than yearly. The SSC NFS agreed to add slides to the template for presenting yearly size information and a description of the methods for obtaining size composition, as well as similar optional slides for presenting monthly or seasonal size information.

26. The SSC NFS reviewed, revised, and endorsed the template for presenting Members' NFS fisheries status information (available on the NPFC website).

27. The SSC NFS agreed that the intended purpose of the template is to standardize the way in which Members share their NFS fisheries status information and not to require Members to collect or present information that they do not have or are unable to provide.

Agenda Item 5. Review of biological information for NFS

28. Japan presented an estimation of the relationship between size box categories and the mantle length (ML) composition of NFS caught by Japanese squid jigging vessels (NPFC-2025-SSC NFS02-WP04). Japan investigated the relationship between size-box categories and ML of the NFS caught by Japanese squid jigging vessels in the North Pacific Ocean. On-board size measurements of MLs of squid caught by commercial jigging were conducted from May to July in 2012 and 2013, covering eight size-box categories. In total, the MLs of 3,451 individuals were measured. Squid sorted into the 6-10 (no. of individuals per box), 11-15, and 16-20 size-box categories were mostly in the ML class of 35 cm or larger, whereas those in the 41-50 and 51-60 size box categories were in the ML class of 20 cm or smaller. These ML frequency distributions were fitted with a lognormal distribution. Japan suggested that the ML compositions could be used to estimate length distributions of NFS landings, assuming data on the number of boxes by size-box category are available. By combining these results with the threshold size for distinguishing between the autumn and winter-spring cohorts, it would be possible to separate the catch into each cohort.

29. The invited expert suggested that Japan explore the use of a Dirichlet distribution for fitting the ML frequency distributions as this may fit better than a lognormal distribution.

30. China presented a summary of squid jigging surveys conducted between 2021 and 2024 by R/V Songhang, Shanghai Ocean University's pelagic fishery resources survey vessel (NPFC-

2025-SSC NFS02-IP05). Based on the surveys, the predominant squid species in the Northwest Pacific Ocean were found to be NFS, boreal clubhook squid, Boreopacific armhook squid, clubhook squid and luminous flying squid. Except for NFS, the four other squid species were bycatch from squid jigging. Catch data from the surveys were collected and mapped. Basic biological characteristics of NFS, including the ML composition, body weight (BW) composition, ML-BW relationship, sexual maturity composition, and feeding ecology information, were recorded. The R/V Songhang's surveys for NFS will be continually improved going forward, and the fishery-independent biological information from the surveys will be provided to support NFS stock assessment work.

31. China offered to provide a more detailed explanation of its sampling survey design at a future meeting. The SSC NFS welcomed the offer, noting that China's research survey may be able to provide not only biological information but also abundance information.

5.1 Common sampling protocol for collecting NFS age and size data

32. The SSC NFS encouraged Members to present their size composition information, even if it is only preliminary, as well as a description of the method they used to estimate size composition, to the next SSC NFS meeting to facilitate information sharing and initial discussions towards the development of a common protocol.

33. Chinese Taipei informed the SSC NFS that it has historical size composition data, that it has potential plans to collect such data in the coming year, and that it could provide these data to the SSC NFS. The SSC NFS welcomed the offer.

34. The United States suggested that it would be useful to develop a common, documented methodology for separating NFS catch into the winter-spring or autumn cohorts.

35. The United States suggested that it would be valuable to estimate NFS size-at-age and to collect statolith samples for that purpose.

Agenda Item 6. Review of potential input data for the surplus production model

6.1 Historical catch data, including data collection methods and fishery-dependent abundance indices (e.g., nominal/standardized CPUE)

36. The Vice-Chair presented plots of Members' annual catch, effort, and nominal CPUE data for each cohort from the annual summary footprints, as well as plots of the preliminary standardized fisheries-dependent CPUE data for the two cohorts.

37. The SSC NFS reviewed and updated the CPUE standardization protocol (Annex D) to enable the extraction of seasonally standardized CPUE, if needed.

38. The SSC NFS requested the Chair to develop a template for presenting CPUE standardizations based on the template for Pacific saury and agreed to include this in the CPUE standardization protocol in the future.

39. The SSC NFS encouraged Members to conduct individual Member-specific CPUE standardizations, following the CPUE standardization protocol, separated by gear and cohort. The SSC NFS encouraged Members that catch NFS with different gears to first prioritize conducting a CPUE standardization for squid jigging over other gears. The SSC NFS encouraged Members to separate the cohorts based on size information, if possible, or, if not, based on catch location.

40. The SSC NFS requested Members to share monthly, 1x1 degree catch and effort data from the Convention Area and, if possible, national waters. The SSC NFS requested that the invited expert use the Convention Area data and, if possible, also the national waters data to conduct joint CPUE standardizations for each cohort, separating the cohorts based on catch location, and to share on the NPFC GitHub the R package she used.

41. Korea explained that it only used squid jigging gear as part of exploratory fishing operations conducted in 2017, 2021 and 2022, and that almost no catch was taken east of 170^{o}E (i.e., autumn cohort). Given the limited data, the SSC NFS agreed that conducting a standardized CPUE for the autumn cohort NFS caught by the Korean squid jigging fishery is not a priority. Korea noted that internal discussion is required to determine whether CPUE standardization should be conducted using the currently limited data.

42. Vanuatu explained that it had limited data available and did not think that they would be sufficiently representative for conducting Member-specific CPUE standardization work. However, Vanuatu expressed its intention to share these data for the conducting of the joint CPUE standardization.

6.2 Fishery-independent abundance indices (e.g., scientific surveys)

43. Japan presented an updated CPUE standardization for the autumn and winter-spring cohorts of NFS based on Japanese driftnet surveys the Northwest Pacific Ocean from 2001 to 2024 (NPFC-2024-SSC NFS02-WP03). The individuals caught by the driftnets were divided into cohorts based on their ML. Generalized additive models (GAMs) were used to standardize the CPUE, incorporating temporal (year and ten-days), spatial (latitude and longitude), and environmental (sea surface temperature (SST) and lunar illumination) variables. There was large interannual variation in the standardized CPUE for both cohorts, with no clear increasing or decreasing trends over the years for both cohorts. Japan suggested that this standardized

CPUE could serve as a fishery-independent abundance index for future NFS stock assessments.

Agenda Item 7. Stock assessment modelling

7.1 Review of any updates and progress on the surplus production models

44. Japan presented a preliminary application of the stochastic surplus production model in continuous time (SPiCT) to NFS in the North Pacific (NPFC-2025-SSC NFS02-WP05). Japan applied the SPiCT to the autumn and winter-spring cohorts using the total annual catch of all Members and two abundance indices from the fishery and Japanese driftnet survey. The fishery index was estimated by standardizing the Members' CPUE using a generalized linear mixed model (GLMM) that included year and Member as explanatory variables. The assessment confirmed a weak positive relationship (Pearson's r = 0.27) between the fishery and survey indices for the autumn cohort and a strong positive relationship (r = 0.57) for the winter-spring cohort. The parameter estimates derived from the autumn cohort assessment using SPiCT were nearly satisfactory with narrow confidence intervals. However, some issues from model diagnostics and retrospective analysis were found. The estimated values in the winter-spring cohort model appeared acceptable. Japan suggested that the utilization of both fishery and survey indices in the SPMs would be a valuable approach for future NFS stock assessments.

45. The invited expert noted that for the fishery-based abundance index, cohort separation was based on catch location, while for the survey-based abundance index, it was based on size composition, making the two indices incomparable. The invited expert suggested that in order to be able to use both indices in a cohort-specific assessment, the same cohort-separation method should be applied to both indices.

46. China expressed its intention to present additional studies exploring the application of Just Another Bayesian Biomass Assessment (JABBA) to NFS at a future meeting. China explained that since the separation of the two cohorts remains unclear, it intends to present preliminary applications of JABBA for cohort-specific assessments, as well as a stock-wide assessment.

7.2 Discussion of alternative stock assessment approaches

47. The SSC NFS reaffirmed that, as a first step, it will prioritize the development of an SPM for NFS stock assessment. The SSC NFS did not hold detailed discussions on alternative stock assessment approaches.

7.3 Recommendations for future work

48. The SSC NFS encouraged Members to conduct hindcasting tests when presenting work on the development of stock assessment models so as to test the prediction ability of models.

49. The SSC NFS noted the importance of environmental impacts and encouraged Members to explore the incorporation of environmental factors that may affect variables such as carrying capacity, intrinsic growth rate, and catchability.

50. The SSC NFS agreed that the following scenarios could be considered for the NFS assessment:
    a) Cohort-specific assessment (winter-spring and autumn cohorts); and
    b) Stock-wide assessment (no cohort separation).

51. The SSC NFS agreed that the base case scenario should be selected based on diagnostic results and biological plausibility, among other factors.

Agenda Item 8. Review of the SSC NFS Work Plan

8.1 Climate change related issues

52. The Science Manager reminded the SSC NFS that the Commission has adopted a Resolution on Climate Change, that the Commission has tasked the SC to make climate change a standing agenda item, and that the SC has instructed its subsidiary bodies to do the same.

53. The Science Manager informed the SSC NFS that at SC09, the consultant for the United Nations Food and Agriculture Organization (FAO) consultancy on climate change in the North Pacific presented the results of a literature review aimed at facilitating the incorporation of climate change into the NPFC's work (NPFC-2024-SC09-OP01).

8.2 Review and update of the SSC NFS Work Plan

54. The SSC NFS reviewed and updated the SSC NFS Work Plan (NPFC-2025-SSC NFS02-WP06 (Rev. 1)).

55. The SSC NFS drafted a timeline of tasks leading up to SSC NFS03 as follows:
    a) The Chair will reach out to Members by email to review progress in CPUE standardization by Members, joint CPUE analysis, and information on size data in early October 2025.
    b) Members will update monthly, 1x1 degree catch and effort data for joint CPUE standardization by mid-October 2025.
    c) The invited expert will share the code developed for joint CPUE standardization on the NPFC GitHub by early November.

8.3 NPFC Performance Review recommendations

56. The Science Manager explained that the Commission has agreed on a new process for reviewing progress against the Performance Review recommendations as described in NPFC Circular 038-2025. In accordance with this process, the SC Chair has reviewed the progress on the implementation of recommendations that concern the SC and its subsidiary bodies and

submitted her responses to the Commission. Therefore, the SSC NFS does not need to conduct its own review this year. The SC-related recommendations will be further reviewed during the SC10 meeting in December 2025.

Agenda Item 9. Other matters

9.1 Species summary for neon flying squid

57. The SSC NFS reviewed and updated the species summary for NFS (NPFC-2025-SSC NFS02-WP07 (Rev. 1)). The SSC NFS recommended that the SC adopt the updated species summary (Annex E).

9.2 Observer Program

58. The Science Manager reminded the SSC NFS that the Commission previously requested that the SC provide guidance to the Technical and Compliance Committee (TCC) on the scientific aspects of a regional observer program (ROP), that the TCC Chair posed specific questions to the SC and its subsidiary bodies, and that the SC and its subsidiary bodies, including the SSC NFS, provided responses. The Science Manager explained that these responses were provided to the TCC but the Commission considered them to be insufficient and recommended that the SC and the TCC continue to work on this matter. Based on this, the TCC Chair has posed additional questions to the SC and its subsidiary bodies concerning critical data points, current level of confidence in NPFC stock assessments, monitoring of rare events, data for development of management procedures and accounting for potential effects of climate change, and electronic monitoring systems. The Small Working Group on Observer Program will establish a process for answering these questions intersessionally, draft responses, and circulate the responses to the relevant SC subsidiary bodies for review.

59. The SSC NFS requested the Chair to contribute to drafting the responses to the TCC Chair’s questions and to coordinate with Members to finalize the responses through correspondence.

60. Regarding the use of electronic monitoring, Pew suggested that it would be useful for the SSC NFS to follow developments related to the use of electronic monitoring systems for jumbo flying squid by the South Pacific Regional Fisheries Management Organisation (SPRFMO).

9.3 Invited expert

61. The SSC NFS recommended that the SC continue to hire an invited expert in 2026 to support the SSC NFS during its meetings and to conduct other work to support the SSC NFS as appropriate.

9.4 Election of Chair and vice-Chair

62. The SSC NFS agreed to extend Dr. Luoliang Xu (China) for another two-year term as the SSC NFS Chair.

63. The SSC NFS agreed to extend Dr. Bungo Nishizawa (Japan) for another two-year term as the SSC NFS Vice-Chair.

9.5 Other

64. No other matters were discussed.

Agenda Item 10. Recommendations to the Scientific Committee

65. The SSC NFS agreed to:
   - (a) endorse the template for presenting Members' NFS fisheries status information.
   - (b) hold further discussions at its next meeting on how to separate the two NFS cohorts for conducting stock assessments of each.
   - (c) develop a template document for Members' CPUE standardizations.
   - (d) share information on the collection of NFS size/age data by individual Members, if available.
   - (e) submit updated monthly, 1x1 degree catch and effort data up to 2024 for joint CPUE standardization work.
   - (f) task the invited expert to conduct joint CPUE standardizations for each cohort and share on the NPFC GitHub the R package she used.
   - (g) conduct CPUE standardization individually by Members targeting NFS.
   - (h) continue to include climate change as a standing agenda item in future meetings.
   - (i) extend Dr. Luoliang Xu (China) for another two-year term as the SSC NFS Chair.
   - (j) extend Dr. Bungo Nishizawa (Japan) for another two-year term as the SSC NFS Vice-Chair.
   - (k) hold two hybrid or in-person meetings in 2026, for three or four days each, with the dates to be determined at SC10.

66. The SSC NFS recommended that the SC:
   - (a) endorse the updated CPUE standardization protocol for NFS (Annex D).
   - (b) adopt the Work Plan of the SSC NFS (NPFC-2024-SSC NFS02-WP06 (Rev. 2)).
   - (c) adopt the updated species summary for neon flying squid (Annex E).
   - (d) continue to hire an invited expert in 2026 to support the SSC NFS during its meetings and conduct other work to support the SSC NFS as appropriate.

Agenda Item 11. Adoption of Report

67. The SSC NFS02 Report was adopted by consensus.

Agenda Item 12. Close of the Meeting

68. The SSC NFS Vice-Chair thanked the participants for their meaningful and productive discussions, as well as the Secretariat and the rapporteur for their support.

69. The SSC NFS thanked China for hosting the meeting.

70. The SSC NFS thanked the SSC Vice-Chair for his leadership.

71. The meeting closed at 10:00 on 10 July 2025, Shanghai time.

LIST OF ANNEXES

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Annex E – Species summary for neon flying squid

Annex A:

Agenda

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Annex B:

List of Documents

MEETING INFORMATION PAPERS

Number	Title
NPFC-2025-SSC NFS02-MIP01 (Rev. 3)	Meeting Information
NPFC-2025-SSC NFS02-MIP02	Provisional Agenda
NPFC-2025-SSC NFS02-MIP03 (Rev. 1)	Annotated Indicative Schedule

WORKING PAPERS

Number	Title
NPFC-2025-SSC NFS02-WP01 (Rev. 2)	Template for NFS fisheries status information
NPFC-2025-SSC NFS02-WP02	Overview of Stock Assessment Methods and Management Measures Used for Squids and Other Short-Lived Species
NPFC-2025-SSC NFS02-WP03	Standardized CPUE for the autumn and winter-spring cohorts of neon flying squid based on Japanese driftnet surveys from 2001 to 2024
NPFC-2025-SSC NFS02-WP04	Estimation of the relationship between size box categories and the mantle length composition of neon flying squid caught by Japanese squid jigging vessels
NPFC-2025-SSC NFS02-WP05	Preliminary application of the stochastic surplus production model in continuous time (SPiCT) to neon flying squid in the North Pacific using the Japanese survey index
NPFC-2025-SSC NFS02-WP06 (Rev. 2)	Five-Year Work Plan of the SSC NFS
NPFC-2025-SSC NFS02-WP07 (Rev. 1)	Neon Flying Squid Species Summary

INFORMATION PAPERS

Number	Title
NPFC-2025-SSC NFS02-IP01 (Rev. 1)	Neon Flying Squid Fishery Chinese Taipei
NPFC-2025-SSC NFS02-IP02	Korean Neon Flying Squid Fishery Status up to 2024
NPFC-2025-SSC NFS02-IP03	Neon flying squid fishing condition in Japan in 2024
NPFC-2025-SSC NFS02-IP04	Neon flying squid fishing conditions in China in 2024
NPFC-2025-SSC NFS02-IP05	Surveys on Neon Flying Squid by Squid Jigging in the High Sea of Northwest Pacific Ocean

NPFC-2025-SSC NFS02-IP06	Management Strategy Evaluation for Short-Lived Species with Only Annual Data: A Case Study of the Autumn Cohort of Neon Flying Squid in the North Pacific Ocean

REFERENCE DOCUMENTS

Number	Title
NPFC-2024-SSC NFS01-Final Report	SSC NFS01 Report

Annex C:
List of Participants

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Annex D:
CPUE standardization protocol for neon flying squid

CPUE is catch per unit effort obtained either from fishery independent or fishery dependent data. The use of CPUE in a stock assessment implicitly assumes that CPUE is proportional to stock abundance/biomass. However, many factors other than stock abundance/biomass may influence CPUE. Thus, any other factors, other than stock abundance/biomass, that may influence CPUE should be removed from the CPUE index. The process of reducing/removing the impacts of these factors on CPUE is referred to as CPUE standardization.

<u>The following protocol is developed for the CPUE standardization:</u>

(1) Provide a description of the type of data (logbook, observer, survey, etc.), and the "resolution" of the data (aggregated, set-by-set etc.).

(2) Identify potential explanatory variables (i.e., spatial, temporal, environmental, and fisheries variables) that may influence CPUE values.

(3) Plot annual/monthly spatial catch, effort and nominal CPUE distributions and determine temporal and spatial resolution for CPUE standardization.

(4) Make scatter plots (for continuous variables) and/or box plots (for categorical variables) and present correlation matrix if possible to evaluate correlations between each pair of those variables.

(5) Describe selected explanatory variables based on (2)-(4) to develop full model for the CPUE standardization.

(6) Specify model type and software (packages) and fit the data to the assumed statistical models (i.e., GLM, GAM, Delta-lognormal GLM, Neural Networks, Regression Trees, Habitat based models, and Statistical habitat based models).

(7) Evaluate and select the best model(s) using methods such as likelihood ratio test, information criterions, cross validation etc.

(8) Provide diagnostic plots to support the chosen model is appropriate and assumption are met (QQ plot and residual plots along with predicted values and important explanatory variables, etc.).

(9) Extract yearly and, if needed, seasonally standardized CPUE and standard error by a method that is able to account for spatial heterogeneity of effort, such as least squares mean or expanded grid. If the model includes area and the size of spatial strata differs or the model includes interactions between time and area, then standardized CPUE should be calculated with area weighting for each time step. Model with interactions between area and season or month requires careful consideration on a case by case basis. Provide details on how the CPUE index was extracted.

(10) Calculate uncertainty (SD, CV, CI) for standardized CPUE for each year. Provide detailed explanation on how the uncertainty was calculated.

(11) Provide a table and a plot of nominal and standardized CPUEs over time. When the trends

between nominal and standardized CPUE are largely different, explain the reasons (e.g. spatial shift of fishing efforts), whenever possible.

Annex E:

Species summary for neon flying squid

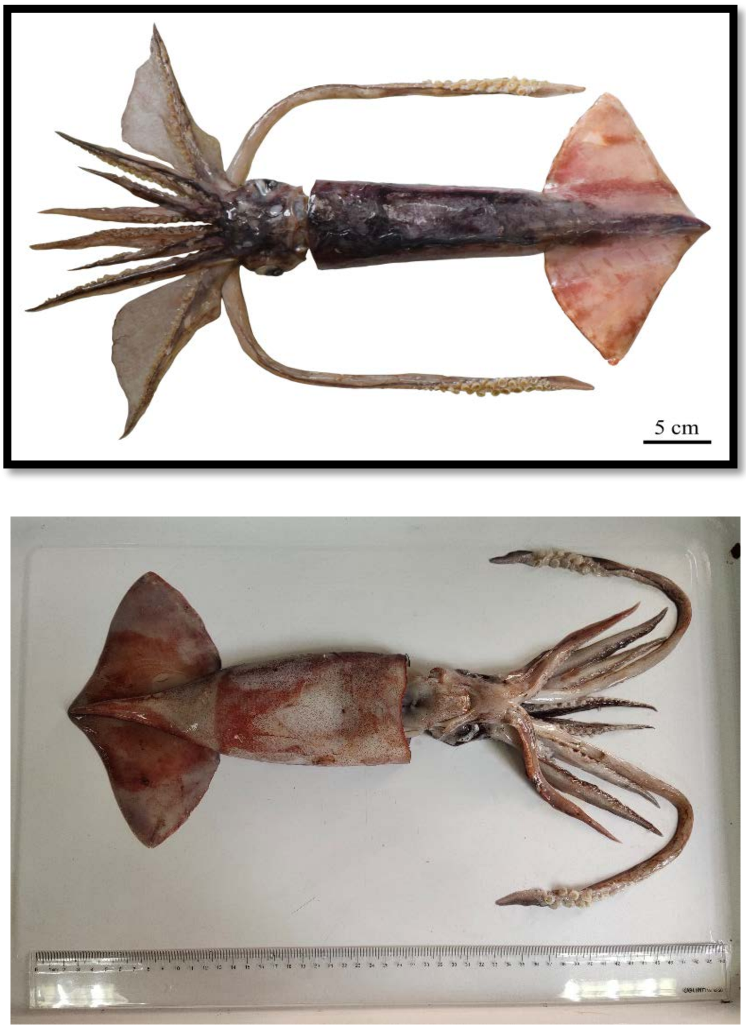

Figure 1. The pictures of neon flying squid

Neon Flying Squid (*Ommastrephes bartramii*)

Common names:

柔鱼 [rou yu] (Chinese); neon flying squid (English); アカイカ [akaika] (Japanese); 빨강오징어 [ppalgangojingeo] (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 2025-11 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 1999-2024 and jigging survey in winter from 2018-2024. Russia conducted upper epipelagic surveys from 1984-1992 and from 1999-2019 (see details in Table 2). China conducted squid jigging survey in summer from 2021-2024.

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.

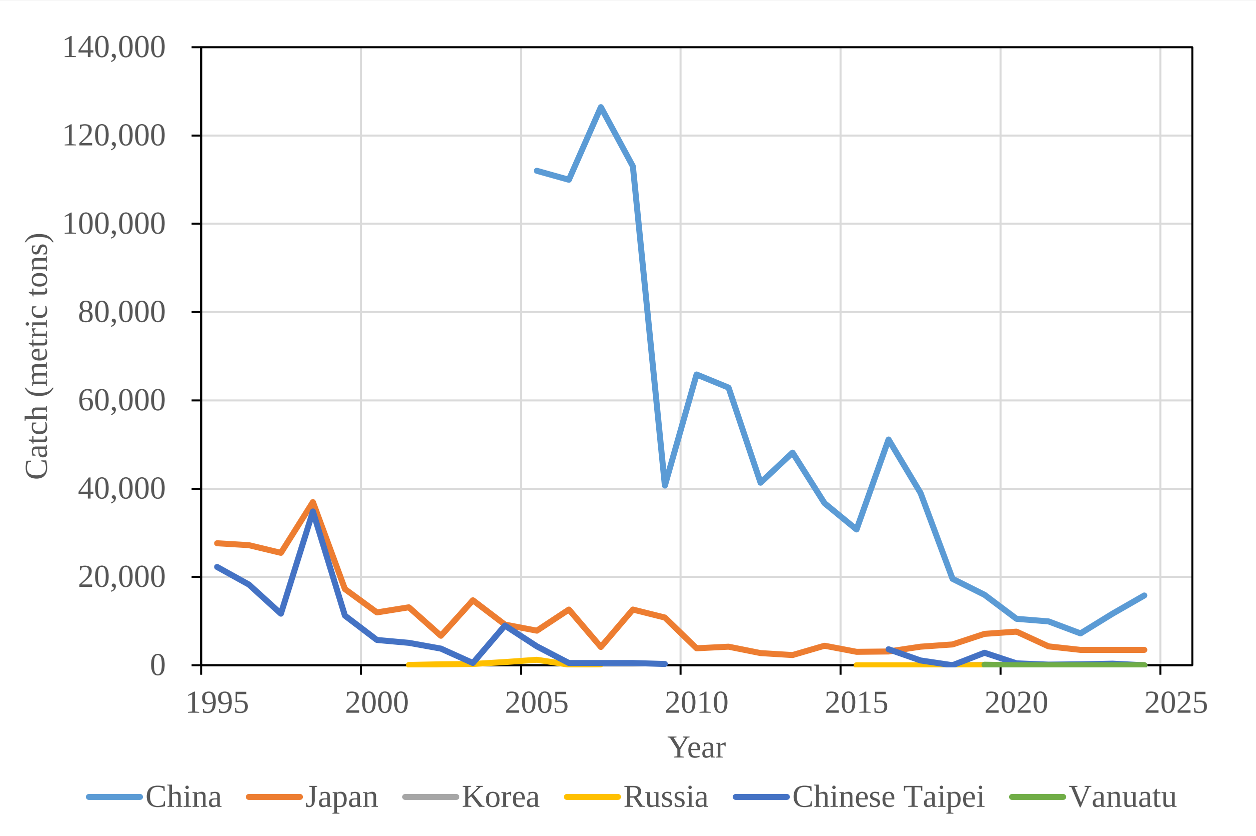

Figure 2. The historical catch of neon flying squid reported by members.

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	Official statistics: 2005-2024 Fishery data before 2005 (need to be confirmed)	Coverage = 100%	The neon flying squid catches are obtained from

	annual report			the fisheries logbook data provided by the fisheries company
Size composition data				
Length measurements	Sampling from commercial squid-jigging fishing vessels	2010-2018 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	1995-2022 Fishery data before 2005 (need to be confirmed)	Coverage= 100%	

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	1995-2024	Coverage=100%	
Size composition data				
Length and weight measurements	Drift net survey (Summer)	1999-2024	500-600 squid/year	
	Jigging survey	2018-2024	300-400	

	(Winter)		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)	1999-2024	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)	2018-2024	12-16 stations/year	
Abundance indices (commercial)				
Jigging fishery	Logbook Standardized CPUE of the winter-spring cohort	1995-2023	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, 2019 and 2021-2024	Coverage =100%	
Size composition data				
Length measurements	Measured by observers while onboard	2017, 2021, 2022	1000 squid/year	Measurement details to be reviewed
Abundance indices (commercial)				
Jigging	Logbook data available	2017, 2021, 2022	30-40 stations/year	Data coverage details to be reviewed

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

			coverage	
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 surveys.	1999-2007, 2011 2012-2019	100-4,000 squids /year (ca. 50 measurements per sampling)	Data coverage details to be reviewed
Abundance indices (survey)				
Summer-autumn surveys to assess pelagic squid 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	Fishing gear used	Data from 1977-	Coverage	

Set net	in different periods: 1977-1979: jigging 1980-1983: jigging and gillnet 1984-1992: gillnet 1993 till now: jigging	1996 was provided by Taiwan Squid Fishery Association, data from 1997-2017 was based on logbook, and data from 2018-2024 was the statistics on landings. (No fishery: 2010, 2012-2015)	=100%	
Size composition data				
Length measurements	Sampling from a research survey (1997). Sampling from commercial fishing vessels.	1997; 1998-2003	200-300 squids /year	Data coverage details to be reviewed
Abundance indices (commercial)				
Squid-jigging fisheries	Squid-jigging logbook	2001-2023 (No fishery: 2010, 2012-2015)	Data Coverage 2001-2016 = 87.3% Data Coverage 2017-2023 =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
VANUATU				
Catch statistics				
Squid jigging fishery	from logbook	2019, 2021-2023	logbook from 2013 to now, coverage	Vanuatu has authorized 4 vessels to conduct Pacific saury and squid jigging

			100%	fishery in NPFC Convention Area. These vessels can target both neon flying squid and Pacific saury, and mainly target Pacific saury.

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.

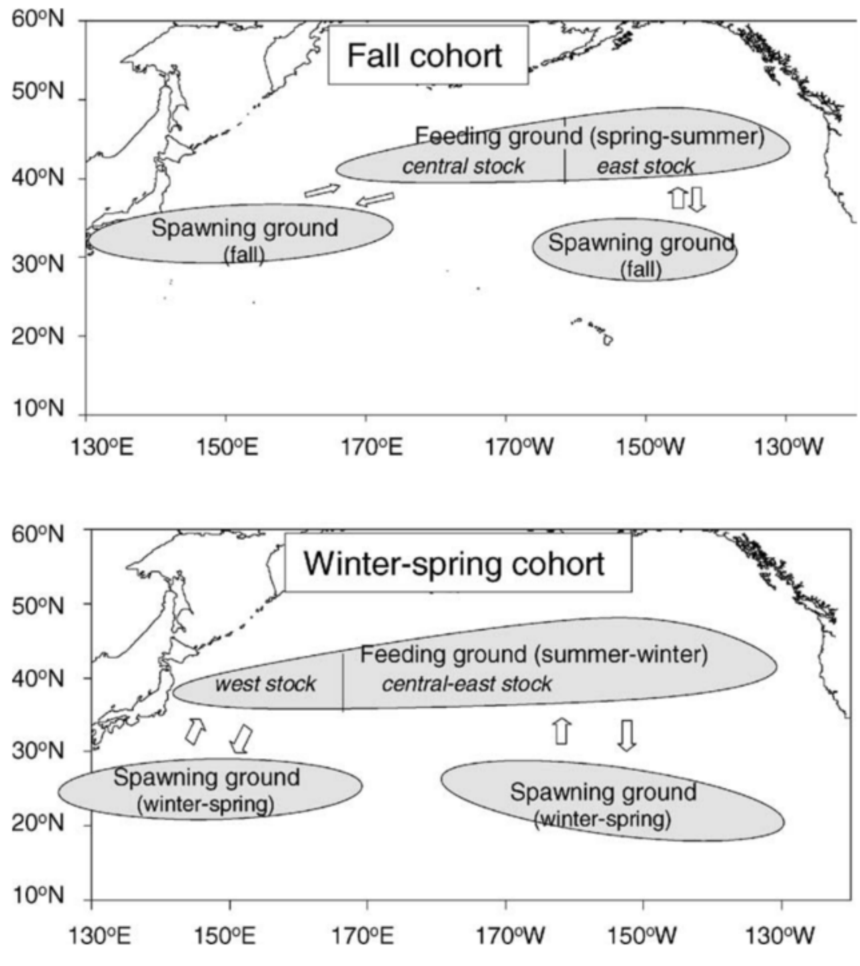

Figure 3. Migration patterns of the fall and winter–spring cohorts of neon flying squid in the North Pacific.

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).

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