North Pacific Fisheries Commission

NPFC-2021-SC06-WP06

2nd meeting of the Small Working Groups on JFS, NFS, SM, and JS
7-8 July 2021 (9 am – 12 pm Tokyo time)
WebEx

Summary

Agenda Item 1. Opening of the meeting

The joint meeting of the Small Working Groups on JFS, NFS, SM, and JS commenced at 9 AM on 7 July 2021, Tokyo time in the format of video conferencing via WebEx. The meeting was attended by Members from Canada (Chris Rooper, Janelle Curtis), China (Luoliang Xu, Heng Zhang, Wei Yu, Yongchuang Shi), Japan (Kazuhiro Oshima, Taro Ichii, Hajime Matsui), Korea (Kyumjoon Park), Russia (Oleg Katugin, Dmitrii Antonenko, Emilya Chernienko, Igor Chernienko, Nickolai Mokrin, Viktor Zamyatin), Chinese Taipei (Wen-Bin Huang, Chih-Shin Chen, Ren-Fen Wu, Tung-Hsieh Chiang), the USA (Kari Fenske) and Vanuatu (Mei-chin Juan) as well as the Secretariat (Dae-Yeon Moon, Alex Zavolokin, Peter Flewwelling, Mervin Ogawa).

The meeting was opened by Dr. Janelle Curtis (SC Chair) who served as the Lead of this joint meeting and was supported by the Leads of the four SWGs: Ms. Kari Fenske (USA), Dr. Luoliang Xu (China), Dr. Kazuhiro Oshima (Japan), and Dr. Chris Rooper (Canada). The Chair informed participants about the resignation of the SWG JFS Lead, Ms. Kari Fenske, from NPFC in August 2021 and that the SWG JFS has to select a new Lead. In addition, Dr. Shota Nishijima, the SWG SM Lead, was not available for the meeting, and Dr. Kazuhiro Oshima volunteered to serve as the Lead.

Agenda Item 2. Adoption of Agenda

There were no amendments to the agenda.

Agenda Item 3. Review the overarching SWG intersessional commitments

The SC Chair briefly reviewed the overarching SWG commitments which are outlined in agenda sub-items 1-4 for each SWG below.

Agenda Item 4. Discussion of the work plan for SWG on Japanese Flying Squid

Ms. Kari Fenske led discussions of the work plan for SWG JFS.

4.1 – Exchange of papers, reports, and other relevant information

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There are seven papers shared on the Mendeley site so far https://www.mendeley.com/community/japanese-flying-squid/. Members noted that there is a lot of literature published on the biology, stock structure, and distribution of JFS, so many more papers are available. Japanese colleagues noted that there are many studies of squid biology, and they will add some to the Mendeley site.

Members were encouraged to add relevant papers to the Mendeley site.

4.2 – Review status quo of the fishery and fishing history

There are multiple stocks or sub-populations of JFS, and these are divided by the season in which they hatch: autumn, winter, spring, and summer. Autumn and winter are the primary (highest abundance) stocks. Spring and summer spawning may be less abundant compared to autumn and winter.

China reported that JFS are a bycatch species only and not targeted by Chinese fisheries. Due to a staffing change, it's unknown (for this meeting) which fisheries do encounter JFS as bycatch. If that answer can be determined in the future, it will be reported to the group. JFS catches from China are very low.

Japan informed the SWG that many fisheries target JFS, and they are a valuable species, popular for human consumption. Japan conducts domestic stock assessments for autumn and winter stocks.

Russia gave a presentation on its fishery for JFS in the NW Pacific Ocean in Russia's EEZ and international waters, though the fleet doesn't go far into the Convention Area. Historically, catch was obtained using jigging gear. Russia had a period of no fishery in NW Pacific Ocean, but resumed the fishery in the 2000s, and switched from jigging to trawl. Russia's presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JFS%20fishery%20Rus.pptx.

Several questions were discussed by Members:

- **What are JFS used for?** JFS are caught for consumption by humans. They are also preyed upon by whales, tunas and other species.
- **Are JFS and neon flying squid easy to differentiate?** Yes, they look very different and are easy to identify, so there should not be species identification problems.
- **Are they caught with other species or mostly by themselves?** JFS are primarily a single species fishery, but during some seasons, they can be caught as bycatch in the Japanese sardine fishery.
- **Can we get more details about age data?** The basic approach for ages uses counting rings on the statoliths, from which we can estimate the hatching date,

measured in days. JFS live about 1 year.

4.3 – Identify available data, data gaps, and data needs

Available data, data gaps, and data needs

Members briefly reviewed the data availability table. No major data gaps were identified during the meeting.

Research surveys

Japan gave a short presentation on its surveys which encounter JFS and some additional detail on their fishing history. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JPN_Fishery%26Survey_JFS.pdf.

- Japan only has data on catch by gear starting in 2002. Coastal jigging is the predominant gear, offshore jigging and bottom trawl are the next most common. There is also a bottom trawl fishery targeting squids in Japan's EEZ. The offshore jigging is predominantly in Japan's EEZ, but is also occasionally in the Convention Area.
- A distribution map of species (winter spawning stock) was shown.
- There are distinct stocks/subpopulations, the autumn and winter groups get sampled and aged and that's how they are divided into stocks. In general, the distribution of each stock is different due to different currents, temperatures, and hatching seasons.
- Stocks move north and offshore to forage as the season progresses.
- There are several surveys in the areas where JFS are found, so they are sampled in these surveys. A trawl survey occurs in May-June, then a jigging survey in June, another trawl survey in Jun-July. Some of these data are used for the domestic stock assessment in Japan.
- There was a question about which season was the primary fishing season for JFS. The main fishing season is for the autumn hatch group, which is the largest in abundance, and fishing occurs on this group in the summer. There is also fishing on the winter hatch group which occurs in the fall.
- JFS migrate to the Sea of Japan via different pathways. There have been attempts to study the genetics of JFS by several Members, to find differences among the spawning cohorts. There have been small differences discovered, but the genetic profile between stocks is similar. Some studies have shown that the autumn spawning stock may be more different from the other seasons's stocks.

Russia informed participants that it conducts a research survey in its EEZ to estimate biomass and abundance of JFS using an area-swept method. However the survey covers only some portion of the stock which migrates to the Russian EEZ, and the collected data may not represent the stock dynamics.

4.4 – Develop species documents with a concise summary of species information, potential data gaps, and progress towards establishing management targets or limits to determine stock status.

Participants viewed the draft species summary progress (Annex A). Several sections need more information that can be filled in after the discussions from the present meeting. The Lead requested each member to provide common names of JFS in their languages. It was noted that the same CMM applies to three species (JFS, NFS and JS) covered in these SWG meetings, so it would be beneficial to have consistent text in each of the species profiles about the CMM and management.

4.5 – Additional activities to support SWG JFS's objectives.

None were noted.

4.6 – Topics and dates for future intersessional meetings.

- The SWG JFS selected Dr. Kazuhiro Oshima as a new Lead of the SWG JFS.
- Participants thanked Ms. Kari Fenske for the great contribution to the SWG and other SC groups she has made over the past years and expressed their gratitude for her passion and dedication.
- The SWG JFS will continue filling in the species summary intersessionally.

Agenda Item 5. Discussion of the work plan for SWG on Neon Flying Squid

Dr. Luoliang Xu led discussions of the work plan for SWG NFS.

5.1 – Exchange of papers, reports, and other relevant information

The Lead noted the scientific papers uploaded by members to the Mendeley site https://www.mendeley.com/community/neon-flying-squid/ and encouraged participants to continue uploading relevant documents. He reminded everyone about pending invitations sent to members.

5.2 – Review of status quo of the fishery and fishing history

Japan reported on the status of its NFS fishery and fishing history. Historically Japan operated jigging and driftnet fisheries, however the latter was banned in 1992. In the recent years, the catch of NFS was less than 10,000 tons and most NFS were caught east

of 170°E in the NPFC Convention Area during summer fishing season. Medium-size squid fishing vessels switch between JFS and NFS depending on the season and squid abundance. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JPN_Fishery%26Survey_NFS.pdf.

China reported on the status of its NFS fishery and fishing history. Squid jigging fishery started in 1993. It targets a winter-spring cohort. Fishing grounds are located in the western part of the Convention Area (36°-48°N and 150°E-175°W). Hand jigging is the fishing gear. Catch data before 2005 are under review and will be provided to the Secretariat after they have been confirmed. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/Neon_flying_squid-China%281%29.pdf.

Participants noted the difference between the main fishing grounds of China and Japan. Japan explained that the autumn cohort mainly inhabits the area east of 170°E while the winter-spring cohort is distributed in both areas east and west of 170°E. In the east area, Japan fishes on the autumn cohort. In the west area, China and Japan fish on the winter-spring cohort although their fishing seasons differ.

Korea reported on the status of its NFS fishery and fishing history. Exploratory fishery was conducted in 2017 (1 vessel) and 2019 (10 vessels) and is being operated in 2021 (as of July). The vessels carry an observer on board who collects information on catch, body length, weight, sex and maturity. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/Neon%20flying%20squid%20fishing%20by%20Korea.pdf.

Russia reported on the status of its NFS fishery and fishing history. NFS was caught mainly within Russia's EEZ. In 1999-2011, NFS catch varied from 101-1,233 tons. In recent year, 2015-2020, catch did not exceed 2 tons. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/NFS%20fishery%20Rus.pptx.

Chinese Taipei reported on the status of its NFS fishery and fishing history. During 1977 and 1979, NFS was fished by jigging. From 1980 to 1992, fishers switched to drift gillnet, and since 1993, the species is mainly captured by jigging. From 1997 onwards, logbooks are used to report catch in the squid fisheries.

Vanuatu reported on the status of its NFS fishery and fishing history. Pacific saury fishery switches to NFS when the primary target species is not abundant. Vanuatu fished NFS only in 2019 (4 vessels, 118 tons). Logbook data are available.

5.3 – Identify available data, data gaps, and data needs

Available data, data gaps, and data needs

The Lead presented a compiled data availability table for NFS from members.

Research surveys

Japan reported time series of standardized CPUEs of the winter-spring cohort from jigging fishery. The standardized CPUE demonstrated a declining trend from 2006 to 2019.

Japan presented the outcomes of its research surveys conducted to collect data for domestic stock assessment. Two areas, west and east of 170°E, are covered by the surveys. The surveys are conducted with a driftnet annually from 1979. Japan noted spatial and temporal variations of the body size composition and CPUEs. Japan distinguished winter-spring and autumn cohorts by size. The analyses indicated that the stock size of the winter-spring cohort in the western area has remained at low level while the stock size of the autumn cohort in the eastern area has been relatively high in recent years. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JPN_Fishery%26Survey_NFS.pdf.

Russia will provide information about its research survey at the next meeting.

Data availability and needs related to spatial and seasonal stock structures

Members discussed data availability and needs related to spatial and seasonal stock structures. Japan pointed out the need for better understanding of stock structure and migrations and noted that it will continue scientific research in this area. Canada recognized the comprehensive studies made by members and suggested, for the purpose of species summary, to draft a simple picture to describe spatial and seasonal distribution of NFS. Members noted the importance of improving the understanding this species' spatial structure before SC begins any stock assessment activity.

Sub-areas for annual catch reporting

The SWG NFS agreed that there is no need for revision of the sub-areas, east and west of 170°E. However, in the future, there may be the need for seasonal information, in addition to spatial data, to address seasonal variations of catch.

The Lead summarized that available data include fishery-dependent abundance indices (potentially from all members fishing on NFS), fishery-independent abundance indices (Japan and Russia), size composition from fishery (China, Japan, Korea, Russia) and size composition from survey (Japan, Russia). This allows application of surplus production models or potentially age-structured models. The group also recognized that the complicated stock structure and fishing behavior from different members need to be better understood before conducting the stock assessment modeling work.

5.4 – Develop species documents with a concise summary of species information, potential data gaps, and progress towards establishing management targets or limits to determine stock status

The Lead will update a species summary document base on the discussions made and information presented at the meeting. A draft will be circulated intersessionally to members for review before SC06 in December. The Lead requested each member to provide common names of NFS in their languages.

5.5 – Identify additional activities to support SWG NFS's objectives

No additional activities were identified.

5.6 – Identify topics and dates for future intersessional meetings

The SWG NFS will continue improving the species summary intersessionally.

Agenda Item 6. Discussion of the work plan for SWG on Spotted Mackerel

Dr. Kazuhiro Oshima led discussions of the work plan for SWG SM.

6.1 – exchange of papers, reports, and other relevant information

The Lead noted three scientific papers uploaded by Japan to the Mendeley site https://www.mendeley.com/community/spotted-mackerel/ and called for other documents from members.

6.2 – Review of status quo of the fishery and fishing history

The Lead reminded participants about the tasks from the previous meeting and presented a summary table of members' annual catch.

Russia clarified that there are no accurate catch statistics on the proportion of spotted and

chub mackerels. However, the portion of SM is very small and probably comprises less than 1% of the total mackerel catch by Russia.

Japan gave a presentation on its SM fisheries. The primary fishing gears are purse-seine (large-scale >40GRT and small-scale <40GRT vessels), set net and dip net. In addition, SM may be caught by other fisheries. In the 1980s, SM were caught mostly by dip net. From the 1990s, large- and small-scale purse-seine fisheries dominated the catch. The SM catch has decreased since 2010s and remains at low levels in recent years. The fishing grounds are located within Japan's EEZ. Japan conducts in-port observations for species identification (SM and CM) and biological data collection. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JPN_Fishery%26Survey_SM.pdf.

China reported that it operates a SM fishery in the NPFC Convention Area only, on the same fishing grounds as ones for chub mackerel. The portion of SM is about 10% although it varies from year to year. China takes samples to determine the composition of mackerel species in the catch and collect biological information.

Russia raised a question about the feasibility of analyzing distribution of spotted and chub mackerels using the information from fisheries.

6.3 – Identify available data, data gaps, and data needs

Available data, data gaps, and data needs

Participants reviewed the data availability table which includes information about catch, abundance indices and biological data from China and Japan.

Research surveys

Japan made a presentation on its research surveys for SM. Japan conducts three surveys: (1) egg and larval distribution survey (every month), (2) juvenile survey (May-Jul from 2001), and (3) pre-recruit fish survey (Aug-Oct from 2001). Japan presented nominal (all three surveys) and standardized (egg and larval distribution survey) abundance indices. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JPN_Fishery%26Survey_SM.pdf.

Stock structure

Japan noted that it conducts stock assessments for the Pacific stock and the East China Sea stock. Only the Pacific stock is distributed in the NPFC Convention Area.

Separation of chub mackerel and spotted mackerel data, including historical data
As discussed earlier, Japan separates CM and SM using samples collected in landing ports, and China relies on information from fishermen.

6.4 – Develop species documents with a concise summary of species information, potential data gaps, and progress towards establishing management targets or limits to determine stock status

Participants reviewed the draft species profile and agreed to fill in the missing information intersessionally. The Lead requested each member to provide common names of spotted mackerel in their languages.

6.5 – Identify additional activities to support SWG SM's objectives

Russia encouraged members to share documents on species identification for SM and CM because, as noted by Members, fishers have a difficult time telling the two species apart. The Secretariat will edit and compile the documents into a brochure and distribute it to members.

6.6 – Identify topics and dates for future intersessional meetings

The SWG SM agreed to continue improving the species summary for SM.

6.7 – Common name: spotted mackerel vs blue mackerel

The SWG SM recommended to SC to change the common name from spotted mackerel to blue mackerel for consistency with FAO database of fish species.

Agenda Item 7. Discussion of the work plan for SWG on Japanese Sardine

Dr. Chris Rooper led discussions of the work plan for SWG JS.

7.1 – Exchange of papers, reports, and other relevant information

- The existing collection of papers and organizational structure of the Japanese sardine Mendeley site was shown https://www.mendeley.com/community/japanese-sardine/.
- The organizational structure of the site was described, and contributors were encouraged to make adjustments to the topic categories as necessary.

- Members were encouraged to add additional literature and to add contributors (if needed).

7.2 – Review of status quo of the fishery and fishing history

- Japan briefly described their Japanese sardine fishery. Their fishery occurs inside Japan's 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. Japan conducts an assessment of the Japanese sardine stock using VPA and a number of data streams (described below). The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JPN_Fishery%26Survey_JS.pdf.
- Russia presented information on the Russian fishery for Japanese sardine. 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 the Russian fishery depends on the migration patterns and overall abundance of Japanese sardine in that 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 from Russia. The Russian fishery occurs primarily from June to November. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JS%20fishery%20and%20survey%20Rus.pptx.
- China described their catches of Japanese sardine. The species is not targeted, but is captured as bycatch by other fisheries (e.g. chub mackerel), 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. Their existing catch records are from 2016 to 2020 and show increasing catches during that time period as the stock has been increasing. The historical catches (prior to 2016) are unknown, thought to be low and likely need to be confirmed. China's catches of Japanese sardine are landed at ports in China and used for human consumption. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JS%20fishery%20Chn.pdf.
- Chinese Taipei does not target Japanese sardine, but they indicated that they had some limited historical bycatch of Japanese sardine. The bycatch was estimated at

~100 mt and has occurred in the Pacific saury fishery.

- Korea also does not target Japanese sardine, but there has some small amount of historical bycatch data, believed to have been captured in bottom trawl fisheries.
- Vanuatu also does not target Japanese sardine and have not recorded any bycatch of this species.

7.3 – Identify available data, data gaps, and data needs

Research surveys and data collection

- China presented its collections of biological data including lengths collected from catches of Japanese sardine in 2020. They also indicated that maturity samples and age structures were also collected in 2020.
- Russia summarized the results of acoustic-trawl surveys that have occurred from 2010-2020 in the Russian EEZ. Russia also presented a summary of its collections of biological data. They collect length and weight data, age structures (scales) and maturity data from both commercial catches and surveys.
- Japan presented data from its surveys that capture Japanese sardine. There are multiple surveys including a pre-recruit, juvenile and monthly egg and larval surveys. The trends in these surveys have matched the increasing trends in Japanese sardine biomass. The egg and larval survey is used as an independent estimate of spawning stock biomass for the Japanese sardine stock assessment conducted by Japan. Japan also collects length, weight, maturity and age data from the survey and fishery. The presentation is available on the Collaboration website https://collaboration.npfc.int/system/files/2021-07/JPN_Fishery%26Survey_JS.pdf.

Available data, data gaps, and data needs

- The table of data availability circulated by the NPFC Science Manager was examined.
- No data gaps or needs were identified at this time.
- The additional catch and biological information from China, Korea, and Chinese Taipei presented under 7.2 and 7.3 that was not originally included, should be added to the data availability table.

7.4 – Develop species documents with a concise summary of species information, potential data gaps, and progress towards establishing management targets or limits to determine stock status

- The components of the draft species summary for Japanese sardine were viewed and discussed (Annex B).

- The Lead requested each member to provide common names of Japanese sardine in their languages.
- The topics of longer-term access to github, species summary standard formatting and NPFC website data formatting were also mentioned as potential future topics for discussion.
- The process for automating the report was briefly described and participants were invited to view the code and become collaborators on the github site (https://github.com/rooperc4/NPFC_Species_Summary)
- The SWG JS Lead will complete revisions to this draft document and circulate to the SWG participants within one month (by August 8th) for comments and additions with the goal of finalizing a version of the Japanese sardine species summary for submission to SC06 in December 2021.

7.5 – Identify additional activities to support SWG JS's objectives

- No additional activities were suggested by participants.

7.6 – Identify topics and dates for future intersessional meetings

- It was suggested that future meetings could work to finalize the species summary document for Japanese sardine.

Agenda 8. Future joint meeting of the SWGs on JFS, NFS, SM, and JS

The SWGs will continue intersessional work, through correspondence, to improve species summaries, provide information about available data and upload scientific papers on the Mendeley sites. Russia and Japan were encouraged to share their stock assessment results in English WPs with other members. The four Leads will summarize the SWGs' activities and present the summary documents at the SC06 meeting in December 2021. If needed, another intersessional meeting will be set to facilitate the work before the SC06 meeting.

Agenda 9. Other matters

None.

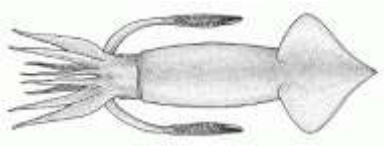
Agenda 10. Closing of the meeting

The meeting closed at 11:40 AM on 8 July 2021, Tokyo time.

Japanese Flying Squid (*Todarodes pacificus*)

Chinese - <insert name in each language, if possible>, Japanese - , Korean - , Russian –

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

Management Summary

The current management measure for Japanese flying squid 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.

An annual (?) stock assessment for JFS is conducted by Japan for their National Waters and used to manage JFS harvest in the Japanese EEZ. <Japan, could you add any relevant information about JFS management measures for your EEZ here? If there are other members who have management measures pertaining the JFS in their EEZ, a sentence or two here would be helpful.

Convention/Management Principle	Status	Comment/Consideration
Biological reference point(s)	🔴	Not established.
Stock status	🔴	Status determination criteria not established.
Catch limit	🔴	
Harvest control rule	🔴	Not established.
Other		None noted

🟢 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 JFS in their national water for the Autumn- and Winter-spawning stocks. (citation of assessment report?).

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. Russia conducts a survey of JFS during their feeding migration into Russian EEZ, this results in an area swept, number, and biomass estimated for Russian EEZ (annual, for winter cohort only). While this survey captures only a portion of the stock so may not fully represent stock biomass, it may could help identify environmental differences in migration patterns, timing, etc.

Fishery

Catches of JFS in the Convention area are low, as the majority of catches come from Japanese and Russian national waters (Figure 1). Catches occur by Members in both the Convention Area as well as National Waters. Catch tables are available at the NPFC website (insert link here). JFS are caught using a variety of gears, most commonly 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, and 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.

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

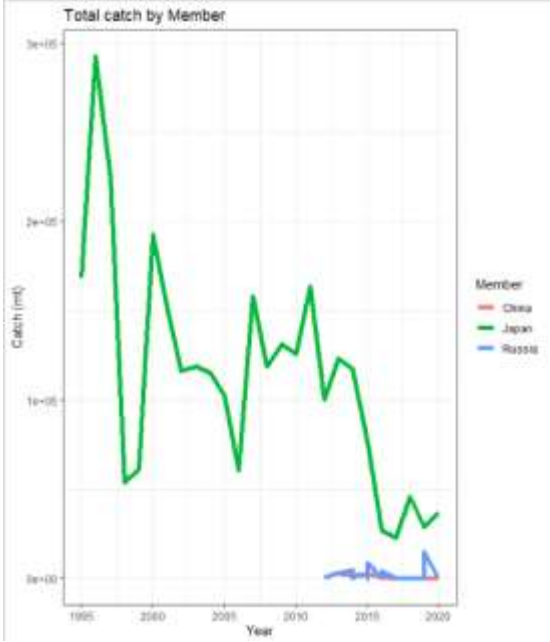


Figure 1. Total catch (mt) for each Member reporting Japanese flying squid catches during 1995-present.

Data table

Data Type	Source	Years Available	Comment
Catch			
Coastal jigging fishery	Japan	1979-2020 (only after 1995 at some ports)	
Offshore jigging fishery	Japan	1979-2020	
Trawl fishery	Japan	1980-2020	
Purse seine fishery	Japan	1995-2020	
Set net	Japan	1995-2020	
Jigging fishery	Russia	Official statistics: 1964-1970, 2013-2020, 1971-2012 (no data available); publications: 1967-2018	
Midwater trawl fishery	Russia	Official statistics: 1964-1970, 2013-2020, 1971-2012 (no data available); publications: 1967-2018	
Size Composition			

Length measurements	Japan	1979-2020	3000-15000 fish/year (about 50 individuals measured per a single size sampling)
Aging	Japan	2012-2020	700-1400 fish/year
Length measurements	Russia	1966-1975, 1992-2020	
Abundance indices (Survey)			
Winter survey for larvae	Japan	2001-2020	BONGO net, 65-204 stations/year
Survey for recruitment from May to June	Japan	1996-2020	Midwater trawl, 24-63 stations/year
Survey for recruitment in June	Japan	1972-2020	Jigging, 25-83 stations/year
Survey for recruitment from June to July	Japan	2001-2020	Midwater trawl mainly targeting saury, 33-136 stations/year
Survey for recruitment in July	Japan	2018-2020	Midwater trawl, 28-39 stations/year
Survey for recruitment in August	Japan	1979-2020	Jigging, 28-66 stations/year
Summer trawl and acoustic (echointegration)	Russia	1992-2020, (June-July) 1992-2020, (July-August)	60-80 stations/year
Abundance indices (Fishery)			
Coastal jigging fishery	Japan	1979-2020	25-37 obs/year, Standardized CPUE for domestic stock assessment

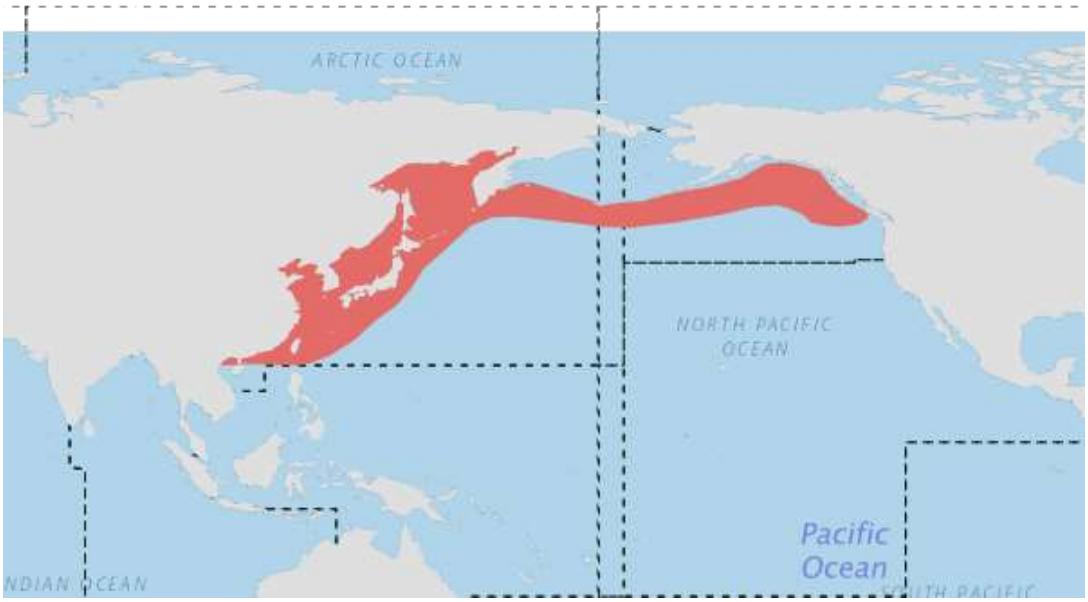
Biological Information

Species ID, Distribution, and Stock Structure

Japanese flying squid are found throughout the northwest and northeast Pacific Ocean, 20° N to 60° N latitude (FAO.org), generally in surface waters (100 m typically) within a temperature range of 5-27°C. There are distinct sub-populations (stocks) which spawn during different seasons. An autumn-spawing stock is most abundance, followed by a winter-spawning stock. There is also evidence of spring- and

summer-spawning JFS stocks (citation needed). Much research has been conducted on linkages between JFS and environmental conditions which may affect their spawning and distribution. <this needs to be filled in with more detail and citations>.

JFS are not commonly mis-identified as other species of squid.



JFS Distribution image from FAO.org, accessed 6-18-21.

Life history

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

Special Comments

<Add any additional information that doesn't fit into categories above.>

Literature Cited

FAO.org http://www.fao.org/fishery/species/3567/en

Code (for reference, not to be retained in the report)

Catch figure (csv file will be uploaded to collaboration site):

```
#set your working drive to location of the data csv file
setwd("your drive here ")
#read in catch data in a tidy format
catchdata <- read.csv("JFS_catch_tidy.csv")
head(catchdata) #verify it read in and note headers
#load required libraries
library(ggplot2)
library(tidyverse)

catchdata %>%
  ggplot()+
  geom_line(aes(x=Year,y=Catch_mt,color=Member),size=2)+
  labs(x="Year",y="Catch (mt)",title="Total catch by Member")+
  theme_bw()
```

Annex B

Species Summary
Japanese Sardine

NPFC Japanese Sardine Small Working Group

2021-07-19

Japanese sardine (***Sardinops melanostictus***)

Common names: (Chinese); Japanese Sardine; (Japanese); (Korean); (Russian) - Need names in each language

Other common names:

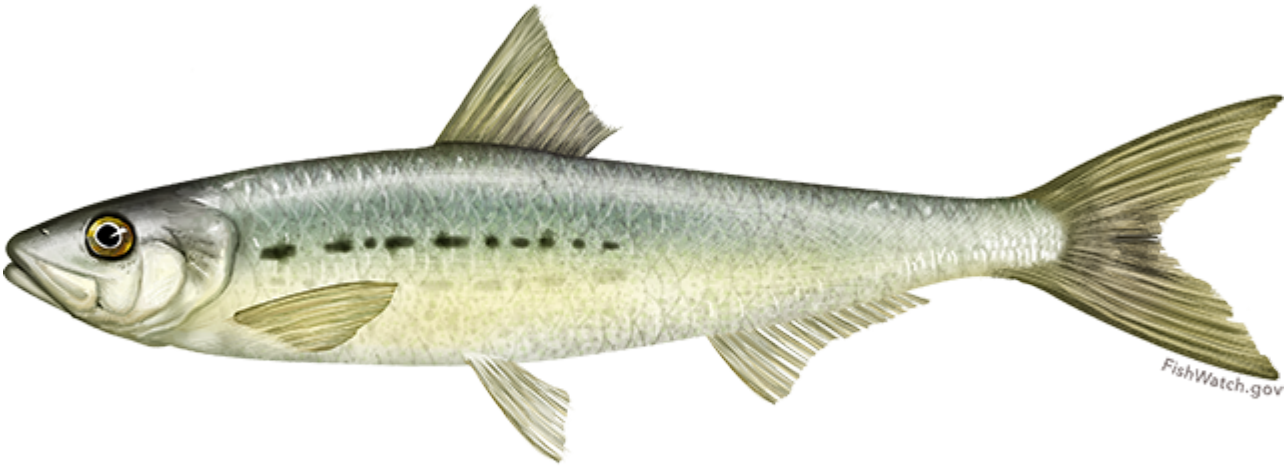


Figure 1: Figure 1. Placeholder picture of Pacific Sardine.

Table 1: Management Summary

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	Intermediate	Recommended catch, effort limits
Harvest control rule	Not accomplished	Not established
Other	Intermediate	No expansion of fishing beyond established areas

Management

Active NPFC Management Measures

The following NPFC conservation and mangement measure (CMM) 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 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.

Assessment

There is currently no stock assessment for Japanese Sardine conducted by NPFC for the convention area.

Japan conducts an assessment of the Japanese Sardine stock using VPA and a number of data sources described below (Hiroshi and Nishida 2005).

Data

Surveys

Japan conducts three surveys that estimate recruitment for a number of pelagic species, including Japanese Sardine (Table 1). 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 [website?]. 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 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 has 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

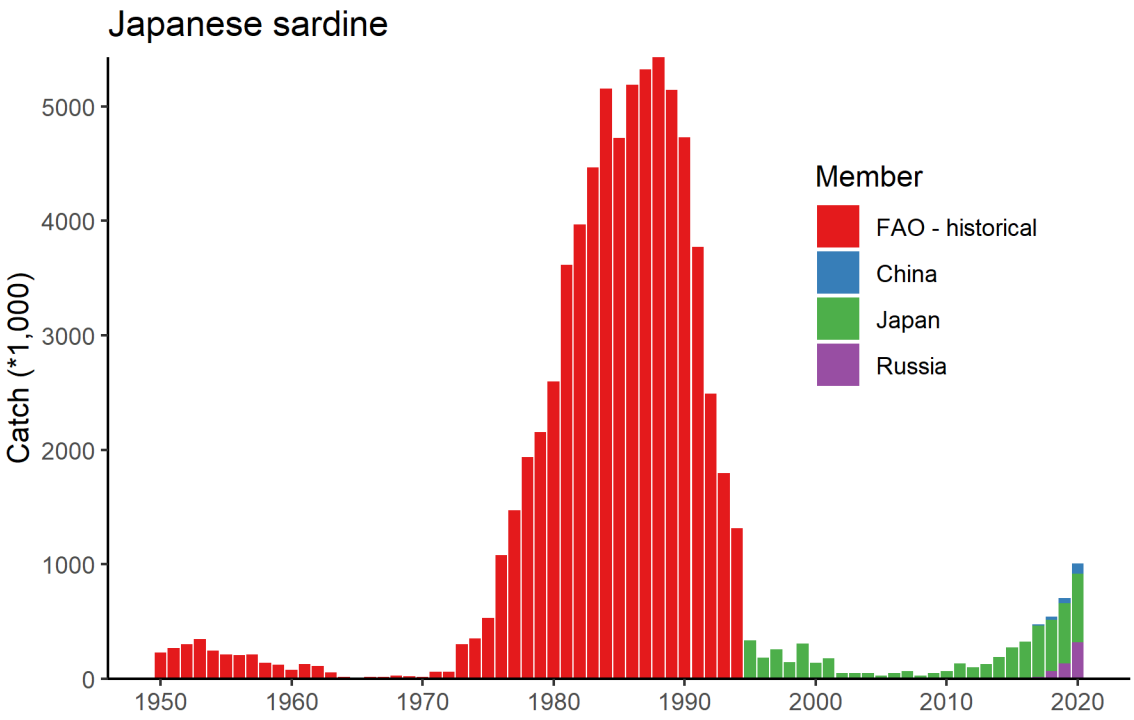


Figure 2: Figure 2. Historical catch of Japanese Sardine.

Vanuatu, Korea and Chinese Taipei do not target Japanese Sardine. Chinese Taipei hsa 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 has no record of Japanese Sardine catches.

Fishery catch data is available for Members from the NPFC website (https://www.npfc.int/system/files/2021-04/NPFC-2021-AR-Annual%20Summary%20Footprint%20-%20Japanese%20Sardine.xlsx) since 2001.

Prior years fishery catch data was downloaded from FAO data collections at https://www.npfc.int/system/files/2021-04/NPFC-2021-AR-Annual%20Summary%20Footprint%20-%20Japanese%20Sardine.xlsx using rfisheries package.

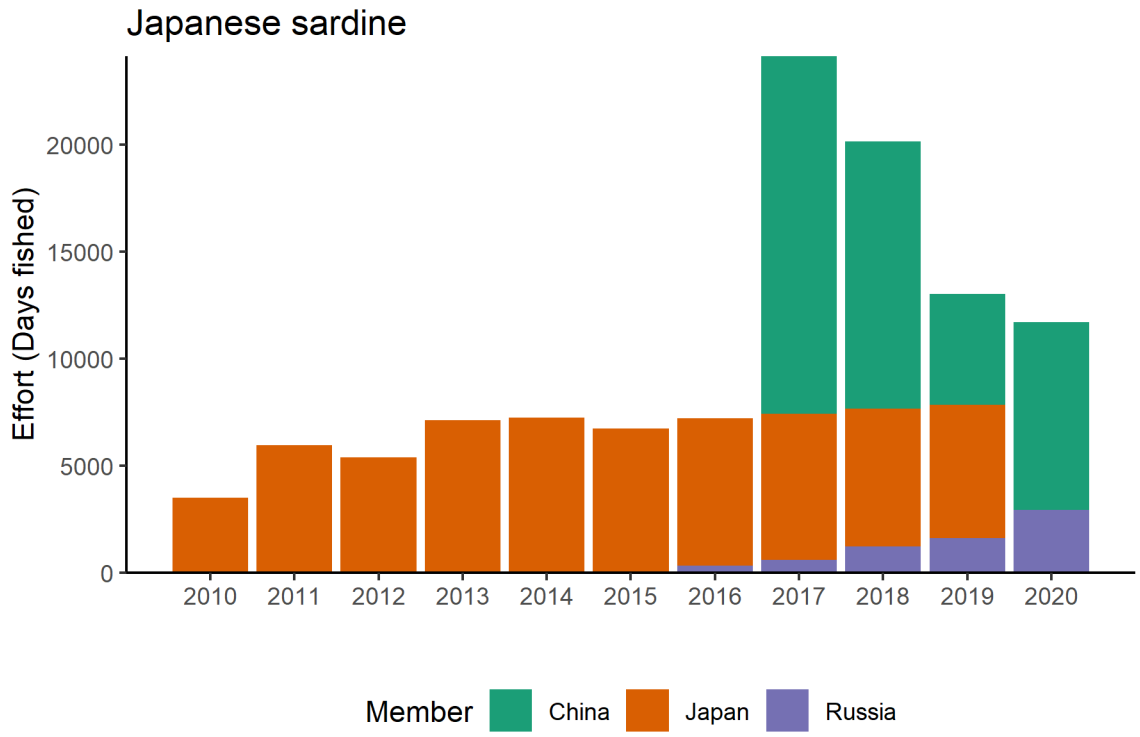


Figure 3: Figure 3. Historical fishing effort for Japanese Sardine.

Biological collections

China collected biological data from fishery catches of Japanese Sardine in 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.

Table 1. Data availability from Members regarding Japanese Sardine

Data	Source	Years	Comment
Catch	China	2016-present	Catches from convention area
	Chinese Taipei		Minor bycatch in Pacific saury fishery
	Japan	1995-present	Historical catch data from 1968 available, catches in national water
	Korea		Minor bycatch in bottom trawl fishery
	Russia	2016-present	Catches primarily in national waters, not convention area
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	Commercial catch
	Japan		Commercial and survey catches
	Russia		Commercial and survey catches
Length data	China	2020	Commerical catch
	Japan		Commercial and survey catches
	Russia		Commercial and survey catches
Maturity/fecundity	China	2020	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 2). 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 (**Whitehead1985?**). 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 inlcuding Sardinops from southern Africa, Australia, South America and California.

[Insert additional text here]

Literature cited

Kaschner, K., Kesner-Reyes, K., Garilao, C., Segschneider, J., Rius-Barile, J. Rees, T., & Froese, R. 2019. AquaMaps: Predicted range maps for aquatic species. Data retrieved from https://www.aquamaps.org. Karthik Ram, Carl Boettiger and Andrew Dyck (2013). rfisheries: R interface for fisheries data. R package version 0.1. http://CRAN.R-project.org/package=rfisheries

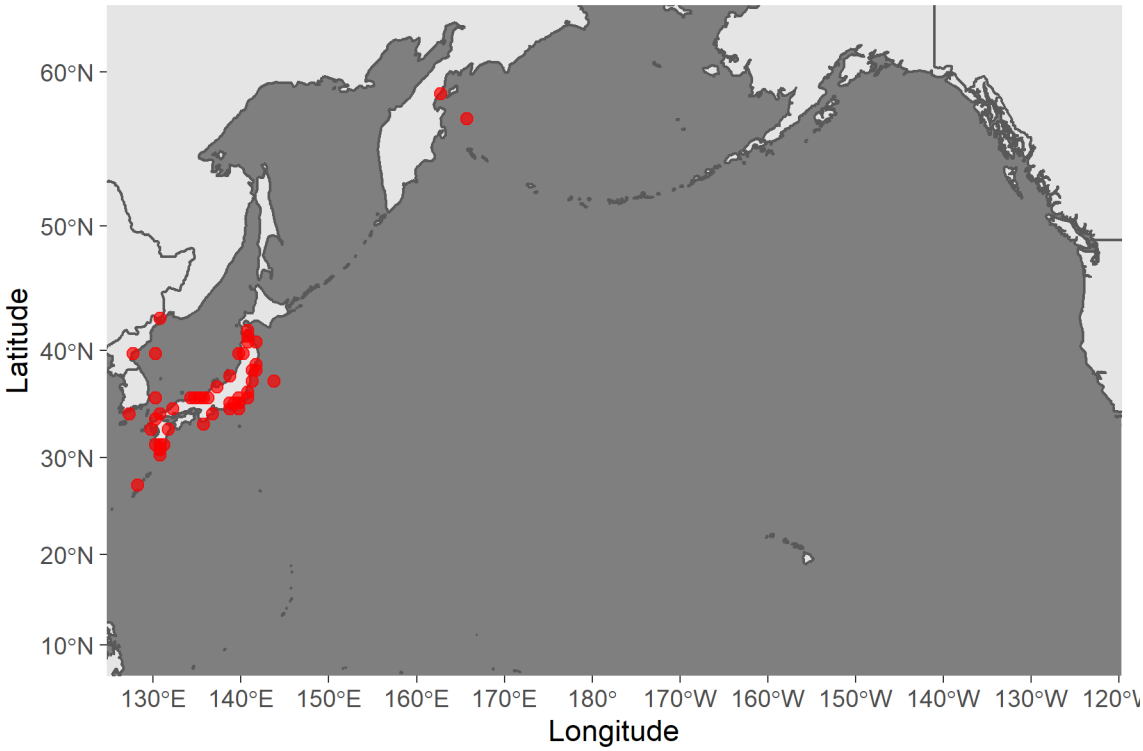


Figure 4: Figure 4. Map of distribution of Sardine species in the North Pacific.

Hiroshi, and Nishida. 2005. "Stock Assessment and ABC Calculation for Japanese Sardine (Sardinops Melanostictus) in the Northwestern Pacific Under Japanese TAC System." In.

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.