



North Pacific Fisheries Commission

NPFC-2021-SC06-WP08

Species summary

Japanese Flying Squid

NPFC Small Working Group on Japanese Flying Squid



Japan Fisheries Research and Education Agency

Japanese Flying Squid (*Todarodes pacificus*)

Common names: 太平洋褶柔魚 (tai ping yang zhe rou yu) (Chinese); Japanese flying squid (English); スルメイカ (surume-ika) (Japanese); 살오징어 (sa ro jing eo) (Korean); тихоокеанский кальмар (tihookeanskiy kalmar) (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 (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.

Convention/Management Principle	Status	Comment/Consideration
Biological reference point(s)		Not established.
Stock status		Status determination criteria not established.
Catch limit		Recommended catch, effort limits.
Harvest control rule		Not established.
Other		No expansion of fishing beyond established areas.

 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 for the Autumn- and Winter-spawning stocks (Kaga et al. 2020, Kubota et al. 2020).

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 Krill Islands waters, this results in number and biomass estimated by area swept method for Krill Islands waters (annual, for winter cohort 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/2021-07/NPFC-2021-AR-Annual%20Summary%20Footprint%20-%20Squids%20%28Rev.%202%29.xlsx>). Catches of JFS in the Convention Area are low, as the majority of catches comes from Japanese and Russian national waters (Figure 1). 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.

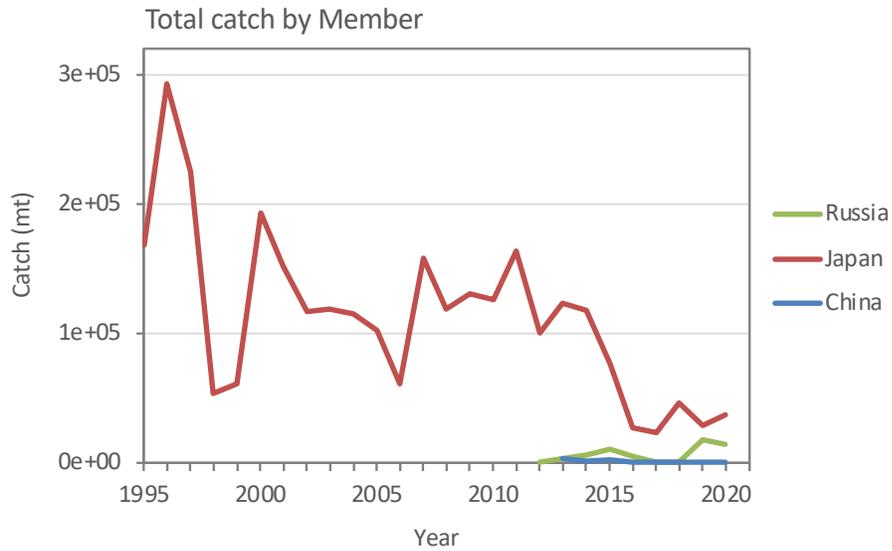


Fig. 1 Total catch (mt) for each Member reporting Japanese flying squid catches during 1995-present.

Data table

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	1979-2020 (only after 1995 at some ports)	Coverage = 100%	
Offshore jigging fishery	Logbook	1979-2020	Coverage = 100%	
Trawl fishery	Logbook	1980-2020	Coverage = 100%	

Purse seine fishery	Official statistics; Reports from fisheries associations and markets (only at Hachinohe and Mie);	1995-2020	Coverage = 100%	
Set net	Official statistics; Reports from fisheries association	1995-2020	Coverage = 100%	
Size composition data				
Length measurements	Port sampling by eight local fisheries research bodies at major ports on the Pacific side	1979-2020	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	2012-2020	700-1400 fish/year	Data coverage in the eastern Hokkaido (Nemuro Strait)
Abundance indices (survey)				
Winter survey for larvae	BONGO net	2001-2020	65-204 stations/year	Review survey protocol and conduct standardization
Survey for recruitment from May to June	Midwater trawl	1996-2020	24-63 stations/year	Review survey protocol and conduct standardization
Survey for recruitment in June	Jigging	1972-2020	25-83 stations/year	Review survey protocol and conduct standardization
Survey for recruitment from June to July	Midwater trawl mainly targeting saury	2001-2020	33-136 stations/year	Review survey protocol and conduct standardization

Survey for recruitment in July	Midwater trawl	2018-2020	28-39 stations/year	Short time series (three years)
Survey for recruitment in August	Jigging	1979-2020	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 from July to December; Standardized CPUE for domestic stock assessment	1979-2020	25-37 observations/year	

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, 2013-2020,	Coverage 1964-1970 ?%;	Data coverage details to be reviewed
Midwater trawl fishery		1971-2012 (no data available); publications: 1967-2018	Coverage 2013-2020 =100%	
Size composition data				
Length measurements	Sampling from commercial fishing vessels.	1966-1975	500-3,000 squids /year (ca.	Data coverage details to be reviewed

	Sampling during research surveys.	1992-2020	50 measurements per sampling)	
Aging	-	-	-	-
Catch at age (CAA)	-	-	-	-
Abundance indices (survey)				
Summer trawl and acoustic (echointegration) surveys to assess pelagic squids abundance	Mid-water upper epipelagic surveys	1992-2020 (June-July) 1992-2020 (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 2 and 3) and their northward/southward shifts in distribution range occur in response to changes in water temperature (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 (Cuttlefishes and Squids of the World, FAO. org).



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

Fig. 2 Distribution of Japanese flying squid.

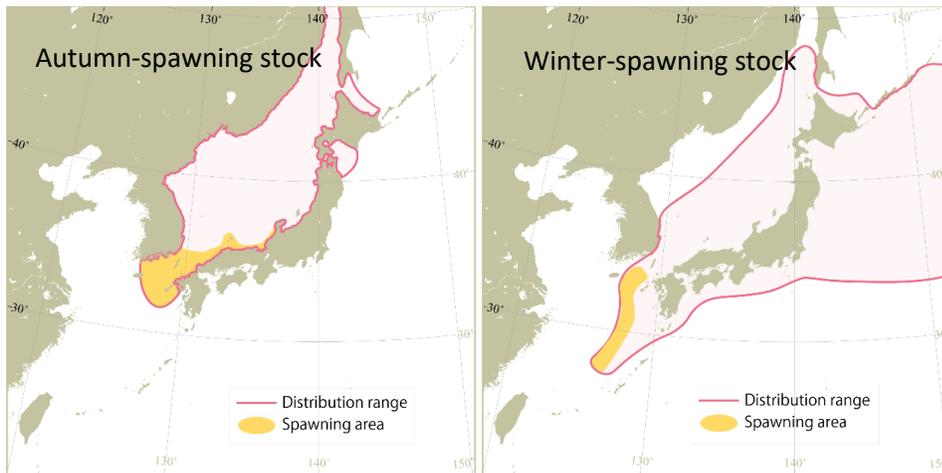


Fig. 3 Distribution ranges and spawning areas of autumn- and winter-spawning stocks. These figures were modified based on Kubota et al. (2020) and Kaga et al. (2020).

Stock Structure

There are distinct sub-populations (stocks) which spawn during different seasons (FAO.org, Sakurai et al. 2013). An autumn-spawning stock is most abundance, followed by a winter-spawning stock which is distributed in the waters off eastern Japan Oyashio region (Sakurai et al. 2013, Kaga et al. 2020, Kubota et al. 2020). 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. 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.

Literature Cited

Cuttlefishes and Squids of the World <http://www.zen-ika.com/zukan/index-e.html>

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

Kaga, T., Okamoto, S., Kubota, H., Miyahara, H. and Nishijima, S (2020) Stock assessment and evaluation for winter-spawning stock of Japanese flying squid (fiscal year 2020). In Marine Fisheries Stock Assessment and Evaluation for Japanese Waters (fiscal year 2020/2021). Fisheries Agency and Fisheries Research and Education Agency of Japan. <http://abchan.fra.go.jp/digests2020/details/202018.pdf>

Kubota, H., Miyahara, H., Kaga, T., Okamoto, S., Nishijima, S., Matsukura, R., Takasaki, K., Saito, T and Inagake, D. (2020) Stock assessment and evaluation for autumn-spawning stock of Japanese flying squid (fiscal year 2020). In Marine Fisheries Stock Assessment and Evaluation for Japanese Waters (fiscal year 2020/2021). Fisheries Agency and Fisheries Research and Education Agency of Japan. <http://abchan.fra.go.jp/digests2020/details/202019.pdf>

Sakurai, Y., Kidokoro, H., Yamashita, N., Yamamoto, J., Uchikawa, K., & Takahara, H. (2013). *Todarodes pacificus*, Japanese common squid. Advances in Squid Biology, Ecology and Fisheries. Part II Oegopsid Squids. Nova Biomedical, New York, 249-272.