



North Pacific Fisheries Commission

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Information Paper submitted by Japan

Japan Japanese Sardine Stock Assessment

## Abstract

Japan is sharing four domestic stock assessments - blue mackerel (IP03), chub mackerel (IP04), Japanese flying squid (IP05), and Japanese sardine (IP06) for information sharing purpose.



## Japanese sardine (Pacific stock)

Japanese sardine is widely distributed around Japan, and this stock is the group that is distributed in the Pacific Ocean.

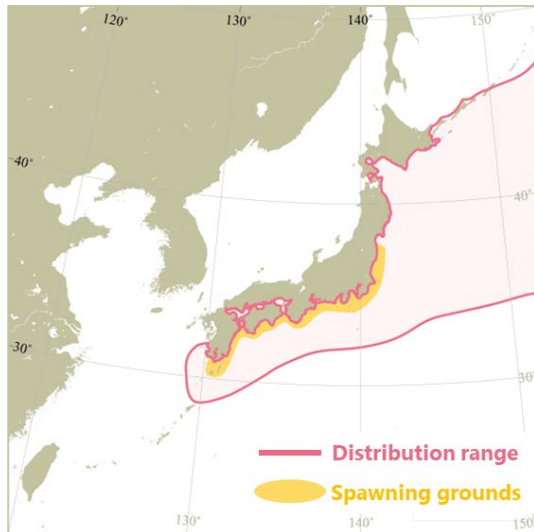


Figure 1 Distribution

Japanese sardine is distributed widely along the Pacific coast of Japan. Since the 1990s, spawning grounds have been formed in the inner Kuroshio region in various areas from off Shikoku Island to the Kanto area.

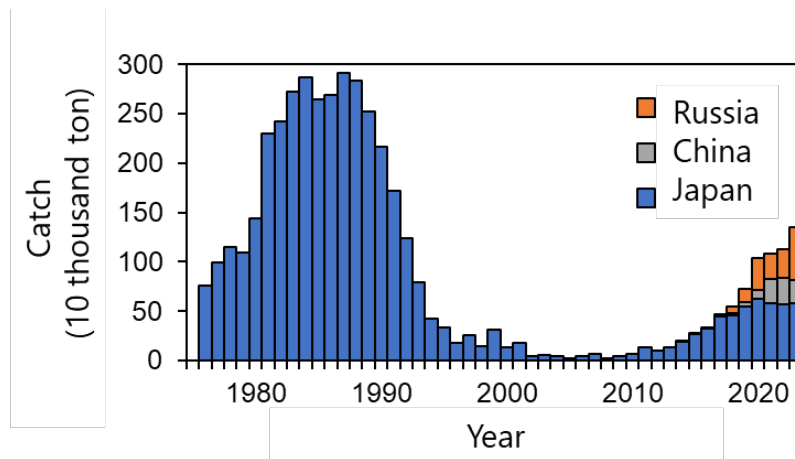


Figure 2 Total catch

The total catch had increased in the late 1970s and remained at high level of over 2.5 million tons in the 1980s; it declined sharply in the 1990s and remained at level in the 2000s; it turned upward in the 2010s, with Japan's catch of 577 thousand tons in 2023. In recent years, catches by foreign vessels have been increasing, with Chinese and Russian catches of 233 thousand and 544 thousand tons, respectively, in 2023. Catches from China and Russia have been included since 2017 and 2014, respectively.

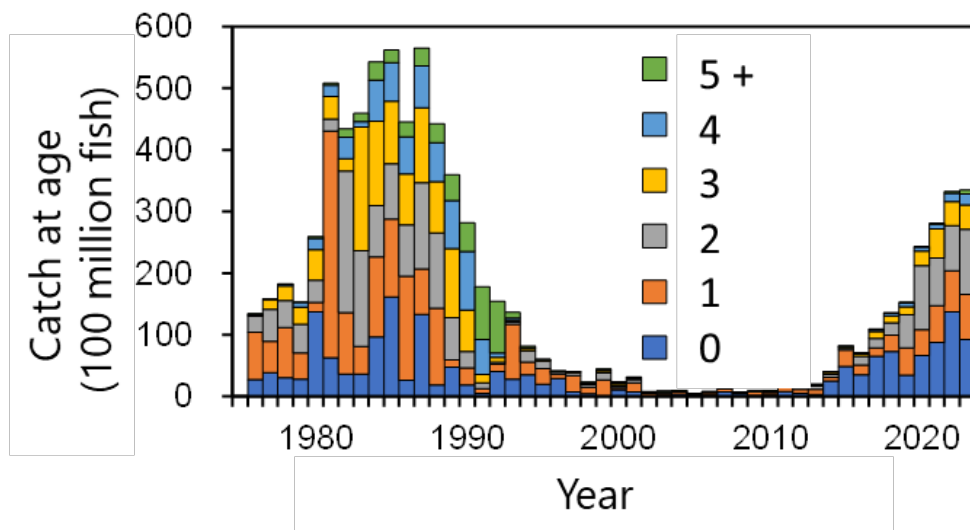


Figure 3 Catch at age

The majority was ages 0 and 1 fish, but the proportion of age 2 and older fish has increased since 2016. Length data from Chinese catches were also used in the estimation.

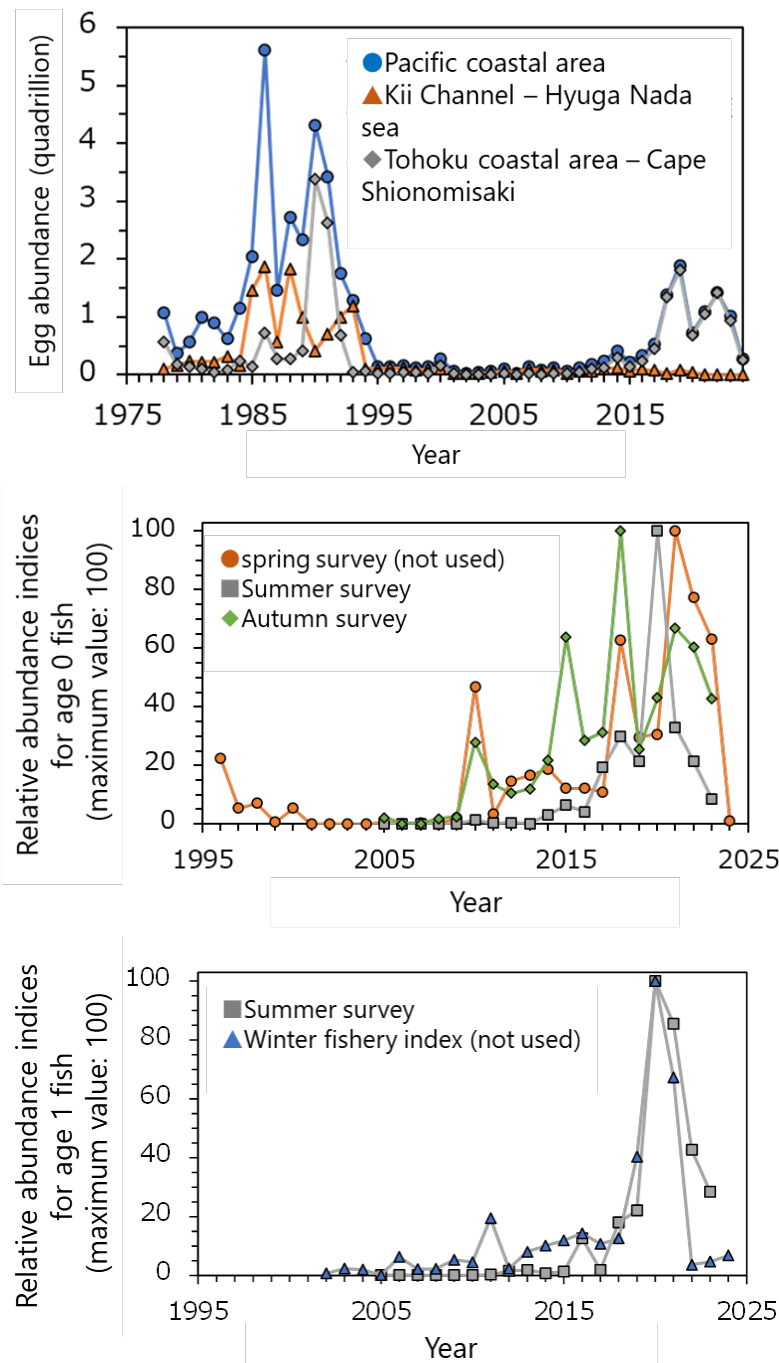


Figure 4 Stock abundance indices

Egg abundance, an indicator of spawning stock biomass, was at low level in the early 2000s. In recent years, egg abundance has increased, reflecting the increase in spawning stock biomass, and the increase is particularly noticeable in East Japan.

All abundance indices for recruitment (age 0) and age 1 fish from summer and autumn surveys show relatively high values for the 2010 year class and younger in recent years.

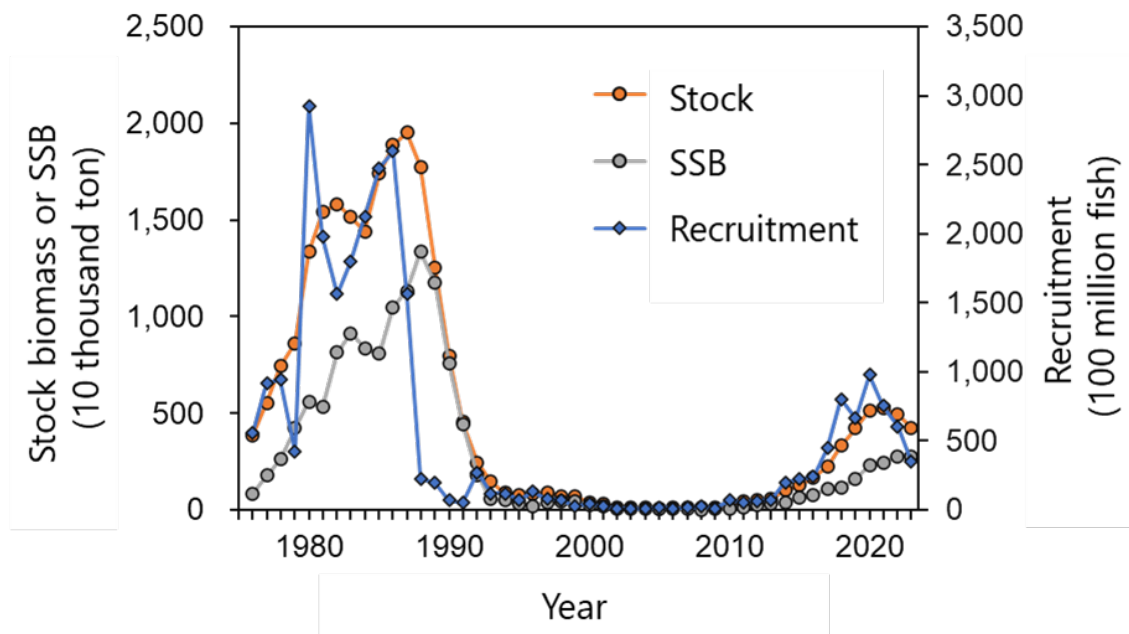


Figure 5 Trends in stock abundance, spawning stock biomass (SSB), and recruitment

Stock biomass has increased since 2010 and exceeded 1 million tons in 2014, but has been decreased since 2021. It was estimated at 4,264 thousand tons in 2023. SSB has also shown the similar trend, and was estimated to be 2,791 thousand tons in 2023. Recruitment (numbers at age 0) showed relatively high levels during 2019-2022, but has shown a decreasing trend recent years. It was estimated at 35.1 billion fish in 2023, lowest among the last five years (2019–2023).

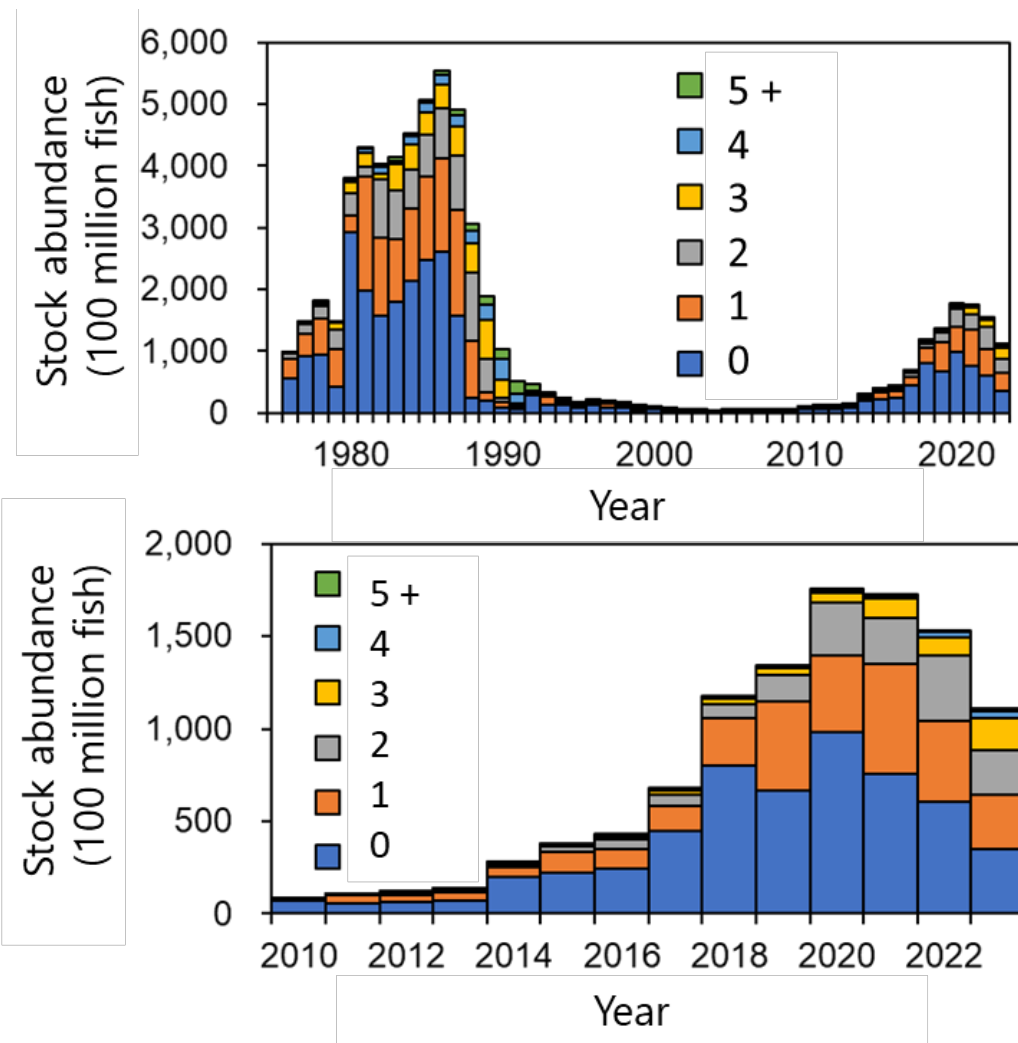


Figure 6 Numbers at age

Although the majority of stock was composed of ages 0 and 1 fish, the percentage of 2 years old and older fish has been increasing in recent years.

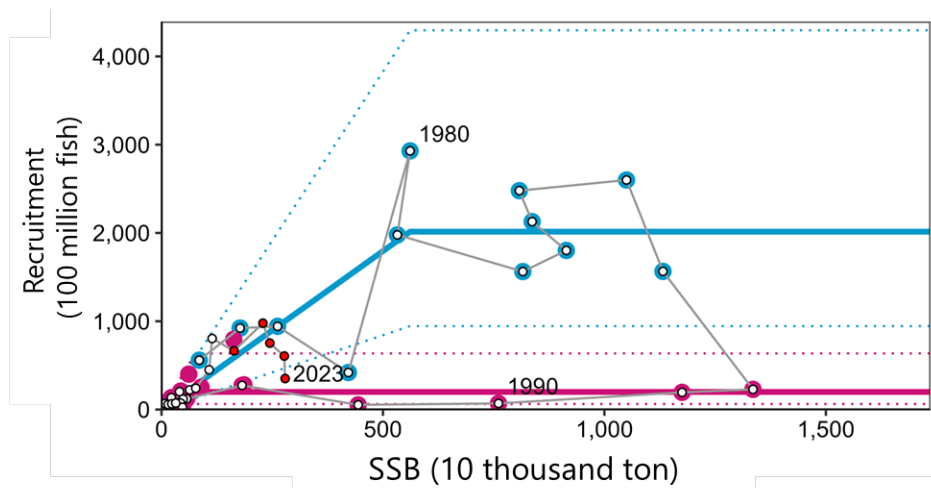


Figure 7 Stock–recruitment relationship (red line: ordinary productivity period; blue line: high productivity period)

A hockey-stick type stock-recruitment relationship was applied to two different stock productivity periods as follows: high productivity period, 1976-1987 (blue line); ordinary productivity period, 1988-2018 (red line). The blue and red dotted lines indicate ranges which include 90% of observed recruitment and SSB for each productivity period. Red and blue circles indicate observed values of recruitment and SSB, which were used for estimation of stock-recruitment relationship in the 2020 stock assessment. White circles show values of recruitment and SSB updated in the 2023 stock assessment. Red circles with outer black circles show observed recruitments and SSBs for the last five years (2019–2023)

\*Management reference points and future projections are based on stock–recruitment relationships for the ordinary recruitment period. The transition to the high recruitment period will be considered depending on the future recruitment levels.

Table 1 Reference points, estimated values and total catch

The target reference point (TRP) was estimated at 1,187 thousand tons, and the limit reference point (LRP) at 487 thousand tons. The fishing ban level was estimated at 69 thousand tons. Spawning stock biomass (SSB) was estimated at 2,791 thousand tons, and the maximum sustainable yield (MSY) at 389 thousand tons. The total catch in 2023 was 1,354 thousand tons.

TRP	LRP	Ban level	SSB in 2023	MSY	Total catch in 2023
1,187 thousand t	487 thousand t	69 thousand t	2,791 thousand t	389 thousand t	1,354 thousand t

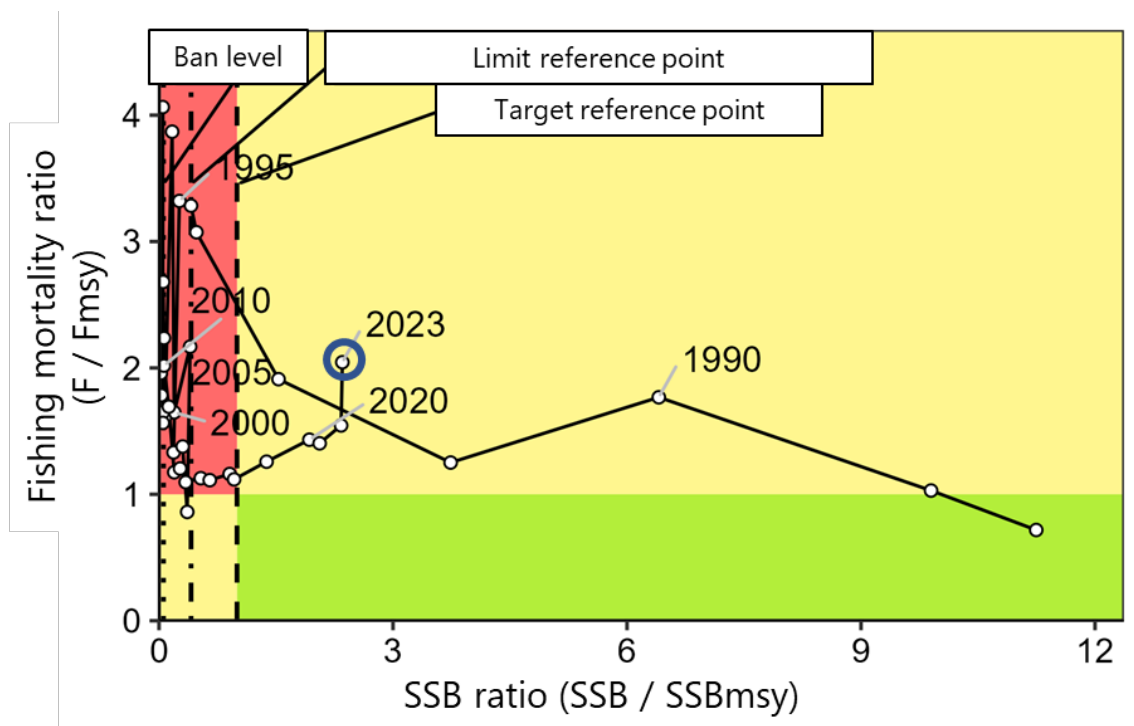


Figure 9 Kobe plot

Since 1988, in many years the spawning stock biomass (SSB) has been below the spawning stock biomass that achieves maximum sustained yield (SSB<sub>msy</sub>) and fishing mortality (F) has been above the fishing mortality that maintains SSB<sub>msy</sub> (F<sub>msy</sub>). In recent years, fishing mortality has declined and has remained equal to F<sub>msy</sub> since 2012, but has been increasing since 2019. As fishing mortality has decreased in recent years, SSB has increased and has been above SSB<sub>msy</sub> since 2018.

\*Reference points from the regular productive period (1988–2018) were applied.