



North Pacific Fisheries Commission

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## **Description on Japanese chub mackerel fisheries with emphasis on those seasonality and fishing grounds**

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### **Summary**

This document provided the decadal monthly catch from Japanese chub mackerel fisheries and the pictures of fishing grounds. The monthly catch showed a periodic change annually over recent decade, which started to increase after July to October, when it touched bottom annually, reached peak in the 3rd quarter to the 4th quarter of the following year and finally dropped to the bottom. The fishing year reflecting this seasonal change of catch has been applied in the Japanese domestic stock assessment. It was recommended that the introduction of fishing year should be considered in development of the NPFC stock assessment of chub mackerel according to seasonal variation of catch and biological background of target species.

### **1. Introduction**

Chub mackerel stock is one of the NPFC priority species and managed in Japan based on the domestic stock assessment results (Yukami et al. 2020). The Technical Working Group of Chub Mackerel Stock Assessment (TWG CMSA) has a plan to complete the benchmark stock assessment before 2023.

Initially important settings towards the stock assessment include the definitions of fishing year. There appeared different views regarding introduction of fishing year between the Members in the 3rd meeting of the TWG CMSA (3rd Meeting of the Technical Working Group on Chub Mackerel Stock Assessment). As a result, the Members agreed to present monthly catch data and the map of their fishing grounds at the 4th meeting of TWG CMSA. Those information is expected to facilitate discussion on a characterization of chub mackerel fisheries. In this document, we describe Japanese chub mackerel fisheries particularly in terms of their seasonality and fishing grounds.

### **2. Materials and methods**

#### **2.1. Brief description on Japanese fisheries**

In Japan, chub mackerel are commercially harvested by purse seiners, set nets and dip nets (Yukami et al. 2020). A large portion of annual catch of this species has been recorded by the purse seiners, which are composed of two categories according to size of fishing boat. The former is the small-scale purse seiners, of which the fishing grounds are limited in coastal waters. This type of purse seiners is operated by the fishing boats approximately smaller than 40 gross registered tonnage (GRT). The latter is the large-scale purse seiners operated in the offshore waters within the Japanese EEZ by the fishing boats of 40 GRT and larger. The catch by the large-scale purse seiners account for a large portion of the annual total catch of this species (see Results and discussion). The spatial and temporal changes in fishing ground of Japanese chub mackerel fisheries, hence, can be characterized by those of the large-scale purse seiners.

## **2.2. Monthly catch**

The annual mackerels (chub and spotted mackerels) catch can be obtained from the Annual Report of Catch Statistics on Fishery and Aquaculture published by the Statistics Department, Ministry of Agriculture, Forestry and Fisheries, the Government of Japan. The Prefectural research bodies historically have collected species-specific information on monthly catch, size measurement and so on, which have been used for the domestic stock assessment. Those information allow to calculate the temporal catch information by fishing gear, resulting in providing the monthly catch to the last decade.

## **2.3. Fishing ground maps**

The large-scale purse seiners are mandated to submit logbook on a regular basis. The logbook contains information on mackerels catch in weight by species and operational position. The catch in weight and fishing effort (number of boats per day) were aggregated into 1x1 degree in latitude and longitude on a quarterly basis using the logbook from 2010 to 2019.

# **3. Results**

## **3.1. Historical catch in weight by fishery**

The total annual catch for chub mackerel showed long-term fluctuation from 1970 to 2020 (**Fig. 1**). The annual catch, in general, decreased before 1990s and remained at the historical lower level before mid-2000s, whereas the twice sudden increase occurred in 1993 and 1997. The annual catch of the large-scale purse seiners accounted for a large part of the total one over the period. On the other hand, the second place was changed among the other fisheries, dip net and others, set net and small-scale purse seiners for

1970s, 1990s and the first half of 2000s, and recent years, respectively.

### **3.2. Monthly catch in weight in recent decade**

Chub mackerel are harvested throughout the year (**Fig. 2**). The monthly catch, as a whole, showed a uniform variation pattern annually over the period and touched bottom in the period of July to October, when the minimums were recorded 6 times in August. After the bottoms, the catch showed an upward trend, reaching a peak in the period of October to January, when the maximums were recorded 5 times in December. The dominant fishery, the large-scale purse seiners, showed a consistent variation pattern in the monthly catch, although the others have been dominant in the first half year since 2017.

### **3.3. Seasonal fishing ground**

Although mackerels landings have been sorted by species at the fishing ports, the logbooks from the large-scale purse seiners record the species-inclusive catch in weight regarding mackerels due to sympatric occurrence of fishing ground of chub and spotted mackerels.

**Figure 3** shows geographical distributions of fishing effort directed to mackerels by year and by quarter from 2010 to 2019. The fishing efforts were clearly deployed within the Japanese EEZ, changing their locations according to season.

The locations of mackerels catch changed their latitudinal positions according to season (**Fig. 4**), because mackerels make seasonal migration in a north-south direction (Watanabe et al. 2012; Ichinokawa and Okamura 2019). The chub mackerel were fished off the eastern and central part of Japan in the second half year, whereas they were caught off the central and western part in the first half year.

## **4. Discussion**

The monthly chub mackerel catch showed a periodic variation annually so that this result allows us to set fishing year in accordance with its periodicity. The periodicity can be described as follows: the monthly catch starts to increase after July to October, when it touches bottom annually, reaches peak in the 3rd quarter to the 4th quarter of the following year and finally drop to the bottom.

The chub-mackerel-specific fishing year which starts from July and ends in June is applied to both the domestic stock assessment and the management in Japan (Yukami et al. 2020). This fishing year reflects a seasonal pattern of the Japanese chub mackerel fisheries as shown in this document. Furthermore, the spawning season of this species from January to June (Watanabe 2010) corresponds to the second half fishing year, so that

the recruitment of age-0 fish occurs in the first half fishing year. The fishing year defined in the Japanese domestic stock assessment also reflect the biological character of this species.

Consequently, it is recommended that the introduction of fishing year should be considered in development of the NPFC stock assessment of chub mackerel according to seasonal variation of catch and biological background of target species.

## References

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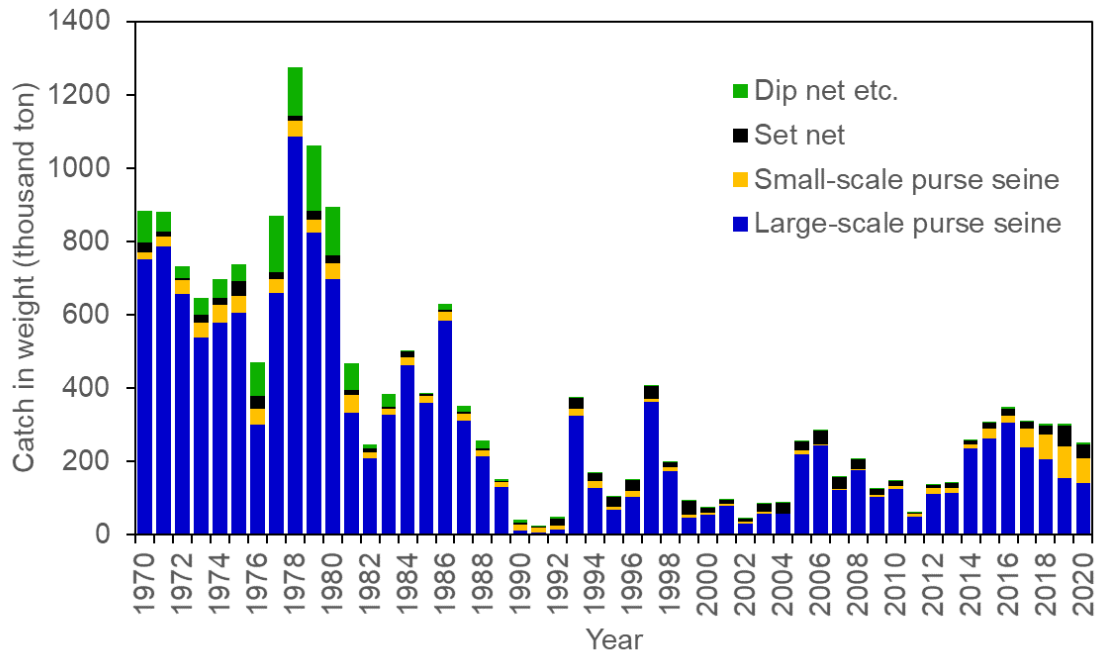


Fig.1 Annual catch in weight of chub mackerel by fishery from 1970 to 2020. Year indicates calendar year.

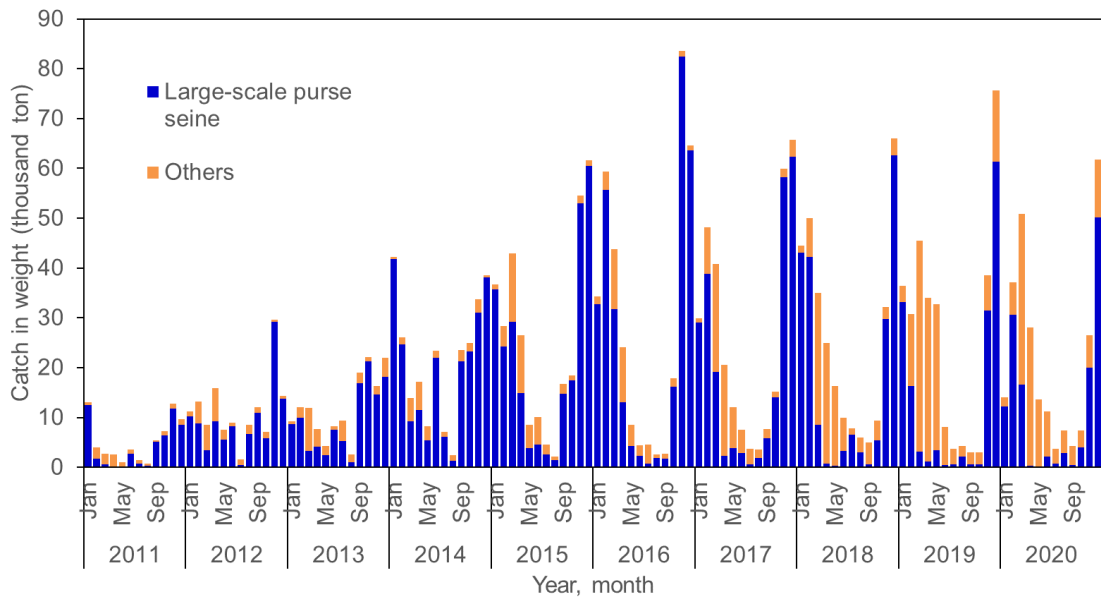


Fig. 2 Monthly catch in weight of chub mackerel for the large-scale purse seine and other fisheries from 2011 to 2020.

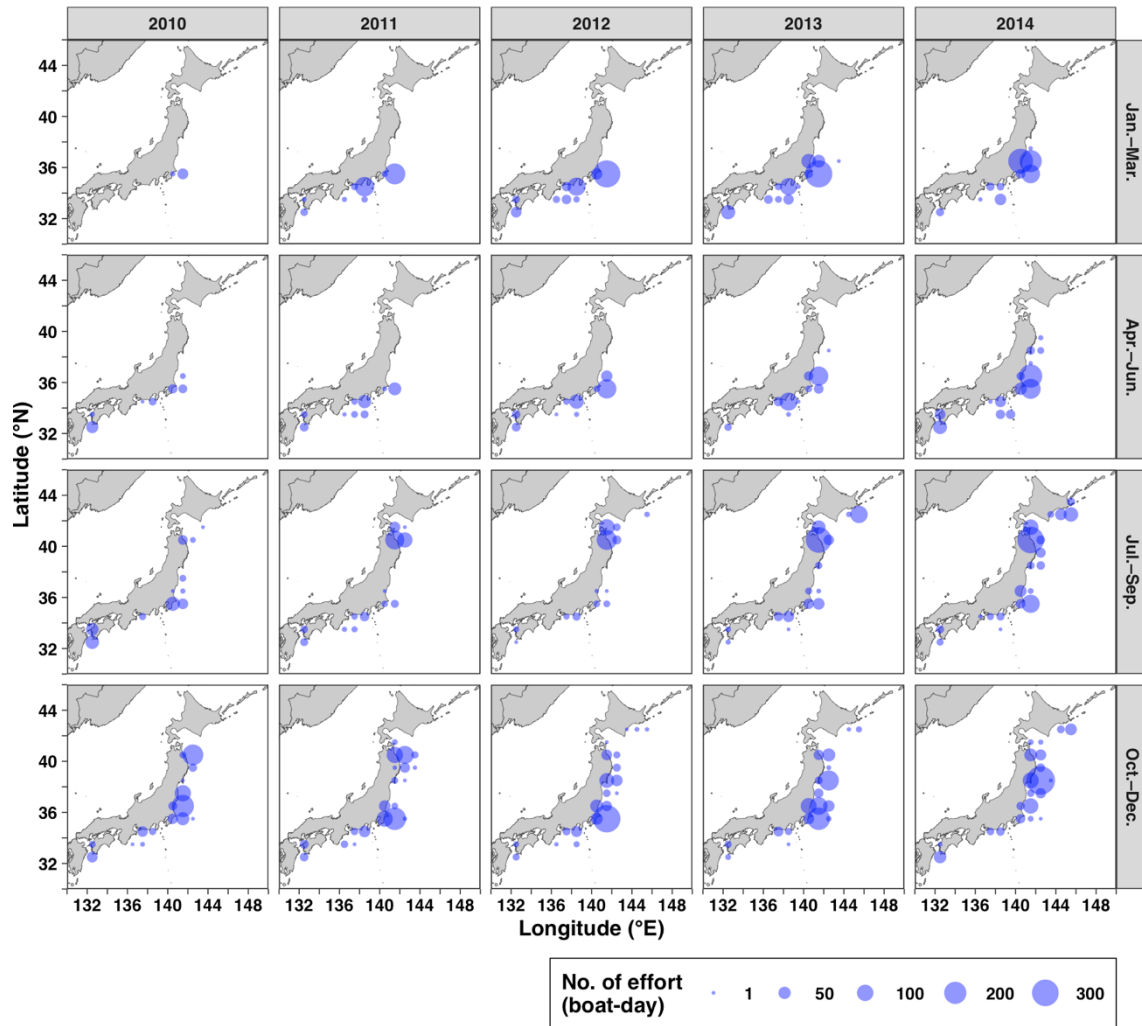


Fig. 3 Quarterly geographical distributions of fishing effort of the large-scale purse seiners from 2010 to 2019. Fishing efforts are defined as number of boat per day.

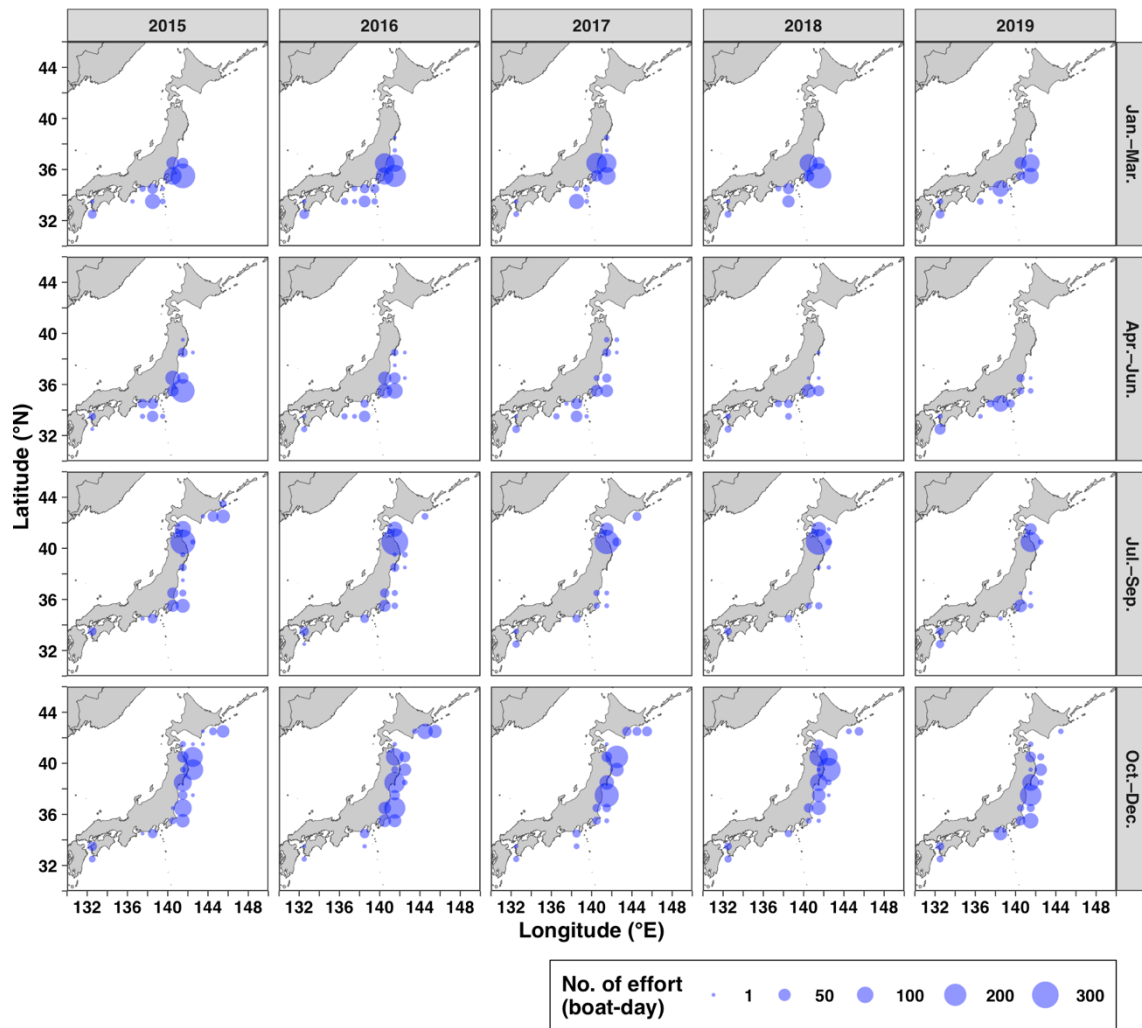


Fig. 3 Continued.

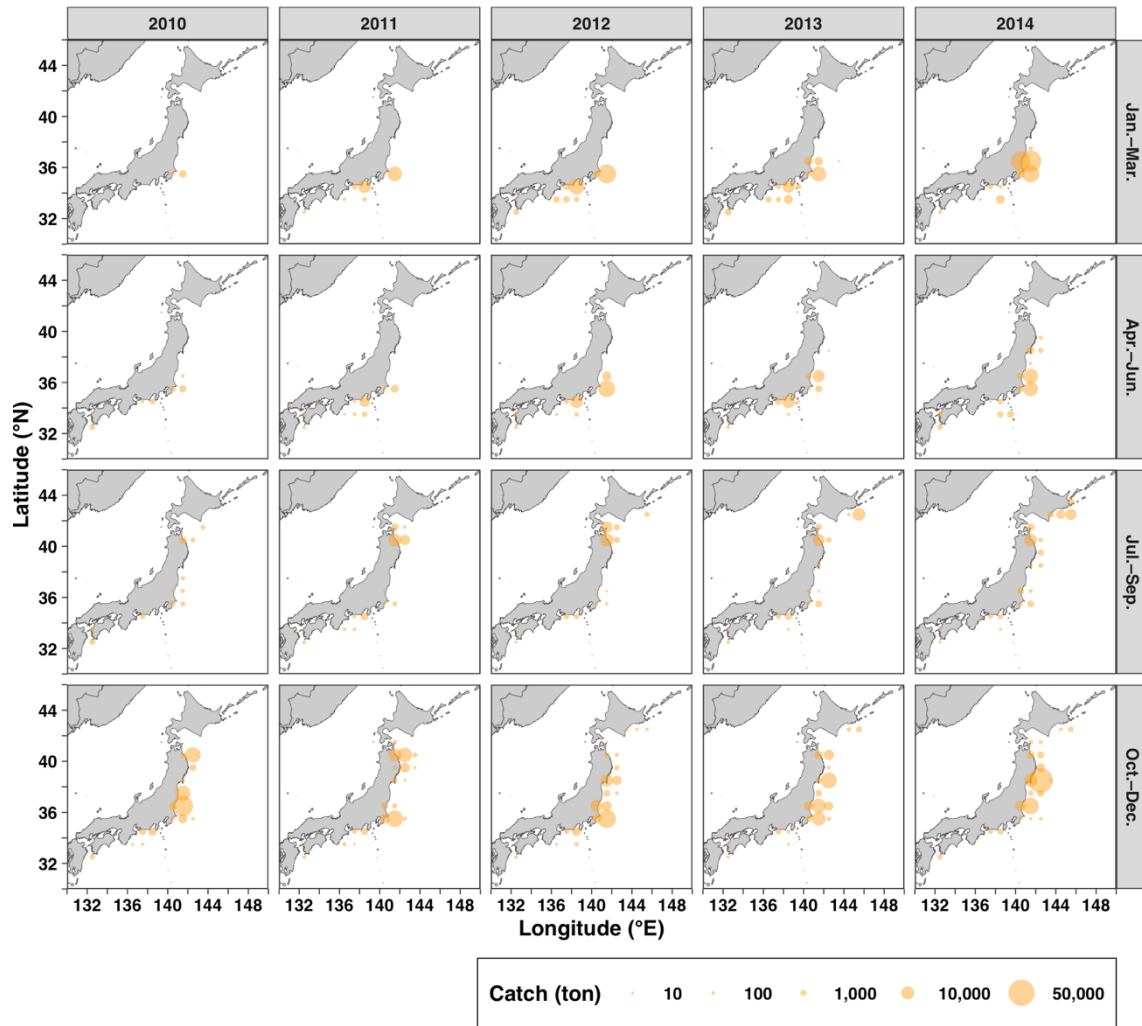


Fig. 4 Quarterly geographical distributions of catch in weight of mackerels caught by the large-scale purse seiners from 2010 to 2019.



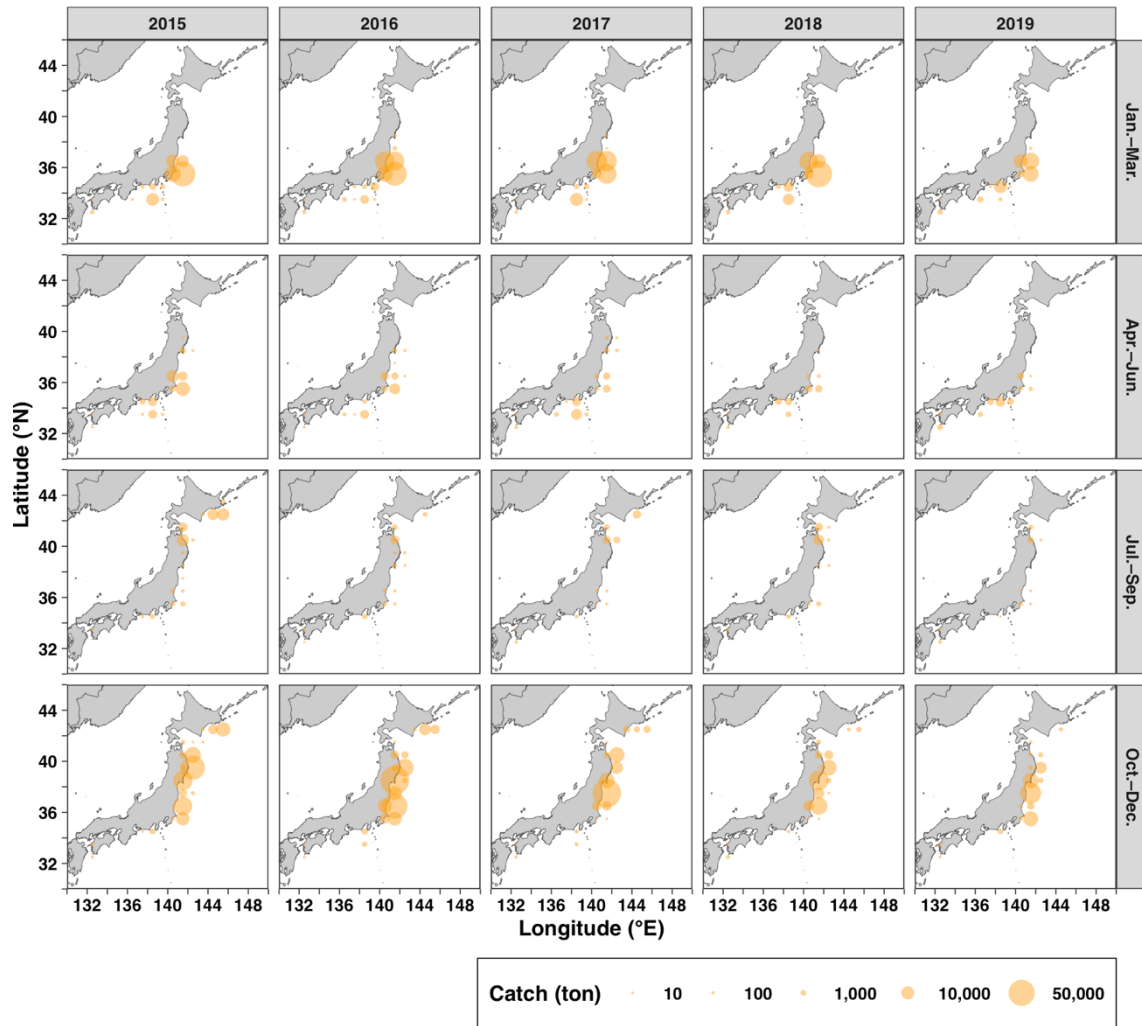


Fig. 4 Continued.