

Review of Japanese longline fishery and its albacore catch in the Indian Ocean

by

Takayuki Matsumoto

National Research Institute of Far Seas Fisheries,
7-1, Orido 5-chome, Shimizu, Shizuoka, 424-8633, Japan

Summary

Status of effort, albacore catch and CPUE were summarized for Japanese longline fishery operating in the Indian Ocean including recent trends. Japanese longline vessels had been targeting albacore until late 1960s, albacore became non-target after that, but it appears to be one of target species in recent years. Fishing effort fluctuated and it sharply decreased in recent years due to the effects of piracy activities. Albacore catch was high in 1960s, sharply decreased in 1970s, gradually increased with fluctuation after that, and then is decreasing after mid 2000s. In the early period, the effort was deployed mainly in the tropical area, and then expanded to the south. Fishing effort in the northwestern part (around Somalia) sharply decreased after 2009 due to piracy activities. During 1960s albacore was main component of the catch in the western part between 10°S and 35°S, and is recently main component in the southern part including west off Australia and around Madagascar.

1. Introduction

There are two kinds of Japanese tuna fishery in the Indian Ocean, i.e. longline and purse seine fisheries. Of those, only the longline fishery has caught albacore. The longline fishery commenced in 1952 in the eastern equatorial waters in the Indian Ocean. The fishing effort of the longline first expanded westward, and then southward. In the late 1960s, the effort covered entire fishing ground of the longline in the Indian Ocean. The annual amount of the effort has changed since the late 1960s. And also annual albacore catch have considerably changed, ranging from 400 t to 18,000 t (Fig. 1), as well as catches of other tunas. Those changes were mainly due to the change of targeting as seen in the other Oceans.

In this document, historical and spatial changes of albacore catch, CPUE and the fishing effort by Japanese longline fishery are described in conjunction with the catches of the other tunas and tuna-like species. These will be useful for considering CPUE standardization for albacore caught by Japanese longline fishery.

2. Data source

In order to count number of hooks and catches in number of tunas and billfishes, basic data used here is the logbook data that have been compiled at Fisheries Resources Institute (former National Research Institute of Far Seas Fisheries (NRIFSF)) based on the logbook mandatory submitted by the fishermen of the longline vessels larger than 20 gross ton (GRT). The data are so-called “raised” data, which is aggregated by month and 5°x5° block, and then expanded with coverage rate of the logbook. The basic data is available for 1952-2020. To count fishing effort by number of hooks between floats, operational level logbook data were used. Several analyses were conducted based on the areas shown in Fig. 2, which is the same as those for fleet definition in the IOTC albacore stock assessment in 2019.

3. Trend of catch and effort

Fig. 3 shows the trend of total effort (number of hooks) and albacore catch in number in the entire Indian Ocean, number of hooks, albacore catch in number and albacore CPUE in each area shown in Fig. 2. This indicates that

after the beginning of the exploitation by longline fishery in the Indian Ocean, annual fishing effort increased until 1967 and then fluctuated ranging from 40% to 99% of the peak year until 2009. However, fishing effort has been decreasing since 2007, and in 2020 it decreased to about 17% of the peak value. Main reason for the decrease in recent years is the effects of piracy activities in the western Indian Ocean (around Somalia). The albacore catch (in number) peaked (1,010 thousands fish) in 1962 and 1964, then sharply decreased to 32 thousands fish in 1978 and 1979, corresponding to 3% of the level in peaked year, and then gradually increased with fluctuation. The catch in 2006 was 481 thousand fish, which corresponds to 48% of peak value and was highest since 1970. After that the catch decreased again with fluctuation, and then is decreasing after mid 2000s. Following is the description for the temporal and spatial changes of the catch and the effort including detailed description in recent years.

Seeing catch and effort in each area, much more fishing effort was deployed in the south area (area 3 and 4) during 1970s-1980s, but usually there was no large difference after that. Albacore catch was higher in area 3 or 4 except for early period. Nominal CPUE was very high until around late 1960s in area 1 and 3. After that CPUE was low until mid 2000s, and then got higher, although it is decreasing trend in area 3 and 4 in recent years.

Fig. 4 and Fig. 5 show species composition of catch in number by Japanese longline fishery in the entire Indian Ocean and in each area, respectively. Albacore is one of main component of the catch. In the entire Indian Ocean, the proportion of albacore increased from late 1970s to early 2010s, and it is decreasing trend after that. In recent years, the proportion of albacore is high in the area 3 and 4. However, in area 4 the proportion of albacore is decreasing after around mid 2010, which is replaced by southern bluefin tuna.

Fig. 6 shows historical change in the proportion of fishing effort (number of hooks) by each category of number of hooks between floats (NHF) in each area. In each area, there is historical increasing trend of NHF, and is stable after around 2010. In recent years, the mode is higher (around 15-20) in area 2 than in other areas (around 10).

Fig. 7-Fig. 9 show geographical distribution of fishing effort (number of hooks), albacore catch and CPUE by each decade, respectively. In the 1950s, when the effort increased (Fig. 3), the effort was deployed mainly in the region north of 15°S. The main component of the catch was yellowfin tuna in this period (Fig. 4).

Following this period, the effort continued to increase up to 130 million hooks until the late 1960s (Fig. 3). In this period, the total catch of four species of tunas, i.e., yellowfin, albacore, southern bluefin and bigeye tunas was historical highest, and species-specific catches were also the highest for yellowfin, albacore and bluefin tunas (Fig. 4). Of the four species, yellowfin tuna was the most dominant catch in this period, to the lesser extent, albacore and southern bluefin tuna. Also the catch of bigeye tuna in this period increased compared to the 1950s. In this period, fishing ground of this fishery expanded to southward, in the west side and the east side of the Indian Ocean, excluding the southern central of the Indian Ocean. Albacore catch was high in the region between 10°S and 35°S, which corresponds to the region of South Equatorial Current (Sub-tropical waters). The CPUE of albacore was also high in the west side of the region, eventually increasing overall CPUE of entire Indian Ocean (Fig. 3), but in the east side the CPUE was lower compared with west side. In the west side of this region, main component of the catch was albacore (Fig. 10), on the other hand, southern bluefin tuna was the largest component in the east area.

In the period from the late 1960s to the late 1970s, the effort decreased to about 60 million hooks, about 50% of the peak year (Fig. 3). In this period, each catch of albacore drastically decreased compared to that in the previous period (Fig. 3). This decrease was due to withdrawing in the effort from the fishing ground ranging from 10°S to 35°S.

In the period from the late 1970s to the mid 1980s, the effort increased again and reached to 130 million hooks (Fig. 3), the same level as the previous peak in the 1960s. This increase was seen in the regions off Somalia and the

south of 35°S, targeting bigeye tuna and high quality (=oily) southern bluefin tuna, respectively.

In the period from the mid 1980s to the early 1990s, the effort decreased again (Fig. 3). This decrease was due to the decrease of the effort in the region south of 35°S, corresponding to the fishing ground for southern bluefin tuna, by introduction of the TAC for southern bluefin tuna in 1986.

In the period from the early to late 1990s the effort increased (Fig. 3). The increase was seen in the regions off west coast of Australia probably targeting bigeye tuna, and south of Madagascar Island where yellowfin, albacore and bigeye were mainly caught (Fig. 10). In those regions albacore was substantially caught, and this contributes to the increase of total catch in the period (Fig. 3).

In the period of 2000s the effort kept high until 2007, sharply decreased until 2012, and kept in a low level after that (Fig. 3). The decrease has been seen especially in the regions off Somalia since 2010 (Fig. 7). This is due to the effect of piracy activities in this area as mentioned above. As a result, the proportion of catch and effort in the area south of 25°S increased, where catch rate of albacore was higher. Also, increase of CPUE in the area west off Australia was observed during 2006-2007. These may have caused increase in albacore CPUE (Fig. 3). In the area west off Australia, the proportion of albacore in the entire catch also increased during 2005-2007, and kept high thereafter (Fig. 10, Fig. 14). As mentioned above, since the late 1960s, the longline fishery had been running without targeting albacore, and the effort had not been deployed in the region where albacore is abundant in general. Eventually, albacore had been caught only as a bycatch with southern bluefin tuna or bigeye tuna, to lesser extent with yellowfin tuna. In recent years, however, due to decreased quota of southern bluefin tuna and enhanced market value of albacore for sashimi products, more Japanese longline vessels seem to be targeting albacore especially in the west off Australia. Also, recent situation of the change in the proportion of effort by area due to piracy activities seems to be unusual.

Historically, albacore was mainly caught in the southeastern and southwestern part (temperate and subtropical areas) of Indian Ocean. It seems that albacore was consistently caught in the southwestern part (around and south of Madagascar), and the catch became higher in the southwestern part (east off Australia) in recent years.

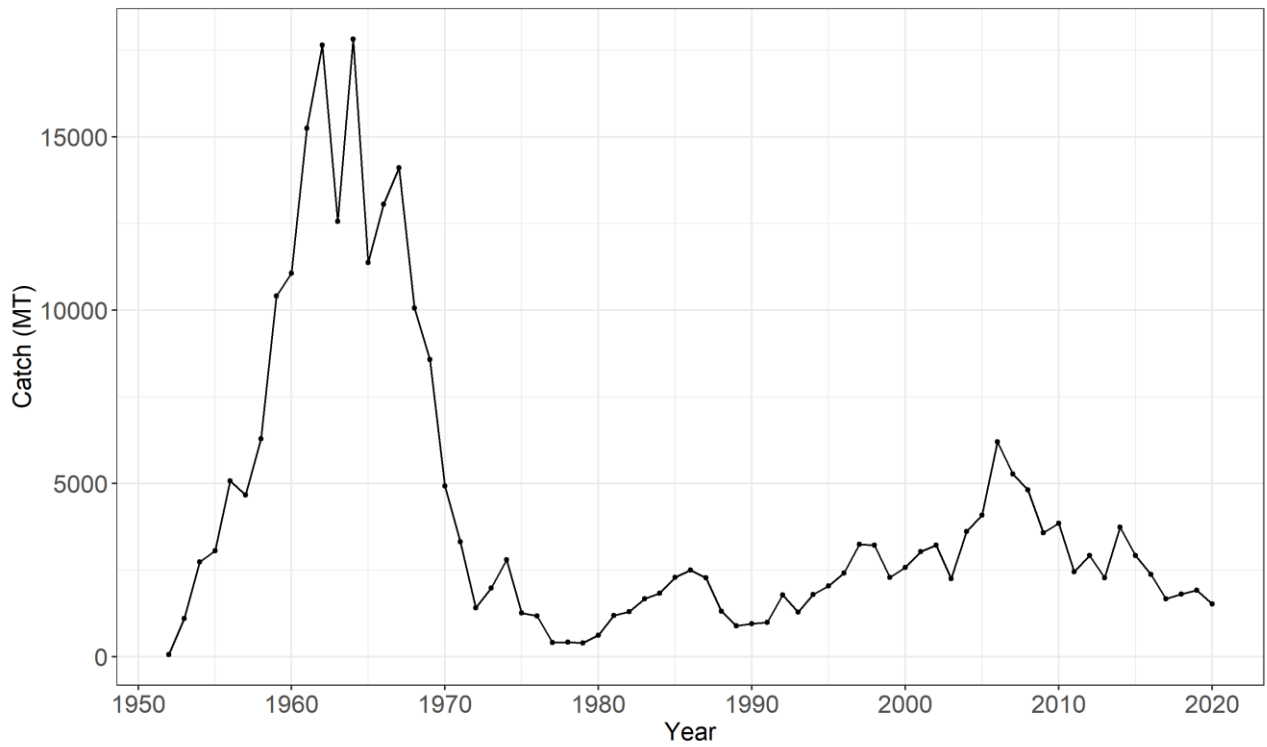


Fig. 1. Albacore catch in weight (t) caught by Japanese longline fishery. Data source: IOTC database.

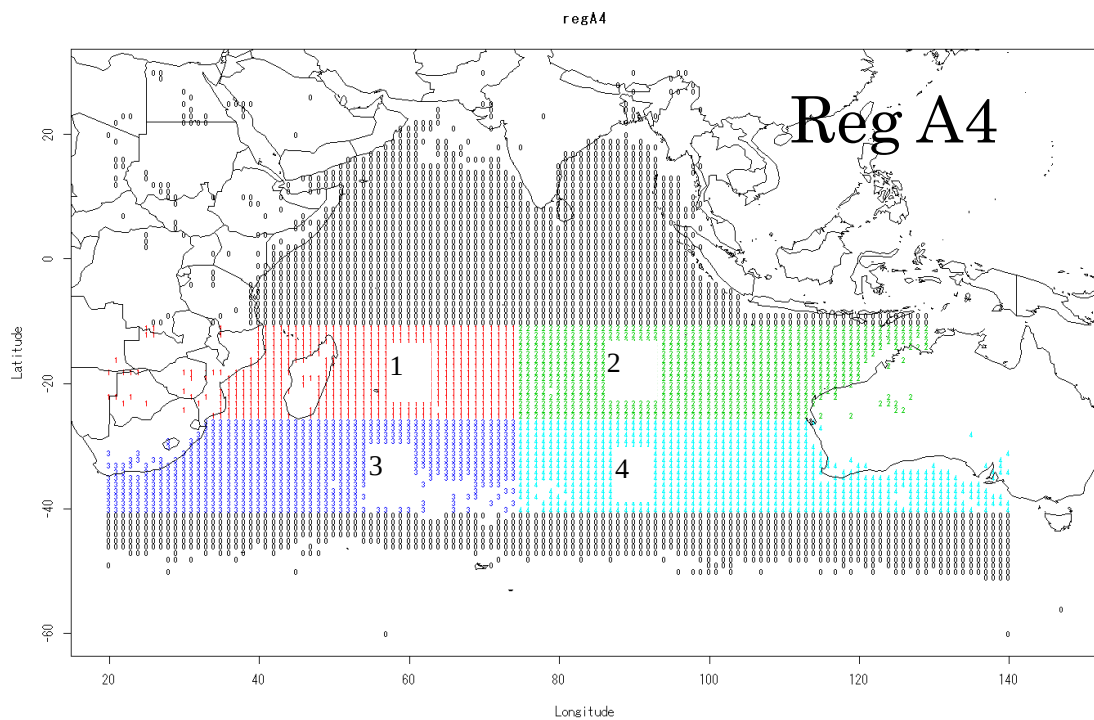


Fig. 2. The geographical range to compile the amount of the effort, catches and CPUE for albacore caught by the Japanese longline fishery.

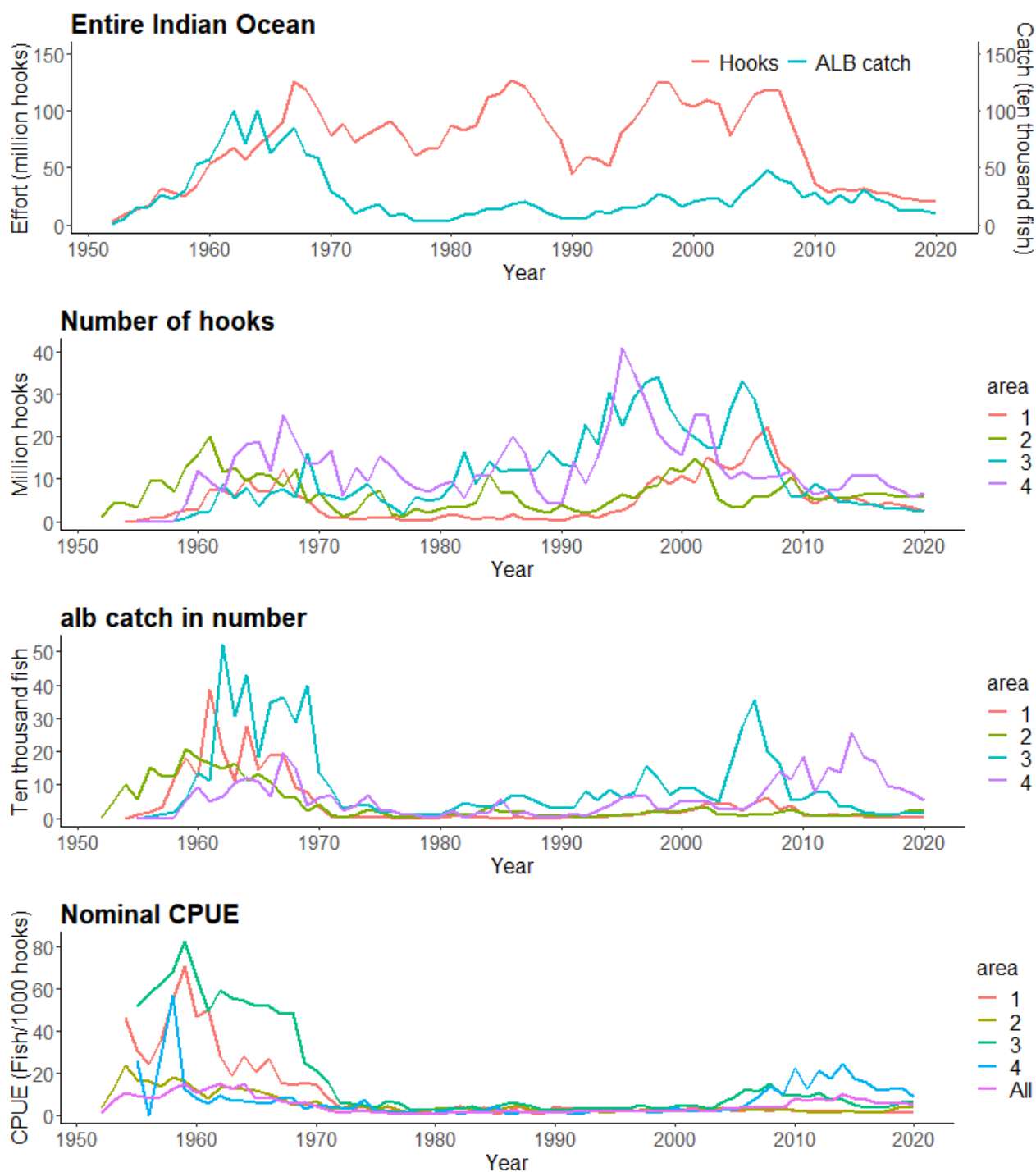


Fig. 3. The number of hooks employed, catch in number and nominal CPUE of albacore in the Indian Ocean by the Japanese longline fishery in the entire Indian Ocean and in each area shown in Fig. 2.

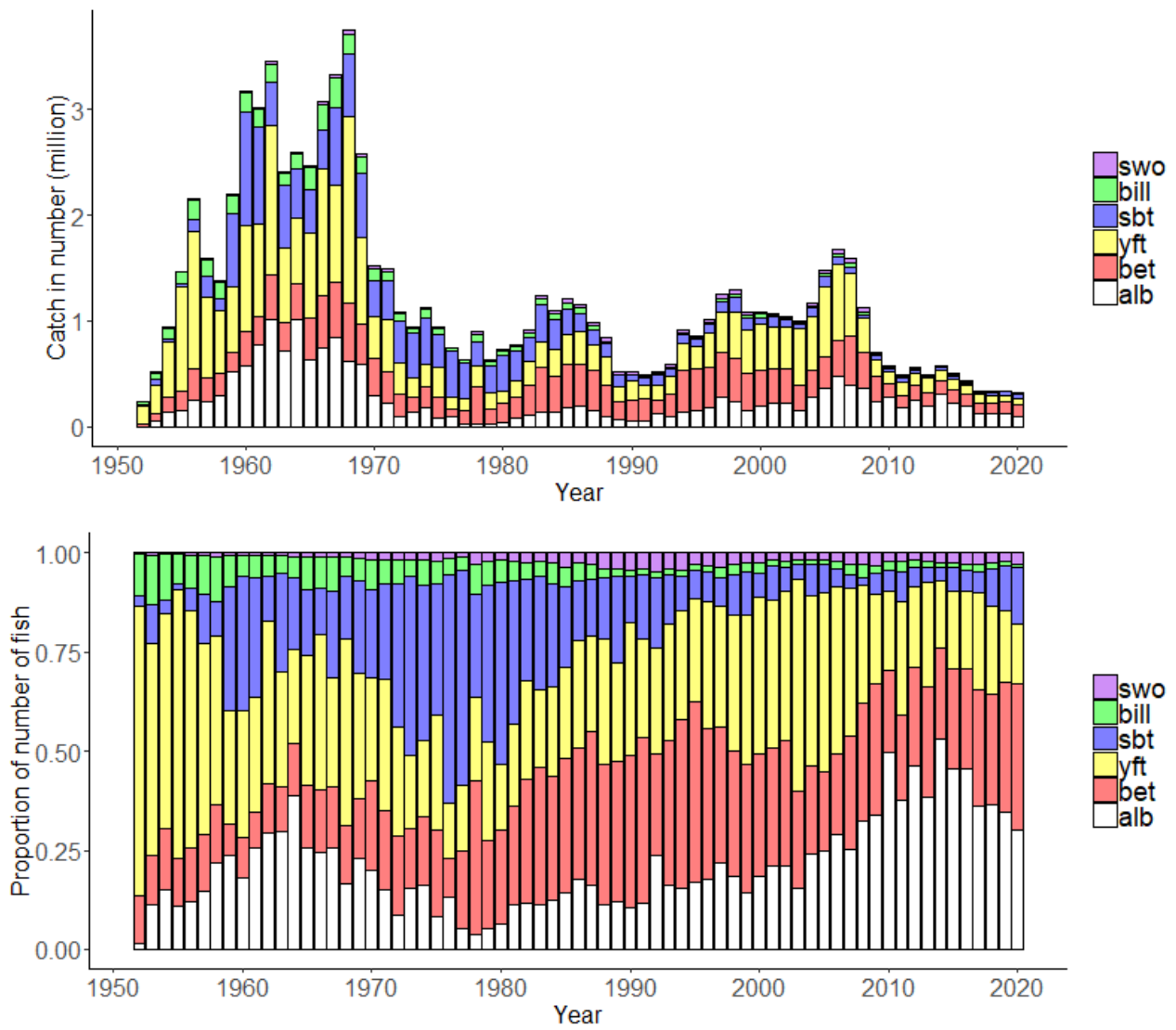


Fig. 4. Species composition of catch in number in the Indian Ocean by the Japanese longline fishery.

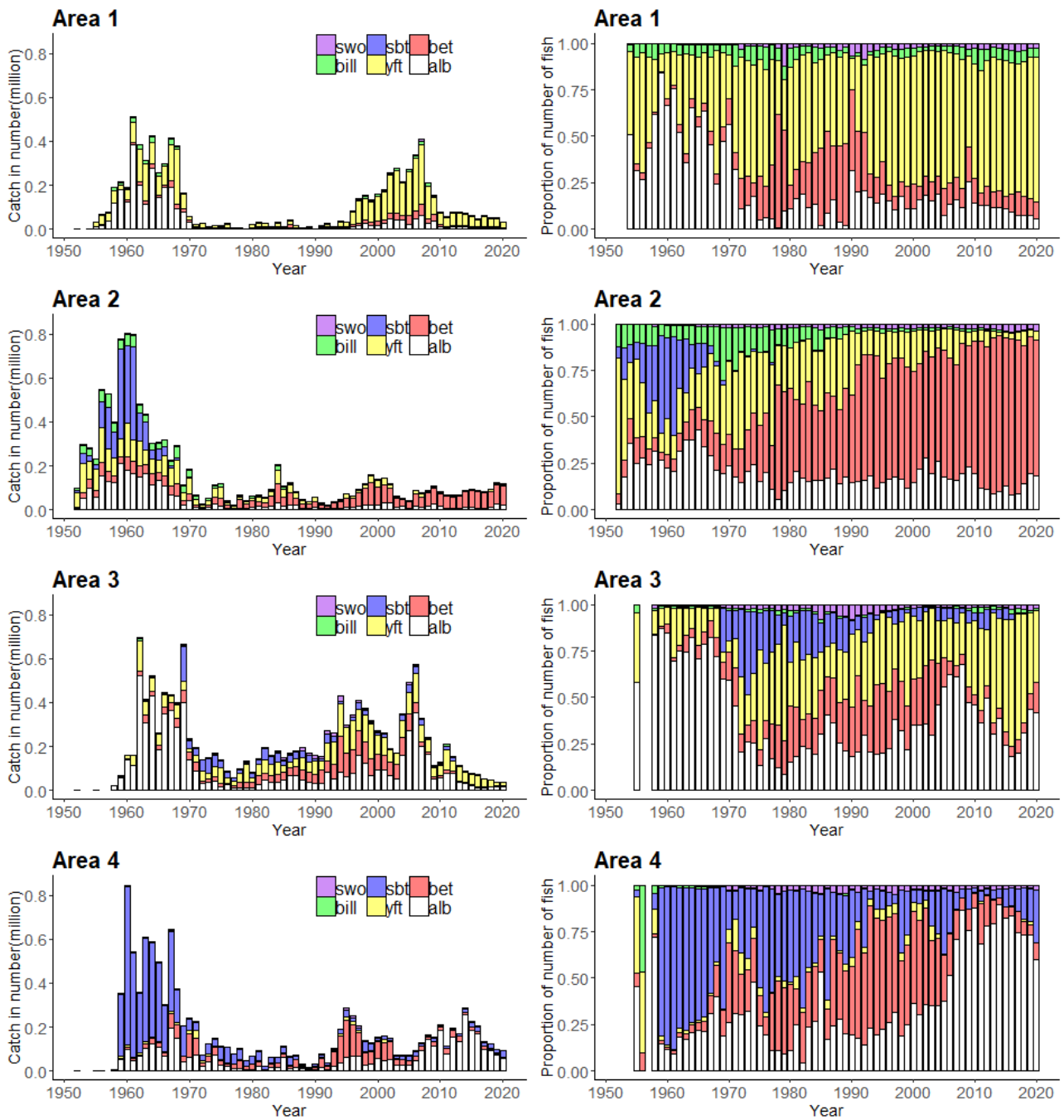


Fig. 5. Species composition of catch in number in each area in the Indian Ocean by the Japanese longline fishery.

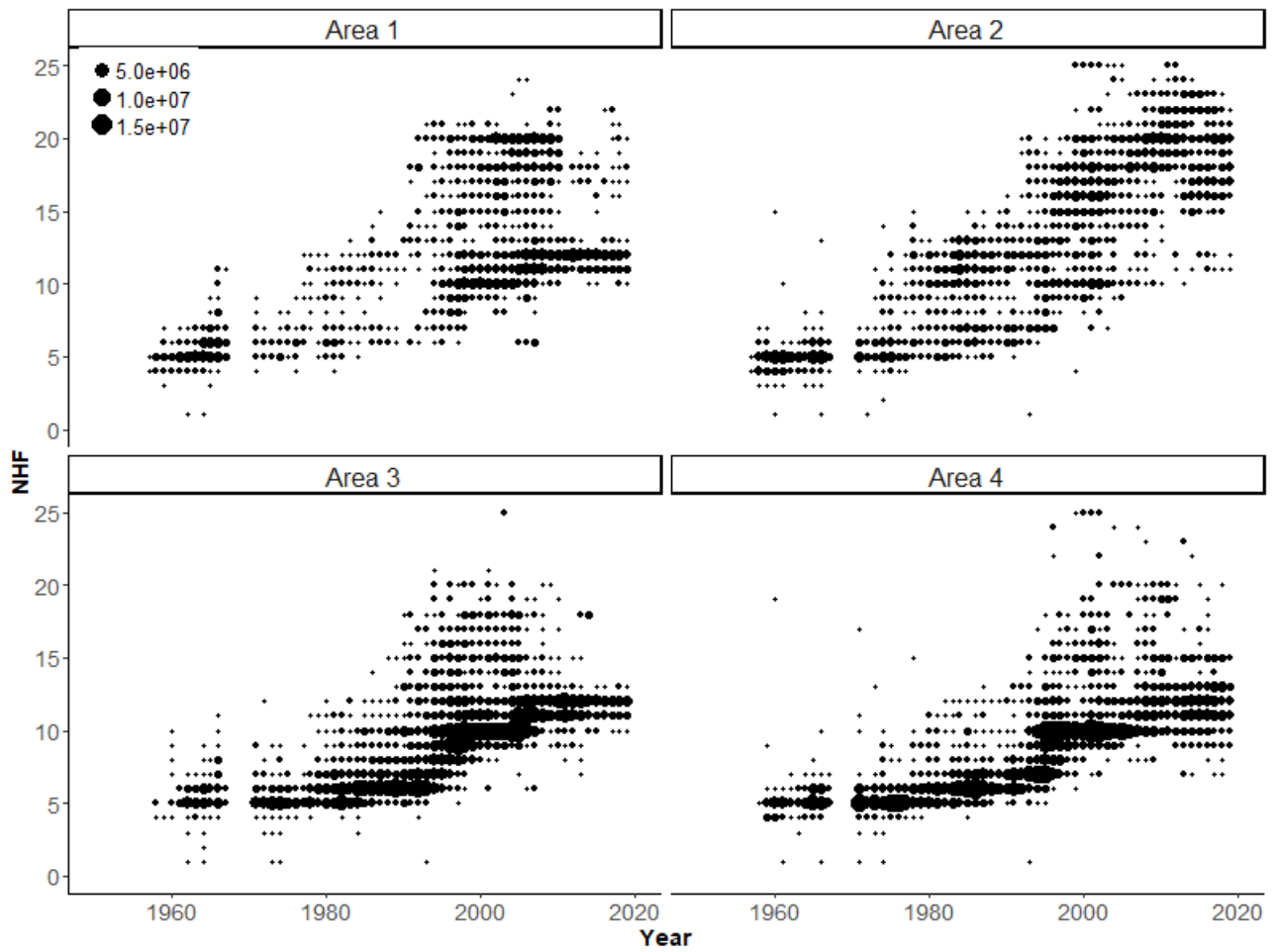


Fig. 6. Change in the amount of fishing effort (number of hooks) by number of hooks between floats (NHF) in each area in the Indian Ocean by the Japanese longline fishery.

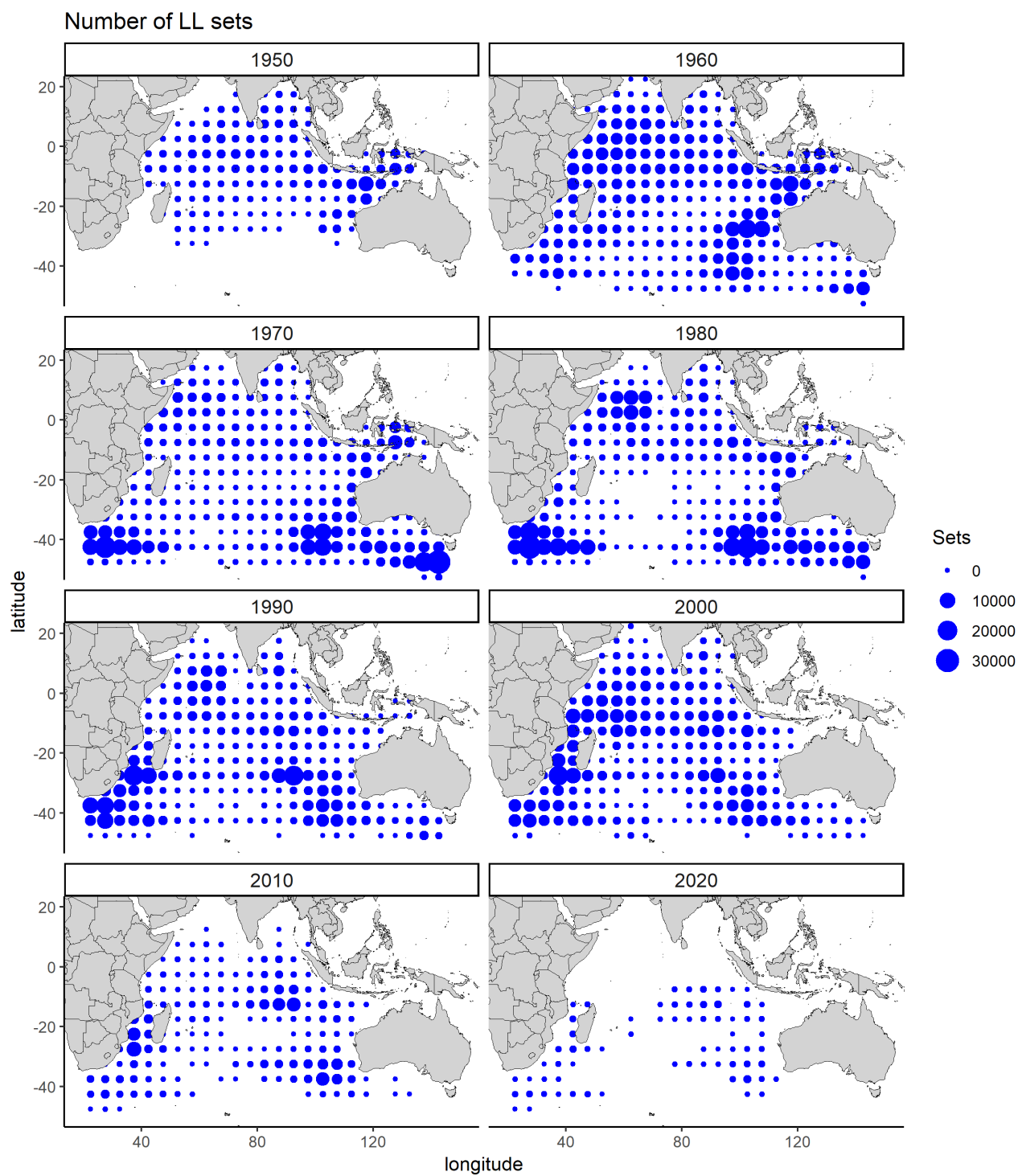


Fig. 7. The distribution of the effort (number of sets) for each decadal period by Japanese longline fishery.

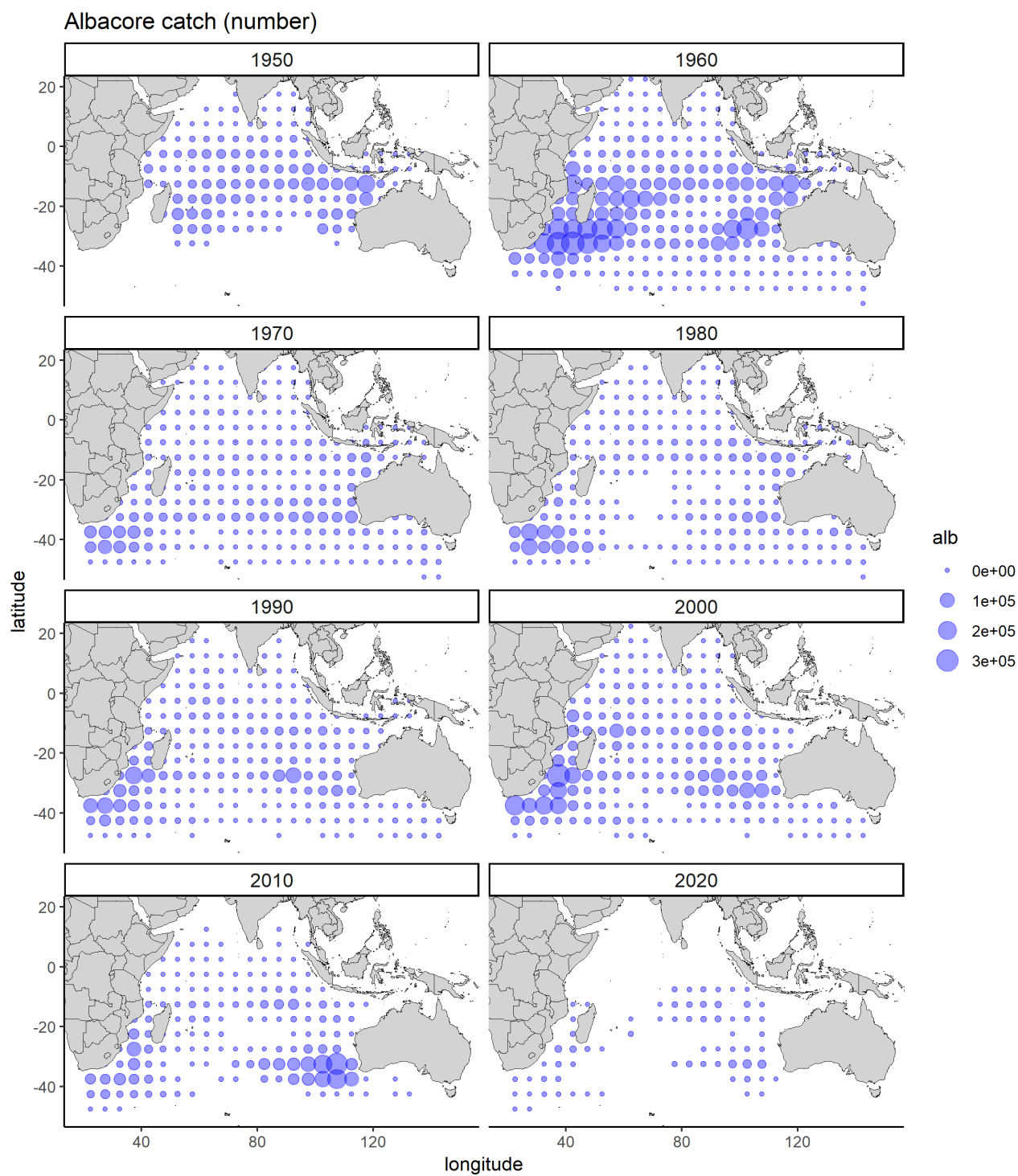


Fig. 8. The distribution of albacore catch (number of fish) for each decadal period by Japanese longline fishery.

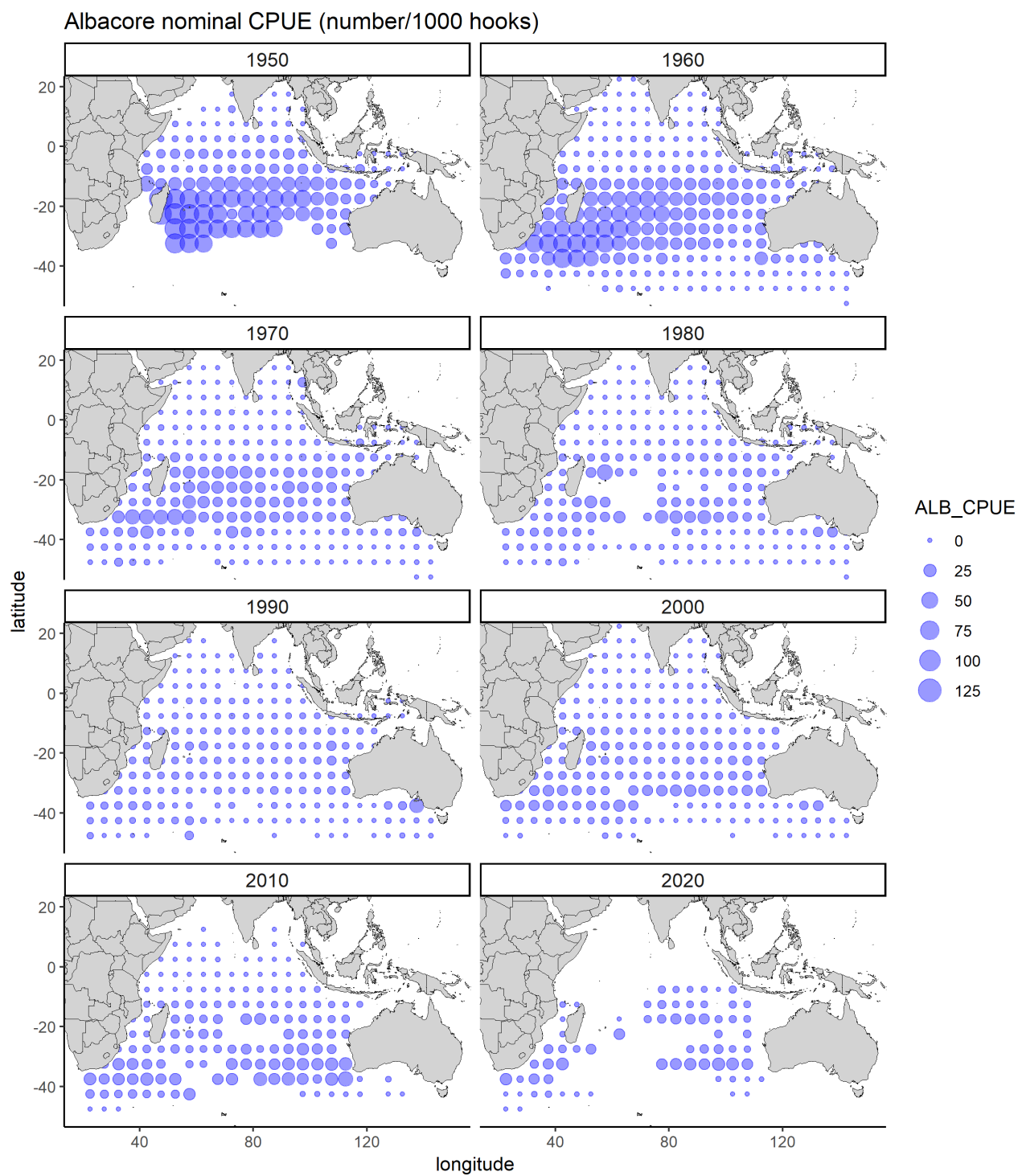


Fig. 9. The average distribution of albacore CPUE (number of fish/1000hooks) for each decadal period by Japanese longline fishery.

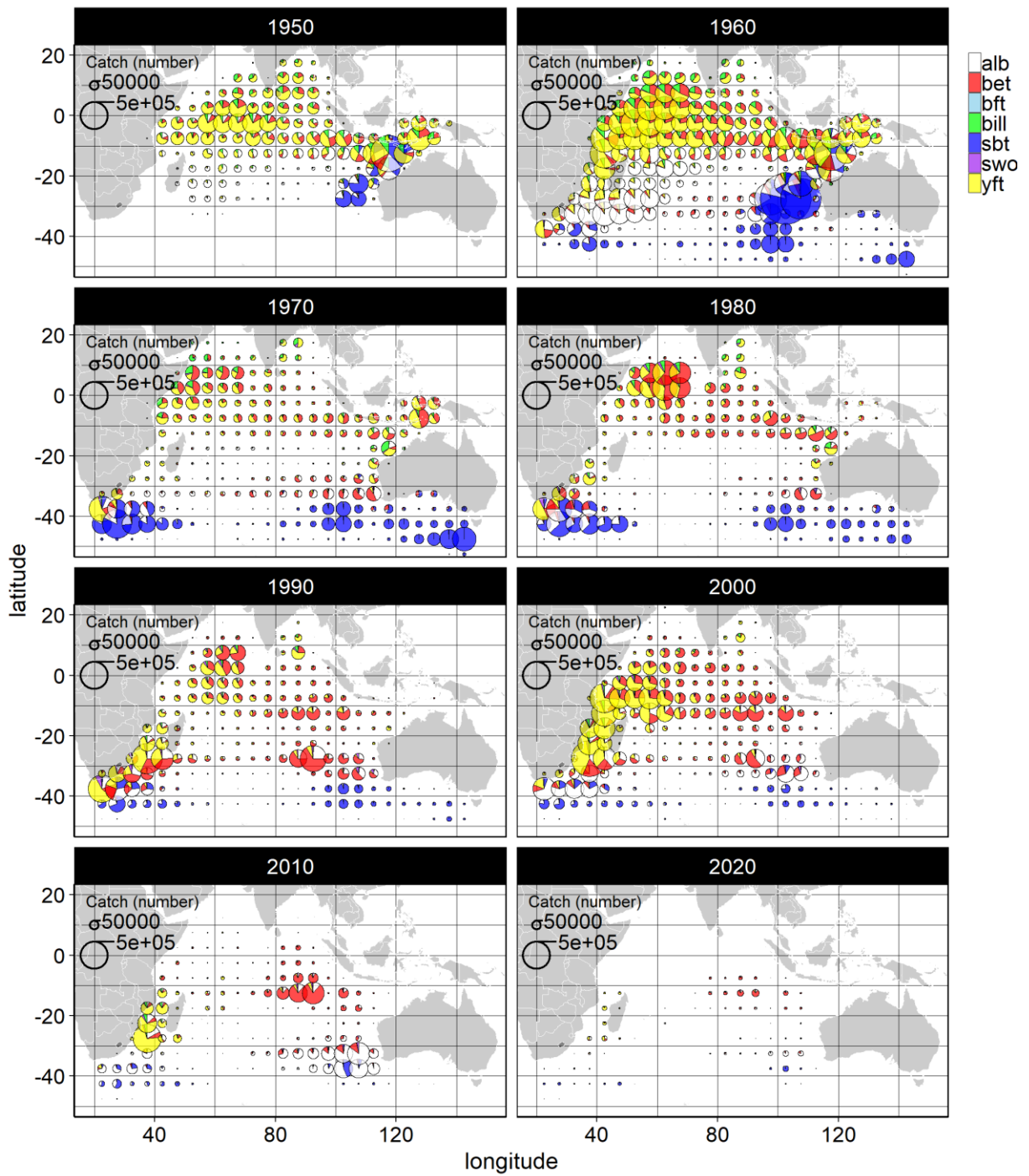


Fig. 10. The distribution of amount of catch in number by species for each decade. Size of circle shows amount of total of catches i.e. southern bluefin tuna (SBT), albacore (ALB), bigeye tuna (BET), yellowfin tuna (YFT), swordfish (SWO) and billfishes (Bill).

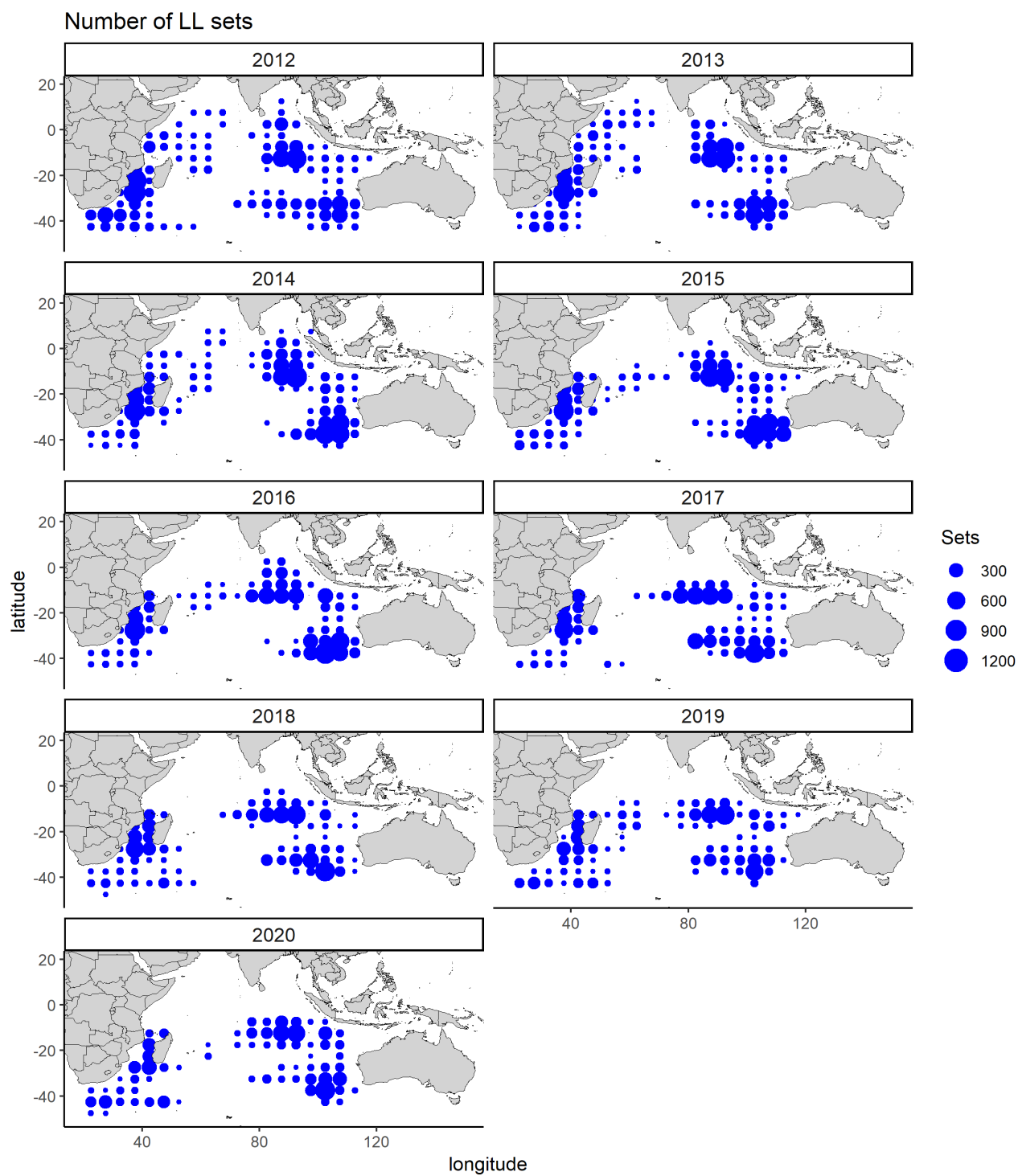


Fig. 11. The geographical distribution of the effort (number of sets) in recent years by Japanese longline fishery.

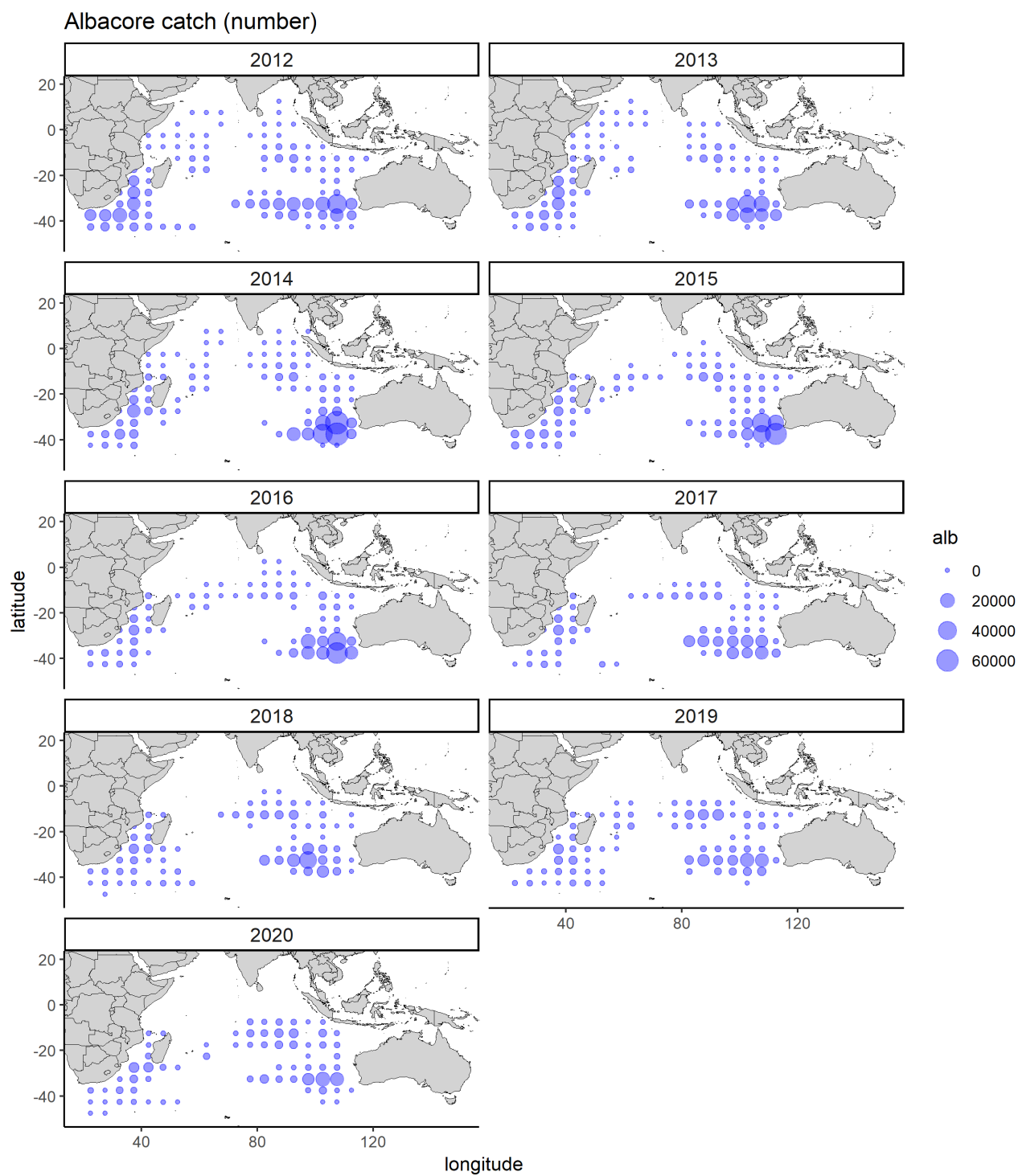


Fig. 12. The geographical distribution of albacore catch (number of fish) in recent years by Japanese longline fishery.

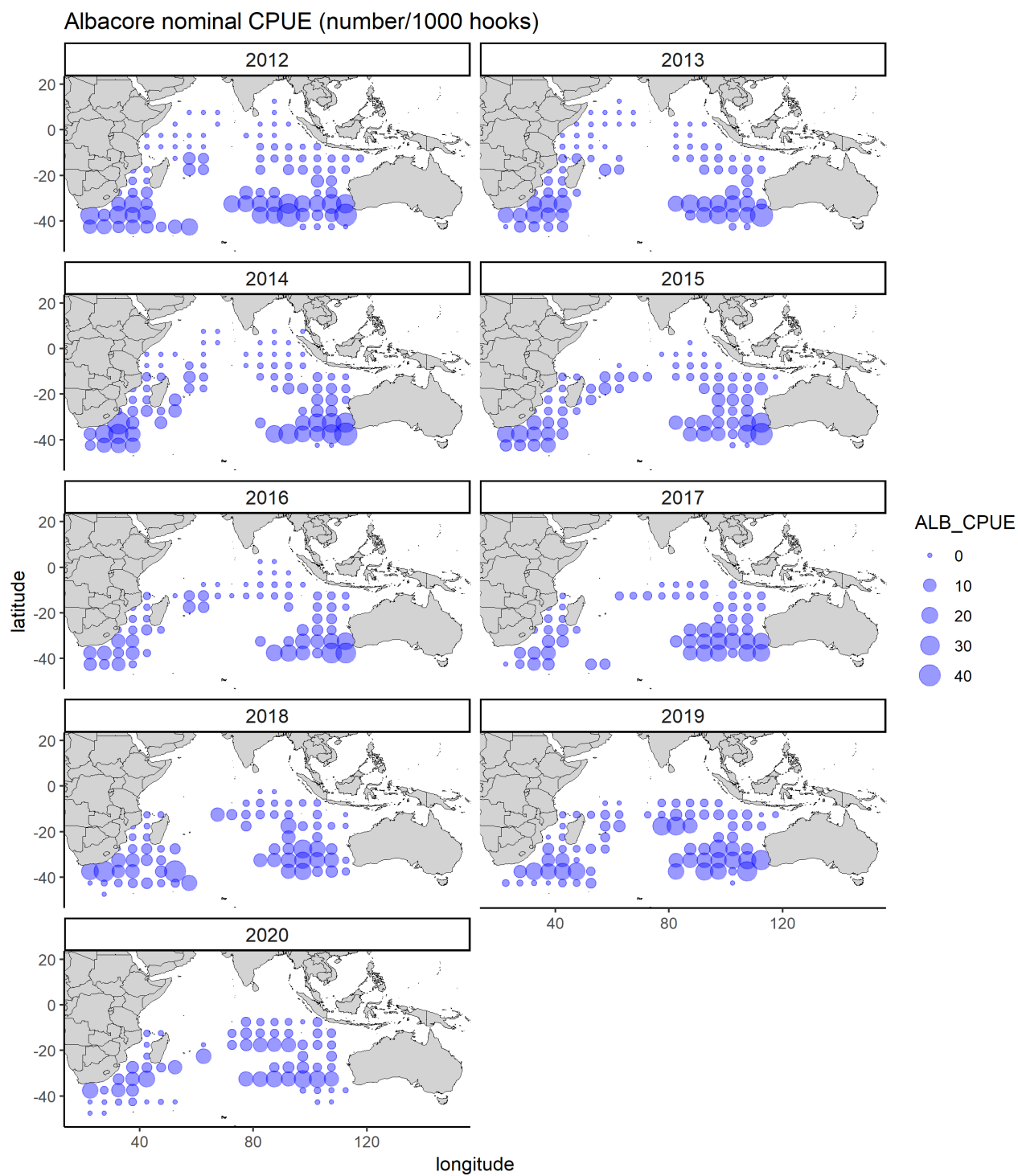


Fig. 13. The geographical distribution of albacore CPUE (number of fish/1000hooks) in recent years by Japanese longline fishery.

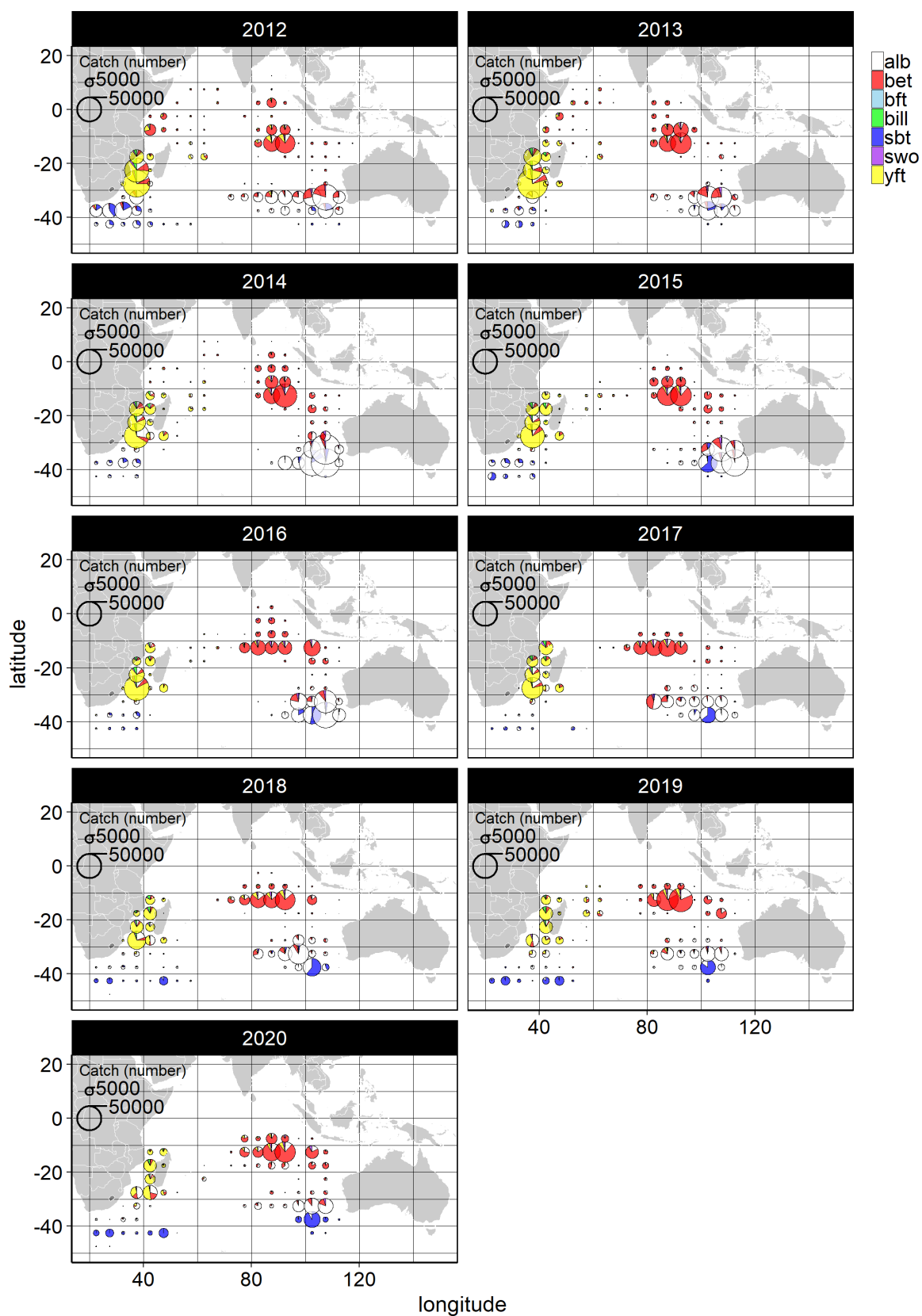


Fig. 14. Annual recent distribution of amount of catch in number by species. Size of circle shows amount of total of catches i.e. southern bluefin tuna (SBT), albacore (ALB), bigeye tuna (BET), yellowfin tuna (YFT), swordfish (SWO) and billfishes (Bill).