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**Quarterly catch data of skipjack caught by
coastal troll and coastal pole-and-line fisheries in the Japanese coastal waters**

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Quarterly catch data of skipjack caught by coastal troll and coastal pole-and-line fisheries in the Japanese coastal waters.

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Abstract

As a new data source to input into the stock assessment model, quarterly catch of skipjack tuna in the coastal waters of Japan is proposed in this document. The coastal troll fishery data from 1995 to 2017 and the coastal pole-and-line fishery data from 1969 to 2017 were employed to calculate the quarterly catches in region1 and region3 as defined in the stock assessment model. Total catch multiplied by the ratio of skipjack catch which was obtained from the monthly fishing efforts of the representative prefecture as collected in the official statistic data since 2007. These new data sets of the coastal fisheries can contribute to the stock analysis.

INTRODUCTION

Japanese coastal troll and coastal pole-and-line fisheries targeting skipjack have been operating in the Japanese coastal waters of the north western Pacific. The WCPFC SKJ WG agreed to include these catch data for the fisheries in region1 and region3 of the 2019 stock assessment model. Throughout, when we present assessment region numbers we refer to the numbering system under the 8 region stock assessment regional structure.

The Japanese coastal catch data have been collected since 1951 as official statistics of Japan by the Ministry of Agriculture, Forestry and Fisheries. As the statistics experienced a few changes in the fisheries category and report form during its history, the data of coastal troll fishery as defined today is available from 1995 to 2017, and the data of coastal pole-and-line fishery is available from 1969 to 2017, respectively. To use the whole data from 1951, it would need further arrangement of the data in the near future for adequate application of differently defined fishery categories into the stock assessment.

In this document, we summarize the historical statistic data sets of the coastal troll and coastal pole-and line fisheries in Japanese coastal waters. Our main objectives are to estimate the quarterly catch data of the coastal troll fishery from 1995 to 2017, and the coastal pole-and-line fishery from 1969 to 2017 as input data for the 2019 stock assessment model. It was conducted as the first step toward the full data input of the coastal catch data that have been collected since 1951, as the wider coverage in time and

space of skipjack catch would certainly yield larger information on the dynamics of the stock and more reliable indices.

DATA and METHODS

Coastal troll fishery

The catch of the coastal troll fishery operated in the Japanese coastal waters has been reported in the statistical catch data since 1951, and there are two categories in the fishery.

i) Other small fisheries: this category has been available since 1951 to the present (the latest available data is 2017) including trolling and other troll-like fishing methods (hand-line fishing etc.). The total amount of catch by year was reported without any information on fishing effort or fishing locations. The catches of this category decreased drastically after the introduction of a new category “Troll fishery” in 1995.

ii) Troll fishery: the fishery category was adopted from the data of 1995. The data between 1995 and 2006 include total annual catches and fishing effort without any time periods (i.e., total number of vessels). From 2007, the data include total annual catches and fishing effort recorded as the total number of vessels each year along with fishing locations (in the form of Japanese prefectures and groups of prefectures). However, the fishing effort data lack the information about target species, such as whether the operation involved other tuna species (e.g., Pacific bluefin tuna, albacore, bigeye tuna, yellowfin tuna, and so on) or not.

An overview of the time series data of skipjack catch according to these categories is shown in Figure 1. We used the troll fishery data (category ii) from 1995 to 2007 to estimate yearly and quarterly catch in region1 to input into the stock assessment model. The catch data of skipjack was aggregated by prefecture name and prefecture group (Fig. 2). Most of skipjack catches were along the Pacific coast of Japan relative to whole Japan, and the coverages in the category ranged from 0.84 to 0.89 in the period of 2007-2017 (Fig. 3). Since other areas except for the Pacific coasts group mainly include skipjack caught as by-catch or outside of the main fishing season, we employed catch data categorized in the Pacific coast of Japan throughout the period 1995-2017. In 1995-2006, since the specific data of the Pacific coasts group is not available, the annual total catches in the period were multiplied by 0.85 based on the catch coverage mentioned above to estimate the catch ratio in the Pacific. The data were then combined with that of the period 2007-2017 to obtain annual catches between 1995 and 2017 in the group of the Pacific coast. Secondly, quarterly catches between 2007 and 2017 were calculated using frequency of monthly fishing effort of one representative prefecture that achieved the largest catch in a prefecture group. This procedure is based on the assumption that the

representative prefecture would most likely have targeted skipjack to earn their catch. The fishing effort information were not available for the data before 2006, thus the quarterly catch between 1995 and 2006 were calculated by multiplying the annual catch in the Pacific coast group by the frequency of monthly fishing efforts aggregated from ten prefectures along the Pacific in the period between 2007 and 2017, assuming the seasonal fishing patterns were similar during that earlier period.

Coastal pole-and-line fishery

Japanese pole-and-line fisheries are categorized into four groups according to the size of vessels as below.

i) Pole-and-line (old): this fishery appeared in the data from 1951 to 1964. It was unclear whether coastal pole-and-line fishery was included in this category.

ii) Pole-and-line distant water (≥ 120 GRT, gross register tonnage): the fishery with large vessels over 120 GRT was categorized and independently stated in the data from 1951 to 1953 and from 1965 to 2017, and the fishing grounds occurred only in distant waters.

iii) Pole-and-line offshore (10-120 GRT): the fishery with middle-sized vessels of between 10-120 GRT was available in the data from 1951 to 1953 and from 1966 to 2017 with the fishing grounds occurring outside of region1 and region3.

iv) Coastal pole-and-line: the fishery category had data from 1969, and the data between 1969 and 2006 consisted of the total amount of catch by the fishery and fishing effort of a total number of vessels operating in each fishing location categorized as a Japanese prefecture and/or a prefecture group. However, the fishing effort did not indicate any information about time periods or target species (which could be skipjack, Pacific bluefin tuna, albacore, bigeye tuna, yellowfin tuna, or other tuna species). After 2007, a total amount of catch and monthly fishing effort (number of vessels) has been reported with fishing locations (Japanese prefectures and/or prefecture groups). The fishing effort during the period reported target species including other tuna species (such as Pacific bluefin tuna, albacore, bigeye tuna, yellowfin tuna, and so on). The reported fishing grounds corresponded to region1 and region3 in the stock assessment model.

An overview of the time series data of skipjack catch by Japanese pole-and-line fisheries are shown in Figure 4. We used the coastal pole-and-line fishery data from 1969 to 2017 (iv) to calculate quarterly catch based on the monthly fishing effort reported in Kochi prefecture which was considered as representative of the fishery targeting skipjack. Kochi prefecture had the largest share of the catch reported by the coastal pole-and-line fishery in Japan, which had the coverage of 0.7 on average in the period of 2007-2017

(Fig. 5). The monthly fishing efforts were also applied to the data between 1969 and 2006 to calculate quarterly catch in that period by assuming the current fishing patterns. According to the previous study (Kiyofuji et al., 2014), the quarterly catch data were calculated based on the ratio of skipjack in the catch frequency within each region and allocated to the northern (region1) and southern (region3) areas by the northern latitude of 30 degrees according to the setting of the stock assessment model (Fig. 6).

RESULTS and DISCUSSION

In this document, we outline the time series data of coastal skipjack catches collected from 1951 to 2017 and estimate the quarterly catch by the coastal troll and the coastal pole-and-line for the periods 1995-2017 and 1969-2017, respectively.

Catch trends of the coastal troll fishery fluctuated year by year showing a gradual decrease overall which continued until 2017 (Fig. 7a). The lowest catch was observed in 2014 (803 metric tons). The catch increased slightly after 2014 (1,443 metric tons in 2017), though these recent values have not reached the average level in the period 1995-2017. The season that achieved the highest catch in a year was generally quarter 2, followed by quarter 1, quarter 4 and quarter 3 (Fig. 7b).

For the coastal pole-and-line fishery, the annual catches of skipjack in region1 and region3 were high around 1980, and after the decrease in the 1990s it gradually increased (Fig. 8a, 9a). Although slight differences were observed between catches in region1 and region3 by year, the trends of fluctuation were similar in both regions between 1969 and 2006 due to multiplication by a certain fishing ratio. Regarding the catch season, skipjack were mostly caught during quarter 2 and quarter 4 in region1 (Fig. 8b), and quarter 2 and quarter 3 in region3 (Fig. 9b).

The present study estimated the quarterly catch both coastal fisheries to input into the 2019 stock assessment model. Because there is no official effort data with target species, the standardized CPUE can be estimated using the details data of skipjack catch, year, month, time, position and SST with unique vessels (Kiyofuji et al., 2014).

REFERENCE

Kiyofuji, H., Ashida, H., Sugimoto, M., Horii, Y. and Okamoto, H. (2014) Abundance of skipjack migrating to the Pacific coastal water of Japan indicated by the Japanese coastal troll and pole-and-line CPUE. WCPFC/SC10/SA-WP-10 Rev 1.

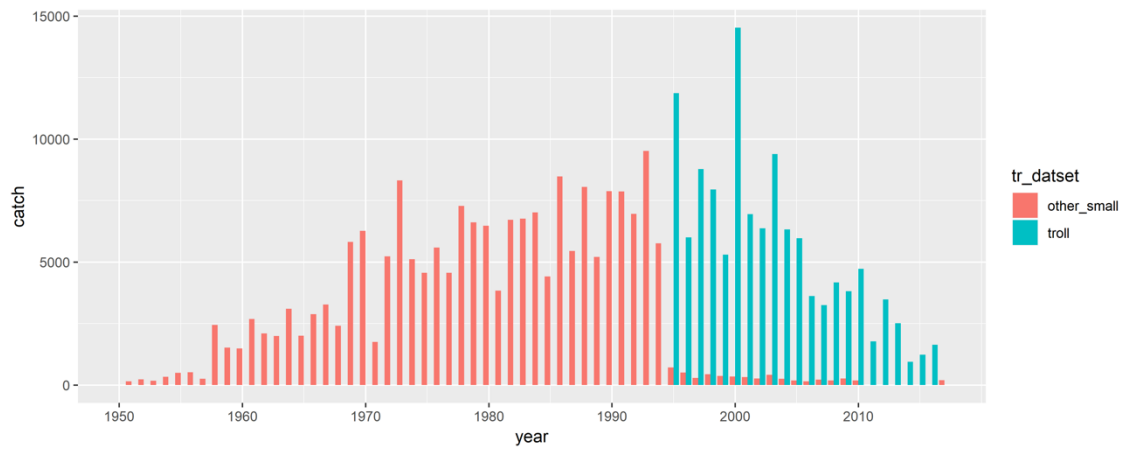


Figure 1. Two different time series data of skipjack catch (metric tons). The red and blue bars show the categories of other small fishery from 1951 to 2017 and troll fishery from 1995 to 2017, respectively.

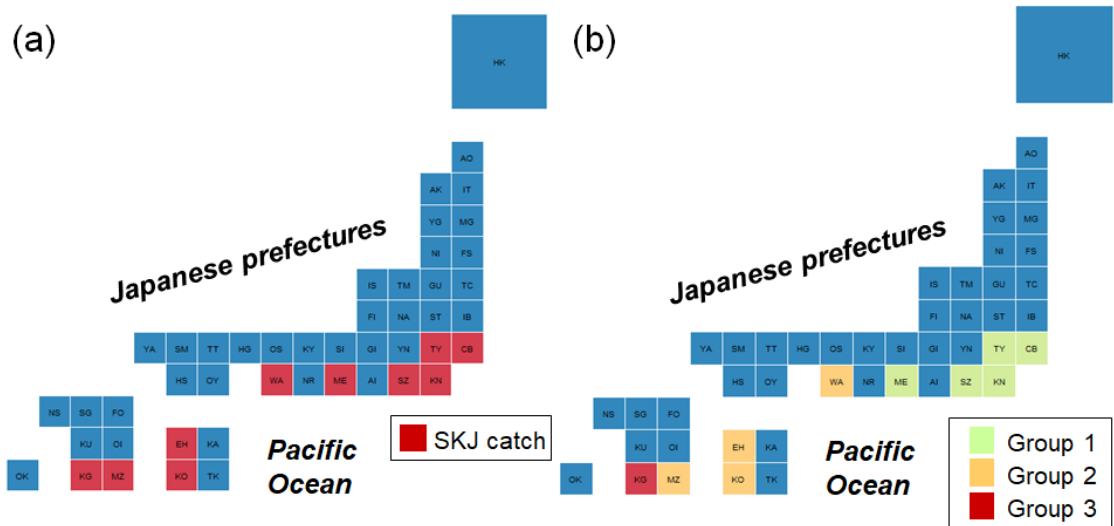


Figure 2. Schematic maps of 47 prefectures in Japan. Statistical data of Japan indicated that (a) 10 prefectures (red) and (b) three prefecture groups contain the main ports for fisheries targeting skipjack tuna along the Pacific Ocean.

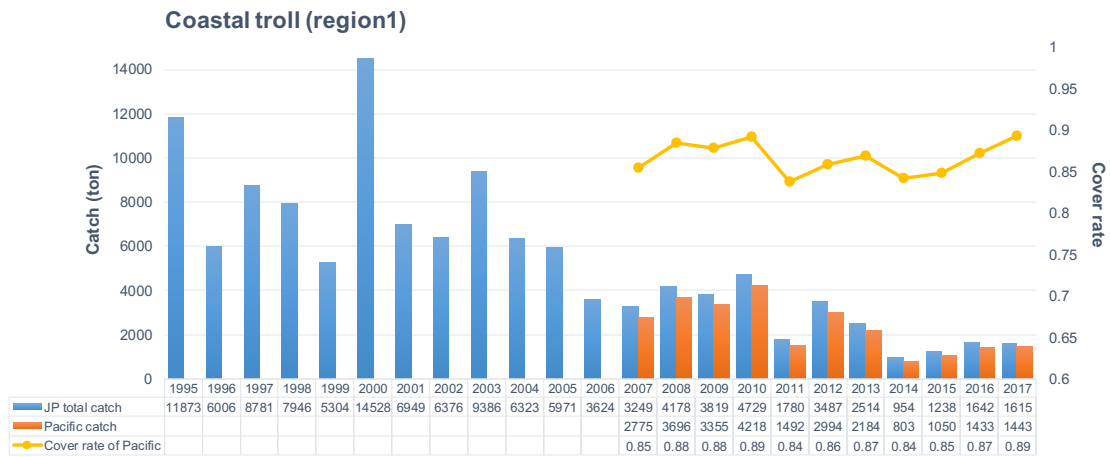


Figure 3. Total catch of skipjack in Japan from 1995 to 2017 by coastal troll fishery (blue bars) and the catch contributed by 10 prefectures (see fig. 2) along the Pacific Ocean (red bars). The coverage (rate) of catch along the Pacific is shown in yellow line.

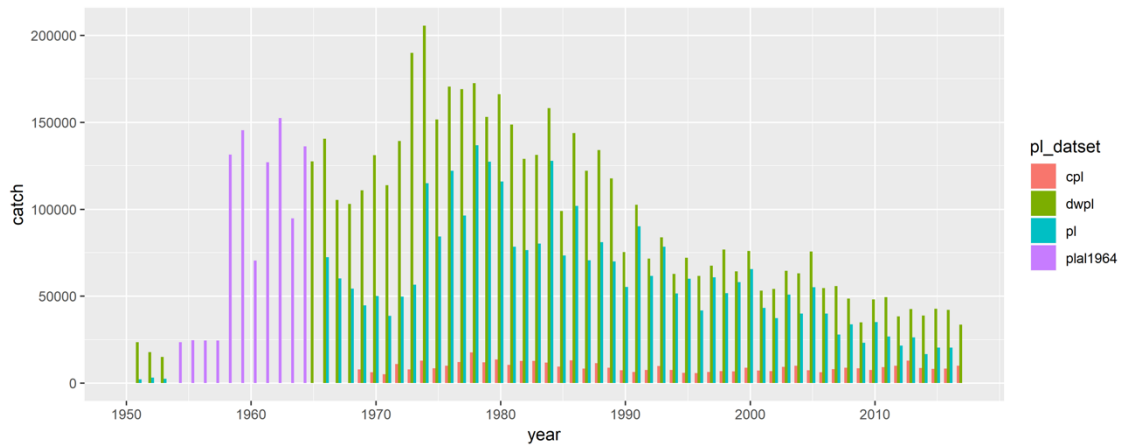


Figure 4. Total catch of skipjack from 1951 to 2017 by four categories of pole-and-line fisheries (red; coastal pole-and-line, green; pole-and-line distant water, blue; pole-and-line offshore, purple; pole-and-line categorized in the old data series).

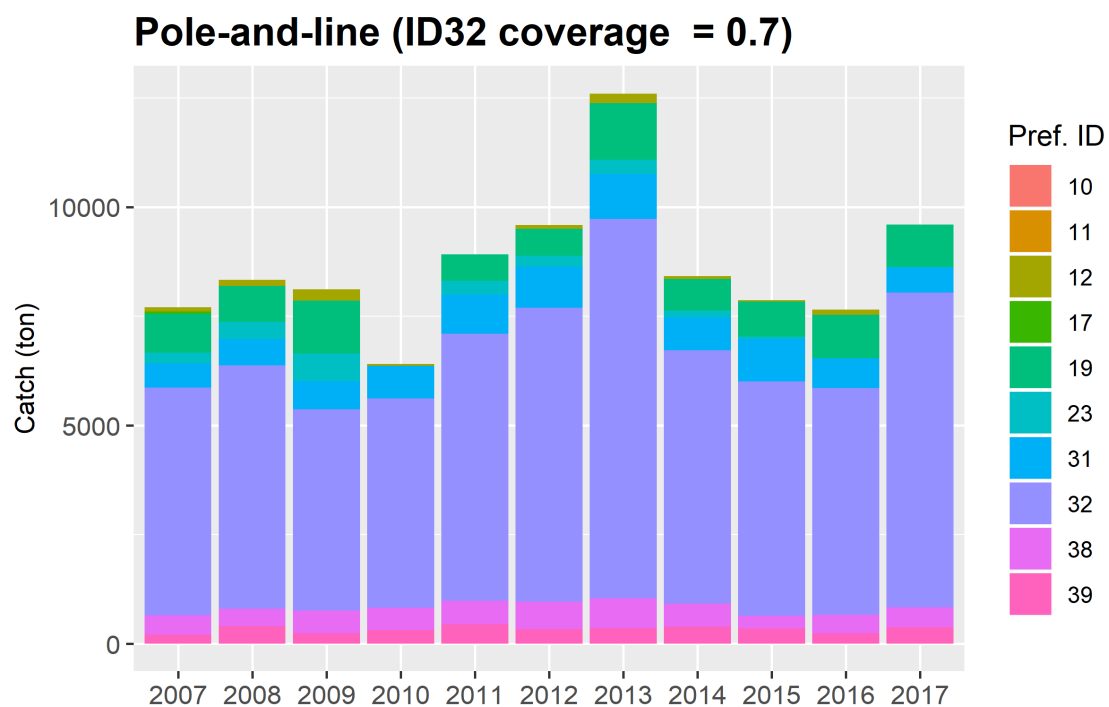


Figure 5. Catch coverage (rate) of each prefecture in the total catch of skipjack by coastal pole-and-line fishery. Different colors show 10 prefectures along the Pacific Ocean (see fig. 2, ID10; Chiba (CB), ID11; Tokyo (TY), ID12; Kanagawa (KN), ID17; Shizuoka (SZ), ID19; Mie (ME), ID23; Wakayama (WA), ID31; Ehime (EH), ID32; Kochi (KO), ID38; Miyazaki (MZ), ID39; Kagoshima (KG)). On average, 70 percent of the skipjack catch is reported in Kochi prefecture (ID32).

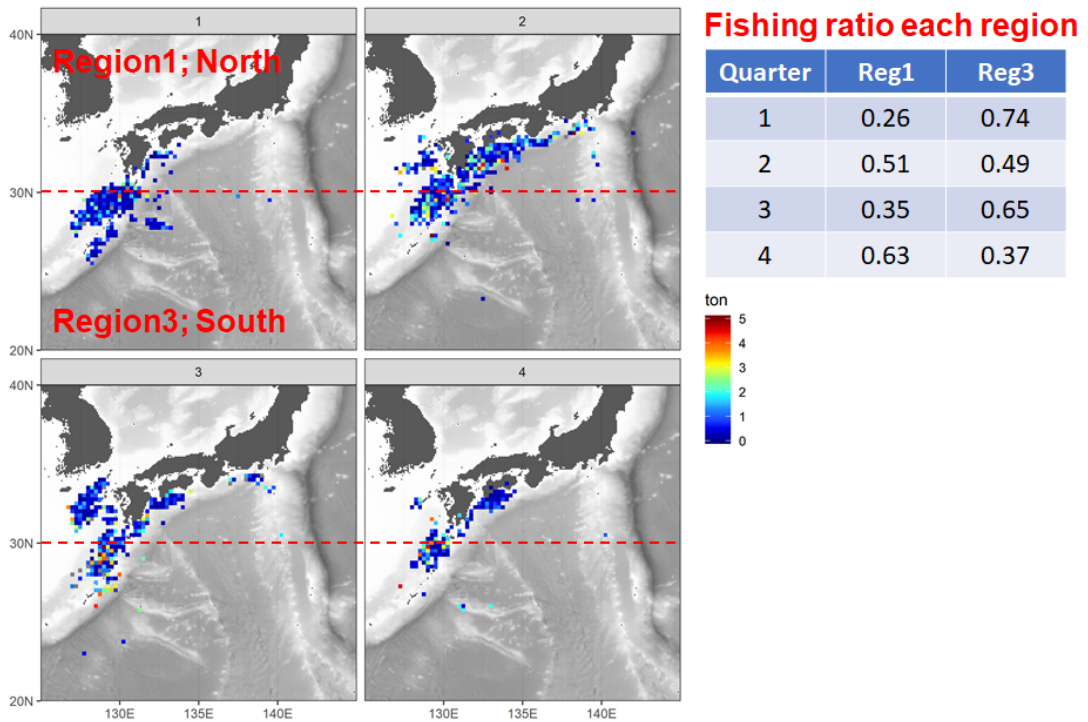


Figure 6. Quarterly distribution of skipjack catches reported by coastal pole-and-line fishery from 2003 to 2004. The red dotted lines show the boundary of north (region1) and south (region3) regions defined in the stock assessment model (left). The quarterly catch ratios (catch frequency) for each region are also shown in the right table. The operational details of the fishery are described in Kiyofuji et al., (2004).

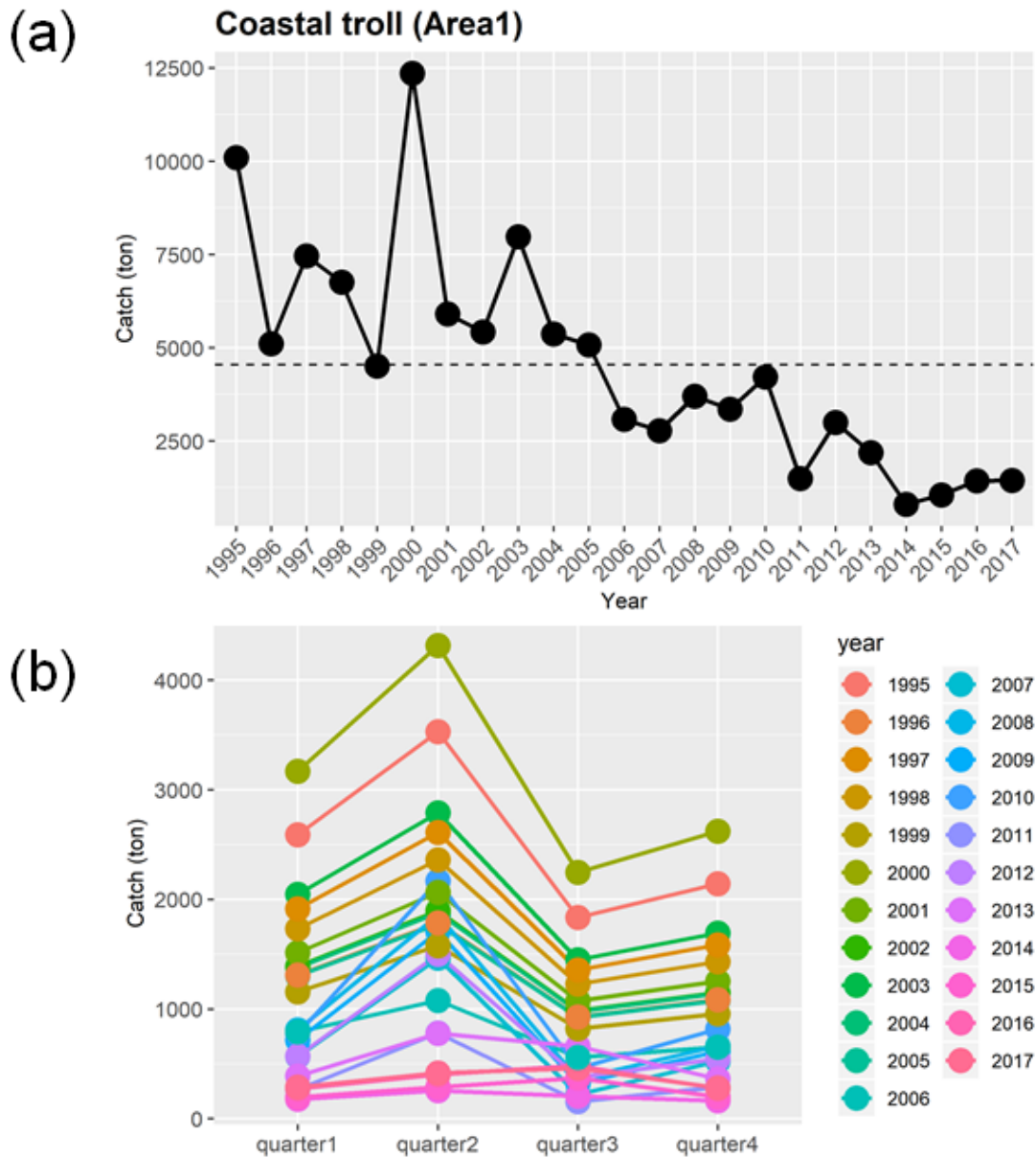


Figure 7. (a) Calculated total skipjack catches reported by the coastal troll fishery in region1 and (b) estimated quarterly catch of skipjack by year. The black dotted line shows the average in the period 1995-2017.

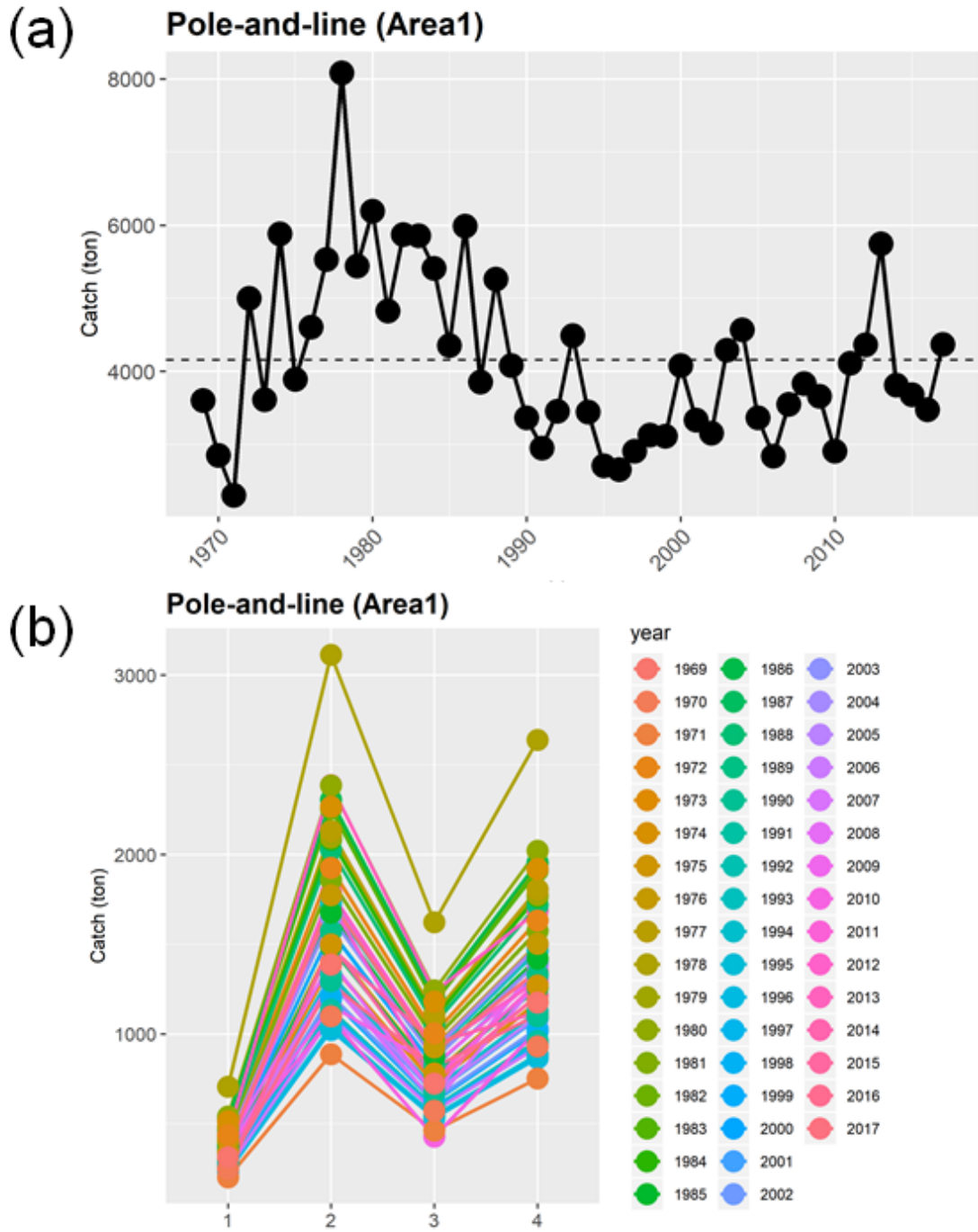


Figure 8. (a) Calculated total skipjack catches caught reported by the coastal pole-and-line fishery in region1, and (b) quarterly catch of skipjack by year. The black dotted line shows the average in the period 1969-2017 in region1.

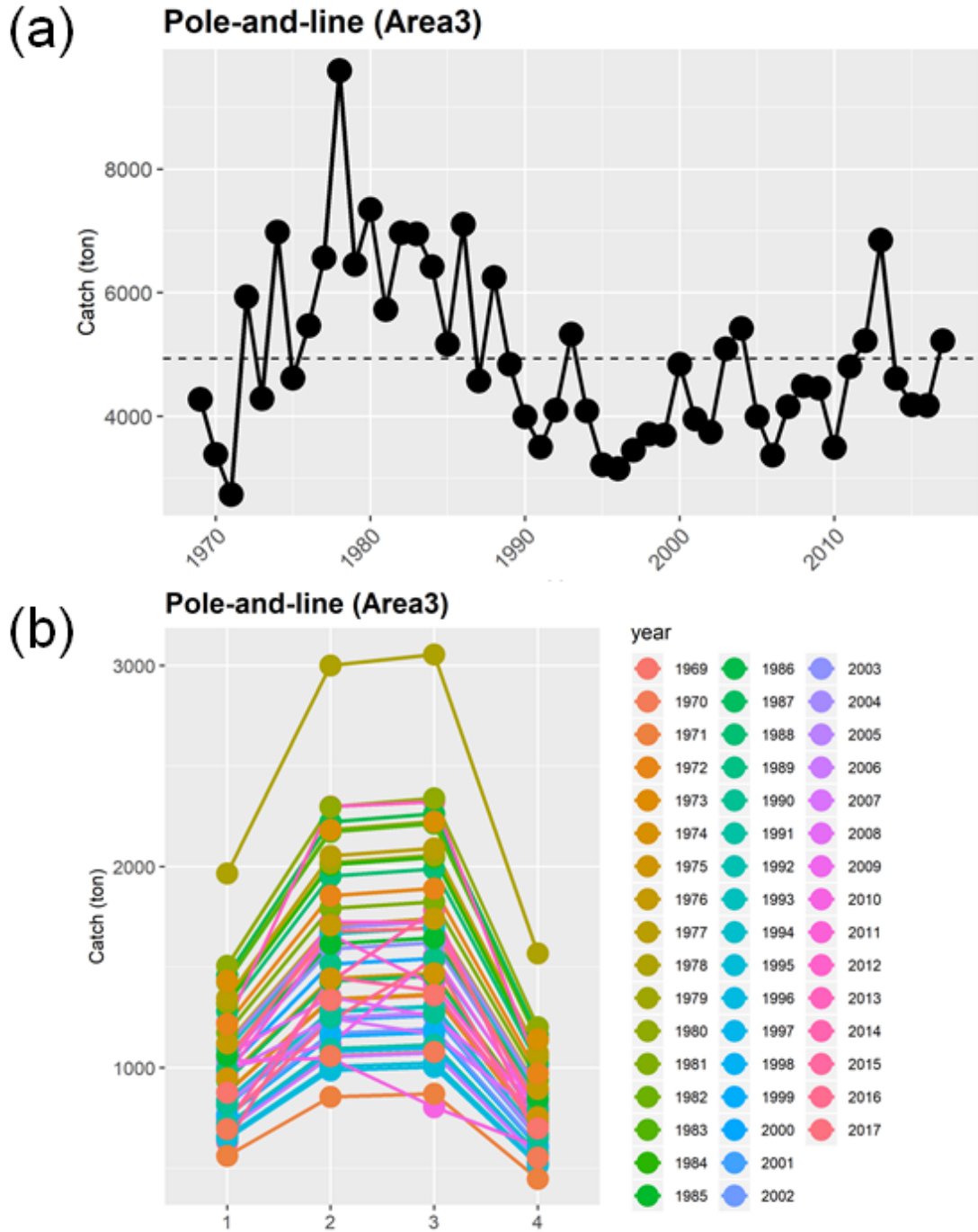


Figure 9. (a) Calculated total skipjack catches reported by the coastal pole-and-line fishery in region3, and (b) quarterly catch of skipjack by year. The black dotted line shows the average in the period 1969-2017 in region3.