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### **National Report on Chinese Taipei (Taiwanese Tuna and Tuna-like Fisheries in the North Pacific Ocean in 2020)**

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# Taiwanese Tuna and Tuna-like Fisheries in the North Pacific Ocean

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## Introduction

Taiwanese tuna fisheries in the North Pacific Ocean mainly comprise tuna longline fishery and purse seine fishery, and with some small scale fisheries operating off waters of Taiwan, such as harpoon, set net and gill net. Ninety percent of tuna and tuna-like species catch of Taiwanese fisheries in the North Pacific Ocean are from tuna longline and purse seine fisheries. The tuna longline fleet consists of large-scale tuna longline fleet (LTLL, previous named DWLL,  $\geq 100$  GRT) and small-scale tuna longline fleet (STLL, previous named OSL,  $< 100$  GRT). The catch of tuna and tuna-like species of tuna longline fishery in the North Pacific Ocean was 20,211 mt in 2020. For purse seine fishery, the total catch was 150,371 mt in the whole Pacific Ocean in 2020. To support Close-Kin Mark-Recapture project, there were 800 tissue samples of Pacific bluefin tuna collected in 2020.

## 1. Fisheries Monitoring

### 1.1. Tuna Longline fishery

#### 1.1.1 Large-scale tuna longline fleet

Large-scale tuna longline (LTLL) fishing vessels refer to those whose GRT are larger than or equal to 100 GRT, which mostly operate in the high seas or in the EEZs of Pacific Island countries under access agreements. There was a fleet size reduction program conducted between 2005 and 2007, 32 LTLL vessels previously operated in the Pacific Ocean had been scrapped. The number of active LTLL vessels reached a low level in 2009 for high fuel price with some temporarily ceasing operation, and the vessel number returned to 90 in 2010 and slightly increased to 95 for some shifting from the Indian Ocean owing to piracy in 2011. After then, the number of fishing vessels reduced to 87 in 2012 and 82 in 2013 with some shifting back to the Indian Ocean. Although the number of vessels in 2014 decreased further to 73, it gradually increased to 82 in 2017. In 2018 and 2019, the number of fishing vessels reduced to 75 which excluded 7 and 11 longlines chartered by the Pacific Islands countries, respectively. And slightly increased to 82 in 2020 (Table 1).

Table 2 shows catch estimates of Taiwanese LTLL fishing vessels operating in North Pacific Ocean during 1997-2020. From 1997 to 2000, albacore was the dominant species of the catch of Taiwanese LTLL in the North Pacific Ocean, accounting for more than 70% of the total catch. However, the catch of bigeye tuna, yellowfin tuna and swordfish increased significantly after 2001. The catch of albacore had gradually declined to 1,866 mt in 2009, and then rebounding to 3,836 mt in 2013. Since then, the albacore catch showed a decreasing trend and the catch in 2020 was preliminarily estimated at 1,565 mt, which reached the historical lowest level.

Prior to 2000, the catch of swordfish in the North Pacific was low and less than 100 mt. Thereafter, the catch increased substantially to more than 1,000 mt from 2001 to 2003 for the increase of fishing efforts on bigeye tuna, but declined to less than 500 mt from 2005 to 2009 due to the reduction of fishing efforts. The catch of swordfish increased to more than 500 mt from 2010 to 2011, gradually decreased to 225 mt in 2014, and returned to 724 mt in 2015. The preliminary estimated catch in 2020 was at 495 mt, which reached the lowest level since 2015. Table 3 shows catch of shark species of Taiwanese LTLL fishery in the North Pacific Ocean during 2009-2020. The annual shark catch was preliminary estimated at 2,370 mt in 2020.

The distribution of fishing efforts (in 1,000 hooks) of Taiwanese LTLL fishing vessels in the Pacific Ocean during 2018-2020 is shown in Figure 1. The weight frequency of albacore and swordfish caught by LTLL in the North Pacific, compiling from e-logbook data, are shown in Figures 2 and 3. The predominant weight ranges for albacore catch of LTLL between 2018 and 2020 are 12 to 16 kg, 12 to 16 kg, and 6 to 14 kg, in whole weight, respectively. The dominant weight ranges for swordfish catch of LTLL between 2018 and 2020 are 15 to 70 kg, 20 to 50 kg, and 20 to 60 kg in dressed weight, respectively.

### 1.1.2 Small-scale tuna longline fleet

The small-scale tuna longline (STLL) vessels generally refer to those smaller than 100 GRT (mostly 50-70 GRT). Table 4 shows the catch of Taiwanese STLL vessels operating in the North Pacific by species from 1997 to 2020. STLL vessels are mainly targeting tropical tuna with some bycatch of albacore, and some of them are seasonally targeting sharks. Prior to 2015, the catch estimation of albacore in the North Pacific Ocean was less than 1000 mt, and then has increased since 2016. A preliminary albacore catch was estimated at 2,244 mt in 2020. The catch of swordfish fluctuated between 1,200 mt to 4,000 mt from 1997 to 2019 and the catch in 2020 was preliminary estimated at 1,373 mt. As for Pacific bluefin tuna, since 2008, the catch fell below 1,000 mt and gradually decreased to 210 mt in 2012, reaching the lowest in the latest decade. The preliminary estimated catch of Pacific bluefin tuna in 2020 was 1,148 mt which reaches a high level in recent 10 years. Table 5 shows the shark catch by species for Taiwanese STLL operating in the North Pacific Ocean during 2009-2020. The shark catch was preliminarily estimated at 15,930 mt in 2020. The distribution of fishing efforts for STLL vessels from 2018 to 2020 is shown in Figure 4.

The weight frequency of albacore, swordfish, and Pacific bluefin tuna caught by STLL vessels in the North Pacific are shown in Figure 2, Figure 3, and Figure 5 separately. For STLL, the weight measurements for albacore, swordfish and Pacific bluefin tuna are sampled at domestic fishing ports. The dominant weight ranges for albacore caught by STLL from 2018-2020 are 18-22 kg, 16-20 kg, and 14-18 kg in whole weight (Figure 2). For swordfish, the dominant weight ranges from 2018-2020 are 15-40 kg, 10-25 kg, and 15-35 kg in dressed weight, separately (Figure 3). For Pacific bluefin tuna, the dominant weight ranges from 2018 to 2020 are 150-235 kg, 160-215 kg, and 160-215 kg in gutted weight, respectively (Figure 5).

### 1.2. Distant water purse seine fishery

Tuna purse seine fishery was introduced into Taiwan in 1982. At the outset, second-hand Japanese group purse seiners were imported and Japanese fishing masters were employed. Through years of

research, the first single boat purse seiner was launched in October 1984, as the cornerstone for rapid development of this fishery in the following 10 years. In 1992, the number of purse seiners reached the highest level of 45 boats. Due to the adjustment of business strategy of some companies, the number of fishing vessels was then reduced to 42. The fleet further reduced to 34 vessels in 2003, after 8 vessels were exported. Since 2004, the number of authorized purse vessels has maintained around 34. In 2020, the number of active fishing vessels was 28.

Fishing operations of the fleet moved along the equator under a seasonal pattern, mainly concentrating in the exclusive economic zones of Papua New Guinea, Federated States of Micronesia, Kiribati, Nauru, Marshall Islands and Solomon Islands, as well as the neighboring high seas. In the years when El Niño phenomena occur, the fish tends to move eastwards and the fishing activities will follow the pattern of this movement. In contrary, in years of La Niña, fish schools tend to concentrate more in the western part of the Pacific, and the fishing activities move likewise. The distribution of fishing effort in recent three years is shown in Figure 6. The total catches of SKJ, YFT and BET by the purse seine fishery in 2020 decreased to 150,371 mt from 239,076 mt in 2019 (Table 6). Catch by species for Taiwanese purse seiners operating in the North Pacific Ocean is shown as Table 7.

### 1.3 Other fisheries

Some other small scale fisheries, such as harpoon, set net and gill net have reported some catches of tunas and tuna-like species in Taiwanese coastal and offshore waters. Table 8 shows the catch of 2020 for Taiwanese small scale coastal and offshore fisheries in the North Pacific Ocean.

## 2. DATA COLLECTION

### 2.1 Tuna longline fishery

#### 2.1.1 Large-scale tuna longline fleet

In the past, several types of fisheries data, including commercial data, weekly report, and logbook data were collected to estimate the LTLL catches. The commercial data are collected from traders, Taiwan Tuna Association, certified weight reports provided by the Organization for the Promotion of Responsible Tuna Fisheries (OPRT) and so on. The logbook data includes each set of catch in number and weight by species, effort deployment, fishing location as well as the length measurement of the first 30 fishes caught each set. In addition, the weekly reports were used to enhance the timeliness of logbook data. After cross-checking and compilation, the commercial information was used to estimate total catches of the Category I data, and the logbook data was used to compile the catch and effort data for Categories II and III.

In 2014, Taiwan introduced the electronic logbook system and enforced it on LTLL in the first stage. Under this system, fishing vessels are all required to report their fishery data daily to the data center of Fisheries Agency through satellite transmission. The system improves the recovery rate of fishery data in a real-time manner and both logbook and weekly report are gradually replaced. In addition, two new measures have been implemented to collect the unloading data. All fishermen shall submit landing declaration after offloading their catches. Also, port inspection conducted by the Fisheries Agency is

another source for landing data. Both of them are used to verifying e-log data. In recent year, these data are the main sources for the data preparation of Categories I, II and III.

### 2.1.2 Small-scale tuna longline fleet

Similar to LTLL, the approaches of data collection for STLL also have been improved during the last several years. In the past, we divided STLL into two categories, namely the domestic-based STLL and the foreign-based STLL, based on the ports that the vessels station and unload their catch. For domestic-based STLL, the landing records from local fishing markets were the main source of Category I data, on the other hand, the landing reports collected from foreign-based agents and monthly catch report from individual vessel were used to estimate the Category I data for foreign-based STLL. As for Categories II and III, the logbook data of STLL had been collected since 1997, and the size data of major tuna species (mainly bigeye tuna and yellowfin tuna) have been sourced from port sampling conducted at domestic fish markets. At the beginning, the low recovery rate of logbook resulted in difficulty in compiling Category II data for stock assessment. To improve the recovery rate of logbook, Fisheries Agency has launched a data improving program by dispatching its staffs to collect logbook, interviewing with fishermen so as to obtain fisheries information, and conducting size sampling program at main domestic fishing ports including Donggang, Nanfangao and Hsinkang since April 2007. Through this program, the recovery rate of logbook has been gradually improved.

In 2015, the implementation scope of e-logbook system was broadened. The Fisheries Agency required STLL vessels operating outside the EEZ of Taiwan to report their catches through the satellite transmission daily since 2016. Due to the great improvement on the recovery rate of the e-logbook of STLL, those e-logbook data are gradually used as the main source. Like LTLL, data from landing declaration and port inspection are also used to verify the e-logbook data reported by fishermen.

Recognizing the importance of Pacific Bluefin tuna to our fishery, Fisheries Agency has implemented the Catch Documentation Scheme (CDS) for the purpose of conservation and management since March 2010. According to the regulation, all longline vessels fishing for Pacific bluefin tuna shall get prior authorization by Fisheries Agency every year and carry an automatic location communicator (ALC) on board. Fishermen have to attach a tag issued by Fisheries Agency to every Pacific bluefin tuna landed on board and report the location, the tag serial number, and the estimate weight to the Fisheries Agency. As mentioned above, all PBF catch landed at the domestic fishing ports would be weighted and measured the length. For PBF catch which is not attached with a tag nor reported by fisherman, the Catch Document will not be issued for it. It takes a positive effect on the data collection of the Pacific Bluefin tuna.

To develop the Pacific Bluefin Close-Kin Mark Recapture project, ISC members decided to collect tissue samples for genetics analysis. In 2020, Taiwan has already collected 800 tissue samples of Pacific bluefin tuna. These Pacific bluefin tuna were caught by STLL and sampled from domestic fishing ports of Donggang and Nanfangao. The length distribution of sampled fish was between 175 cm and 268 cm in fork length.

### 2.2 Distant water purse seine fishery

The logbook recovery rate for distant water purse seine fishery has always been satisfactory and reaching 100%, and all purse seiners have been required to report their operation data via iFIMS (integrated Fisheries Information Management System) in a real-time manner since 2015. Length data has been collected from fishing vessels since 2013.

### 2.3 Other fisheries

The annual catch data of small scale coastal and offshore fisheries are collected and compiled by local governments.

### 2.4 Observer program

To better understand the fishing activities of the longline fishery, including target and non-target species and to be in line with the international requirements for conserving marine resources, Fisheries Agency has launched a pilot observer program since 2001 in the Indian Ocean. Further, the observer program has been carried out in the Pacific Ocean since 2002. Table 9 shows the number of observers deployed on board annually during 2011-2020. In accordance with the government's policy of establishing an observer program and availability of budgets to support the increase of observers, the number of observers gradually increased annually, besides, it has been extended to the STLL fleets since 2012. The number of observers deployed on longline vessels in 2020 was 56 in total, including 14 observers for LTLL vessels and 42 observers for STLL vessels, respectively. One of them both deployed on LTLL and STLL vessels in 2020. The observer coverage rate for both LTLL and STLL has met the RFMOs' requirement of 5%.

### 2.5 VMS monitoring

Since 2005, Taiwanese tuna fishing vessels with GRT over 20 tons fishing for highly migratory fish stocks are required to install ALC and transmit one vessel position every 4 hours. In 2018, the measure further require the vessels operating in the area beyond national jurisdiction to transmit their positions every 1 hour. It would provide more information of the distribution of the fishing operation.

Furthermore, considering the importance to monitor the fishing activities on the Pacific bluefin tuna, since 2018, the requirement of installation of ALC and transmitting vessel position is extended from vessels over 20 GRT to all sized longline vessels that intend to fish for the Pacific bluefin tuna. The data will be used to monitor fishing activities as well as to verify the fishing location that recorded in logbooks.

## 3. RESEARCH

For the purpose of improving stock assessment of species in the North Pacific, government of Taiwan has commissioned scientists to conduct a series of researches in 2020 as follows :

- (1) Study on abundance index and HS/MS elements for WCPO tropical tunas.
- (2) A study on the elements of the harvest strategy/management strategy developments of the south Pacific albacore tuna and the biology and stock assessment of Pacific blue marlin.

- (3) Stock status and NDF assessment of sharks in the Pacific Ocean.
- (4) The impacts of mitigation measures on the bycatch species in Taiwanese distant water vessels.

Besides, the scientific papers presented at recent ISC meetings during 2020-2021 were as follows:

- (1) Blue marlin (*Makaira nigricans*) catch and size data of Taiwanese fisheries in the Pacific Ocean. (ISC/20/BILLWG-01/08)
- (2) Movement patterns and habitat preferences of five species of billfish in northwestern Pacific Ocean. (ISC/20/BILLWG-01/09)
- (3) Considering age uncertainty and two stanzas of growth for the Pacific blue marlin (*Makaira nigricans*). (ISC/20/BILLWG-01/11)
- (4) Abundance index of Taiwanese PBF fisheries based on traditional and spatiotemporal delta-generalized linear mixed models. (ISC/20/PBFWG-1/03)
- (5) Length-Based Proportional Sampling for Life History Research: Establishing Uniform Sampling for North Pacific Billfish Species. (ISC/20/BILLWG-02/01)
- (6) Estimation of the two-stanza growth curves with ageing uncertainty for the Pacific blue marlin (*Makaira nigricans*). (ISC/20/BILLWG-02/03)
- (7) CPUE standardization of blue marlin (*Makaira nigricans*) for the Taiwanese distant-water tuna longline fishery in the Pacific Ocean during 1971 - 2019. (ISC/20/BILLWG-03/03)
- (8) Updated standardized CPUE and historical catch estimate of the shortfin mako shark caught by Taiwanese large-scale tuna longline fishery in the North Pacific Ocean. (ISC/21/SHARKWG-1/01)
- (9) Updated size composition of shortfin mako shark caught by the Taiwanese tuna longline fishery in the North Pacific Ocean. (ISC/21/SHARKWG-1/02)
- (10) Movement ecology of swordfish (*Xiphias gladius*) in the northwestern Pacific Ocean using electronic tags and stable isotope analysis. (ISC/21/BILLWG-01/06 rev1)

Regarding international cooperation in research, NRIFSF of Japan, sponsored by Ajinomoto Group Corporate, had conducted skipjack tagging project in the waters off Japan since 2009 to study the migration route of skipjack. As it is believed that some tagged skipjack off Yonaguni were harvested by Taiwanese fishermen, NRIFSF proposed to work with Taiwanese scientists to recover tags on skipjack. In 2016, Taiwan began to assist the cooperation program on tag recovery. There were 5 tags recovered and returned to NRIFSF as by the end of 2019, but no tag recovered during 2020.



Table 1. Number of active Taiwanese tuna fishing vessels in the Pacific Ocean by fishery

| Year  | Longline Fishery |       | Purse Seine Fishery |
|-------|------------------|-------|---------------------|
|       | LTLL             | STLL  |                     |
| 2009  | 75               | 1,220 | 34                  |
| 2010  | 90               | 1,236 | 34                  |
| 2011  | 95               | 1,376 | 34                  |
| 2012  | 87               | 1,326 | 34                  |
| 2013  | 82               | 1,296 | 34                  |
| 2014  | 73               | 1,275 | 34                  |
| 2015  | 76               | 1,306 | 34                  |
| 2016  | 79               | 1,303 | 34                  |
| 2017  | 82               | 1,079 | 28                  |
| 2018  | 75               | 843   | 27                  |
| 2019  | 75               | 723   | 30                  |
| 2020* | 82               | 710   | 28                  |

LTLL: largescale tuna longline vessel, STLL: small scale tuna longline vessel

\* Data of 2020 is still preliminary. The numbers of chartered LL vessels are excluded.

Table 2. Catch by species of the Taiwanese LTLL fishing vessels operating in the North Pacific Ocean

Unit: mt

| Year  | ALB   | PBF | BET   | YFT   | SWO   | MLS | BUM | BLM | SFA | SKJ | TOTAL  |
|-------|-------|-----|-------|-------|-------|-----|-----|-----|-----|-----|--------|
| 1997  | 9,119 | 0   | 112   | 41    | 15    | 59  | 20  | 1   | 13  | 72  | 9,452  |
| 1998  | 8,617 | 0   | 156   | 39    | 20    | 90  | 21  | 5   | 34  | 444 | 9,426  |
| 1999  | 8,186 | 0   | 360   | 122   | 70    | 66  | 53  | 8   | 5   | 114 | 8,984  |
| 2000  | 7,898 | 0   | 1,450 | 584   | 325   | 153 | 75  | 19  | 49  | 195 | 10,748 |
| 2001  | 7,852 | 0   | 4,569 | 1,882 | 1,039 | 121 | 209 | 4   | 4   | 243 | 15,923 |
| 2002  | 7,055 | 0   | 7,257 | 2,689 | 1,633 | 251 | 138 | 5   | 1   | 16  | 19,045 |
| 2003  | 6,454 | 0   | 2,936 | 1,105 | 1,084 | 241 | 218 | 4   | 7   | 40  | 12,089 |
| 2004  | 4,061 | 0   | 4,939 | 1,230 | 884   | 261 | 372 | 2   | 11  | 191 | 11,951 |
| 2005  | 3,990 | 0   | 3,963 | 1,552 | 392   | 199 | 376 | 15  | 63  | 175 | 10,725 |
| 2006  | 3,848 | 1   | 2,756 | 1,035 | 438   | 204 | 363 | 5   | 11  | 8   | 8,669  |
| 2007  | 2,465 | 0   | 2,965 | 657   | 345   | 102 | 275 | 1   | 2   | 3   | 6,815  |
| 2008  | 2,490 | +   | 2,840 | 484   | 338   | 78  | 255 | 1   | 20  | 129 | 6,635  |
| 2009  | 1,866 | 0   | 2,302 | 303   | 373   | 37  | 225 | 0   | 8   | 175 | 5,289  |
| 2010  | 2,281 | 0   | 3,139 | 467   | 531   | 53  | 409 | 32  | 4   | 44  | 6,960  |
| 2011  | 2,972 | 0   | 3,318 | 448   | 502   | 74  | 675 | 16  | 40  | 85  | 8,130  |
| 2012  | 2,055 | 0   | 2,653 | 285   | 350   | 91  | 287 | 5   | 29  | 82  | 5,837  |
| 2013  | 3,836 | 0   | 1,814 | 281   | 291   | 87  | 253 | +   | 23  | 102 | 6,687  |
| 2014  | 2,302 | 0   | 1,349 | 221   | 225   | 25  | 146 | 1   | 0   | 47  | 4,316  |
| 2015  | 2,629 | 0   | 2,745 | 730   | 724   | 47  | 468 | 1   | 40  | 90  | 7,474  |
| 2016  | 2,395 | 0   | 2,681 | 1,043 | 692   | 79  | 600 | 1   | 20  | 74  | 7,585  |
| 2017  | 1,986 | +   | 2,224 | 1,649 | 632   | 98  | 498 | 8   | 21  | 133 | 7,249  |
| 2018  | 1,863 | 0   | 2,095 | 1,314 | 636   | 71  | 325 | 1   | 18  | 47  | 6,370  |
| 2019  | 1,694 | 0   | 2,868 | 1,460 | 525   | 59  | 280 | 1   | 28  | 74  | 6,989  |
| 2020* | 1,565 | 0   | 1,867 | 946   | 495   | 46  | 163 | 1   | 6   | 26  | 5,115  |

Species -- Albacore (ALB), Pacific bluefin tuna (PBF), bigeye tuna (BET), yellowfin tuna (YFT), swordfish (SWO), striped marlin (MLS), blue marlin (BUM), black marlin (BLM), sailfish (SFA), skipjack tuna (SKJ)

\* Data of 2020 is still preliminary.

+: below 499kg catch.

Table 3. Shark catch by species for the Taiwanese LTL fishing vessels operating in the North Pacific Ocean

Unit: mt

| Year  | BSH   | FAL** | SMA | OCS | THR | SPN | POR | SKX | TOTAL |
|-------|-------|-------|-----|-----|-----|-----|-----|-----|-------|
| 2009  | 417   | 155   | 78  | 32  | 10  | -   | 0   | 29  | 721   |
| 2010  | 238   | 109   | 54  | 21  | 9   | 3   | 0   | 11  | 445   |
| 2011  | 670   | 289   | 208 | 53  | 43  | 9   | 0   | 29  | 1,301 |
| 2012  | 401   | 197   | 74  | 11  | 6   | +   | 0   | 3   | 692   |
| 2013  | 453   | 173   | 107 | 0   | 3   | +   | 0   | 13  | 749   |
| 2014  | 481   | 68    | 119 | 0   | 2   | 0   | 0   | 5   | 675   |
| 2015  | 943   | 13    | 322 | 0   | 50  | 6   | 0   | 49  | 1,383 |
| 2016  | 783   | 7     | 220 | 0   | 59  | 5   | 0   | 30  | 1,104 |
| 2017  | 1,642 | 0     | 187 | 0   | 23  | 6   | 0   | 7   | 1,865 |
| 2018  | 2,255 | 0     | 265 | 0   | 58  | 15  | 0   | 12  | 2,605 |
| 2019  | 2,985 | 2     | 273 | 0   | 12  | 4   | 0   | 5   | 3,281 |
| 2020* | 2,097 | 2     | 248 | 0   | 14  | 3   | 0   | 6   | 2,370 |

Species -- blue shark (BSH), silky shark (FAL), shortfin mako sharks (SMA), oceanic whitetip (OCS), thresher sharks (THR), hammerhead sharks (SPN), porbeagle shark (POR), other sharks & rays (SKX). +: below 499kg catch. -: there is no clear information of the catch.

\* Data of 2020 is still preliminary

\*\* Catch after 2015 was from NEPO

Table 4. Catch by species for the Taiwanese STLL fishing vessels operating in the North Pacific Ocean

Unit: mt

| Year  | ALB   | PBF   | BET   | YFT    | SKJ | SWO   | MLS | BUM   | BLM   | SFA   | TOTAL  |
|-------|-------|-------|-------|--------|-----|-------|-----|-------|-------|-------|--------|
| 1997  | 337   | 1,814 | 3,506 | 9,419  | 59  | 1,358 | 290 | 3,625 | 611   | 527   | 21,546 |
| 1998  | 193   | 1,910 | 3,520 | 8,955  | 32  | 1,178 | 205 | 3,603 | 469   | 868   | 20,933 |
| 1999  | 207   | 3,089 | 2,578 | 8,961  | 27  | 1,385 | 128 | 3,362 | 563   | 402   | 20,702 |
| 2000  | 944   | 2,780 | 2,041 | 7,848  | 31  | 3,390 | 161 | 4,056 | 453   | 499   | 22,203 |
| 2001  | 832   | 1,839 | 1,898 | 8,166  | 26  | 3,813 | 129 | 4,524 | 428   | 640   | 22,295 |
| 2002  | 910   | 1,523 | 2,150 | 9,145  | 67  | 3,766 | 226 | 4,310 | 173   | 504   | 22,774 |
| 2003  | 712   | 1,863 | 6,136 | 15,689 | 14  | 3,687 | 681 | 7,467 | 1,110 | 2,079 | 39,438 |
| 2004  | 927   | 1,714 | 4,067 | 12,617 | 32  | 3,364 | 261 | 6,300 | 1,506 | 2,081 | 32,869 |
| 2005  | 482   | 1,368 | 5,314 | 12,181 | 33  | 3,572 | 584 | 7,254 | 1,144 | 1,333 | 33,265 |
| 2006  | 469   | 1,148 | 6,204 | 13,116 | 24  | 3,944 | 537 | 5,366 | 961   | 488   | 32,257 |
| 2007  | 451   | 1,401 | 5,075 | 11,885 | 17  | 3,754 | 199 | 4,842 | 259   | 1,059 | 28,942 |
| 2008  | 579   | 979   | 6,055 | 12,567 | 15  | 3,407 | 192 | 5,222 | 249   | 918   | 30,183 |
| 2009  | 512   | 877   | 3,807 | 13,122 | 66  | 3,177 | 225 | 4,413 | 298   | 372   | 26,869 |
| 2010  | 537   | 373   | 1,967 | 13,692 | 169 | 2,313 | 200 | 4,550 | 383   | 960   | 25,144 |
| 2011  | 462   | 292   | 2,769 | 11,382 | 235 | 3,075 | 269 | 3,950 | 335   | 876   | 23,645 |
| 2012  | 588   | 210   | 4,240 | 11,237 | 190 | 3,396 | 352 | 3,803 | 240   | 740   | 24,996 |
| 2013  | 591   | 331   | 3,493 | 9,928  | 265 | 2,555 | 285 | 4,354 | 444   | 665   | 22,911 |
| 2014  | 315   | 483   | 2,687 | 6,964  | 122 | 2,592 | 115 | 4,715 | 441   | 443   | 18,877 |
| 2015  | 391   | 552   | 2,504 | 6,679  | 70  | 2,475 | 181 | 3,838 | 386   | 472   | 17,548 |
| 2016  | 1,011 | 454   | 2,650 | 6,920  | 126 | 1,362 | 135 | 2,798 | 177   | 553   | 16,186 |
| 2017  | 2,347 | 415   | 3,140 | 12,004 | 194 | 1,562 | 291 | 3,479 | 196   | 367   | 23,998 |
| 2018  | 2,651 | 381   | 3,316 | 10,498 | 251 | 1,488 | 259 | 3,176 | 239   | 364   | 22,623 |
| 2019  | 3,760 | 486   | 2,567 | 10,155 | 580 | 1,588 | 314 | 3,079 | 250   | 551   | 23,330 |
| 2020* | 2,244 | 1,148 | 1,996 | 5,479  | 380 | 1,373 | 307 | 1,792 | 233   | 144   | 15,096 |

Species -- Pacific bluefin tuna (PBF), albacore (ALB), bigeye tuna (BET), yellowfin tuna (YFT), skipjack tuna (SKJ), swordfish (SWO), striped marlin (MLS), blue marlin (BUM), black marlin (BLM), sailfish (SFA).

\* Data of 2020 is still preliminary

Table 5. Shark catch by species for the Taiwanese STLL fishing vessels operating in the North Pacific Ocean

Unit: mt

| Year  | BSH    | FAL** | MAK   | OCS | THR | SPN | POR | SKX   | TOTAL  |
|-------|--------|-------|-------|-----|-----|-----|-----|-------|--------|
| 2009  | 11,124 | 390   | 477   | 15  | 628 | 552 | 0   | 3,217 | 16,403 |
| 2010  | 7,432  | 146   | 620   | 7   | 498 | 320 | 0   | 1,925 | 10,948 |
| 2011  | 12,447 | 216   | 976   | 2   | 788 | 388 | 0   | 3,087 | 17,904 |
| 2012  | 10,205 | 94    | 686   | 2   | 579 | 349 | 0   | 3,051 | 14,966 |
| 2013  | 5,868  | 55    | 518   | 0   | 717 | 316 | 0   | 2,644 | 10,118 |
| 2014  | 7,670  | 35    | 391   | 0   | 531 | 218 | 0   | 1,403 | 10,248 |
| 2015  | 7,608  | 19    | 571   | 0   | 459 | 245 | 0   | 1,298 | 10,200 |
| 2016  | 7,780  | 26    | 470   | 0   | 430 | 172 | 0   | 1,321 | 10,199 |
| 2017  | 9,479  | 6     | 568   | 0   | 530 | 237 | 0   | 2,639 | 13,459 |
| 2018  | 9,506  | 1     | 585   | 0   | 533 | 290 | 0   | 2,785 | 13,700 |
| 2019  | 15,180 | 0     | 1,084 | 0   | 579 | 326 | 0   | 2,744 | 19,913 |
| 2020* | 13,443 | 0     | 1,087 | 0   | 449 | 348 | 5   | 598   | 15,930 |

Species -- blue shark (BSH), silky shark (FAL), mako sharks (MAK), oceanic whitetip (OCS), thresher sharks (THR), hammerhead sharks (SPN), porbeagle shark (POR), other sharks & rays (SKX).

\* Data of 2020 is still preliminary

\*\* Catch after 2015 was from NEPO

Table 6. Catch by species for the Taiwanese DWPS fishing vessels operating in the Pacific Ocean

Unit: mt

| Year  | SKJ     | YFT    | BET   | Total   |
|-------|---------|--------|-------|---------|
| 2006  | 189,392 | 19,793 | 978   | 210,163 |
| 2007  | 209,002 | 21,147 | 2,386 | 232,535 |
| 2008  | 165,007 | 35,770 | 3,196 | 203,973 |
| 2009  | 173,725 | 16,237 | 2,113 | 192,075 |
| 2010  | 166,211 | 29,203 | 3,437 | 198,851 |
| 2011  | 155,641 | 18,143 | 2,151 | 175,935 |
| 2012  | 172,664 | 25,750 | 2,239 | 200,653 |
| 2013  | 186,330 | 22,659 | 3,491 | 212,480 |
| 2014  | 213,154 | 20,548 | 3,418 | 237,120 |
| 2015  | 160,597 | 28,593 | 5,059 | 194,249 |
| 2016  | 146,204 | 34,494 | 4,994 | 185,692 |
| 2017  | 126,960 | 35,345 | 4,934 | 167,239 |
| 2018  | 160,599 | 28,427 | 4,656 | 193,682 |
| 2019  | 201,731 | 33,761 | 3,584 | 239,076 |
| 2020* | 123,154 | 23,533 | 3,684 | 150,371 |

Species -- skipjack tuna (SKJ), yellowfin tuna (YFT), and bigeye tuna (BET).

\* Data of 2020 is still preliminary

Table 7. Catch by species for the Taiwanese purse seine vessels operating in the North Pacific Ocean

Unit: mt

| Year  | ALB | PBF | BET   | YFT    | SWO | MLS | BUM | BLM | SFA | SKJ    | TOTAL   |
|-------|-----|-----|-------|--------|-----|-----|-----|-----|-----|--------|---------|
| 2006  | -   | -   | 182   | 7,717  | -   | -   | -   | -   | -   | 75,442 | 83,341  |
| 2007  | -   | -   | 564   | 8,037  | -   | -   | -   | -   | -   | 87,232 | 95,833  |
| 2008  | -   | -   | 1,243 | 9,994  | -   | -   | -   | -   | -   | 50,587 | 61,824  |
| 2009  | -   | -   | 568   | 6,319  | -   | -   | -   | -   | -   | 69,026 | 75,913  |
| 2010  | -   | -   | 121   | 1,215  | -   | -   | -   | -   | -   | 42,397 | 43,733  |
| 2011  | -   | -   | 724   | 4,037  | +   | -   | 2   | 3   | +   | 42,796 | 47,562  |
| 2012  | -   | -   | 764   | 7,517  | -   | +   | 12  | 2   | +   | 71,482 | 79,777  |
| 2013  | -   | -   | 1,749 | 8,714  | -   | +   | 9   | 3   | +   | 66,694 | 77,170  |
| 2014  | -   | -   | 1,248 | 8,700  | +   | 1   | 7   | 4   | +   | 95,091 | 105,051 |
| 2015  | -   | -   | 2,082 | 17,873 | -   | -   | 3   | 2   | +   | 59,274 | 79,234  |
| 2016  | -   | -   | 2,196 | 12,586 | -   | 1   | 4   | 2   | +   | 57,384 | 72,443  |
| 2017  | -   | -   | 1,095 | 12,231 | +   | -   | 6   | 5   | +   | 41,945 | 55,282  |
| 2018  | -   | -   | 1,141 | 9,437  | -   | +   | 10  | 5   | +   | 82,292 | 92,886  |
| 2019  | 1   | -   | 659   | 12,040 | -   | +   | 4   | 1   | -   | 56,110 | 68,810  |
| 2020* | -   | -   | 1,357 | 8,304  | -   | -   | -   | +   | -   | 32,274 | 41,935  |

Species -- Albacore (ALB), Pacific bluefin tuna (PBF), bigeye tuna (BET), yellowfin tuna (YFT), swordfish (SWO), striped marlin (MLS), blue marlin (BUM), black marlin (BLM), sailfish (SFA), skipjack tuna (SKJ).

\* Data of 2020 is still preliminary. +: below 499kg catch.

Table 8. The annual catch of Taiwanese coastal and offshore fisheries in the North Pacific Ocean for 2020 (preliminary)

Unit: mt

| Fisheries        | PBF | ALB | BET | YFT | SKJ   | SWO | MLS | BUM | BLM | SFA | SSP | SKX | TOTAL |
|------------------|-----|-----|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-------|
| Offshore Gillnet | 0   | 5   | 0   | 0   | 265   | +   | 0   | 0   | 0   | 0   | -   | 70  | 341   |
| Offshore Others  | 3   | +   | 0   | 165 | 1,384 | +   | 0   | +   | 0   | 44  | -   | 192 | 1,787 |
| Coastal Gillnet  | +   | 0   | 0   | 3   | 41    | 0   | 8   | 22  | 72  | 122 | -   | 139 | 405   |
| Coastal Setnet   | 1   | 0   | +   | 28  | 661   | 2   | 0   | 0   | 9   | 54  | -   | 5   | 761   |
| Coastal Harpoon  | 0   | 0   | 0   | 0   | 0     | 0   | 26  | 99  | 191 | 223 | -   | 36  | 575   |
| Coastal Longline | 0   | 0   | 0   | 1   | 1     | 0   | 0   | 0   | 0   | 1   | -   | 1   | 6     |
| Coastal Others   | 0   | 0   | 0   | 1   | 12    | 0   | 0   | 0   | 0   | 0   | -   | 13  | 27    |

Species -- Pacific bluefin tuna (PBF), albacore (ALB), bigeye tuna (BET), yellowfin tuna (YFT), skipjack tuna (SKJ), swordfish (SWO), striped marlin (MLS), blue marlin (BUM), black marlin (BLM), sailfish (SFA), shortbill spearfish (SSP), other sharks & rays (SKX).

+: below 499kg catch. -: there is no clear information of the catch.

Table 9. The number of observers deployed on tuna longline vessels in the Pacific Ocean during 2011-2020

| Year                | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---------------------|------|------|------|------|------|------|------|------|------|------|
| Number of observers | 15   | 32   | 24   | 24   | 32   | 28   | 66   | 76   | 46   | 56   |

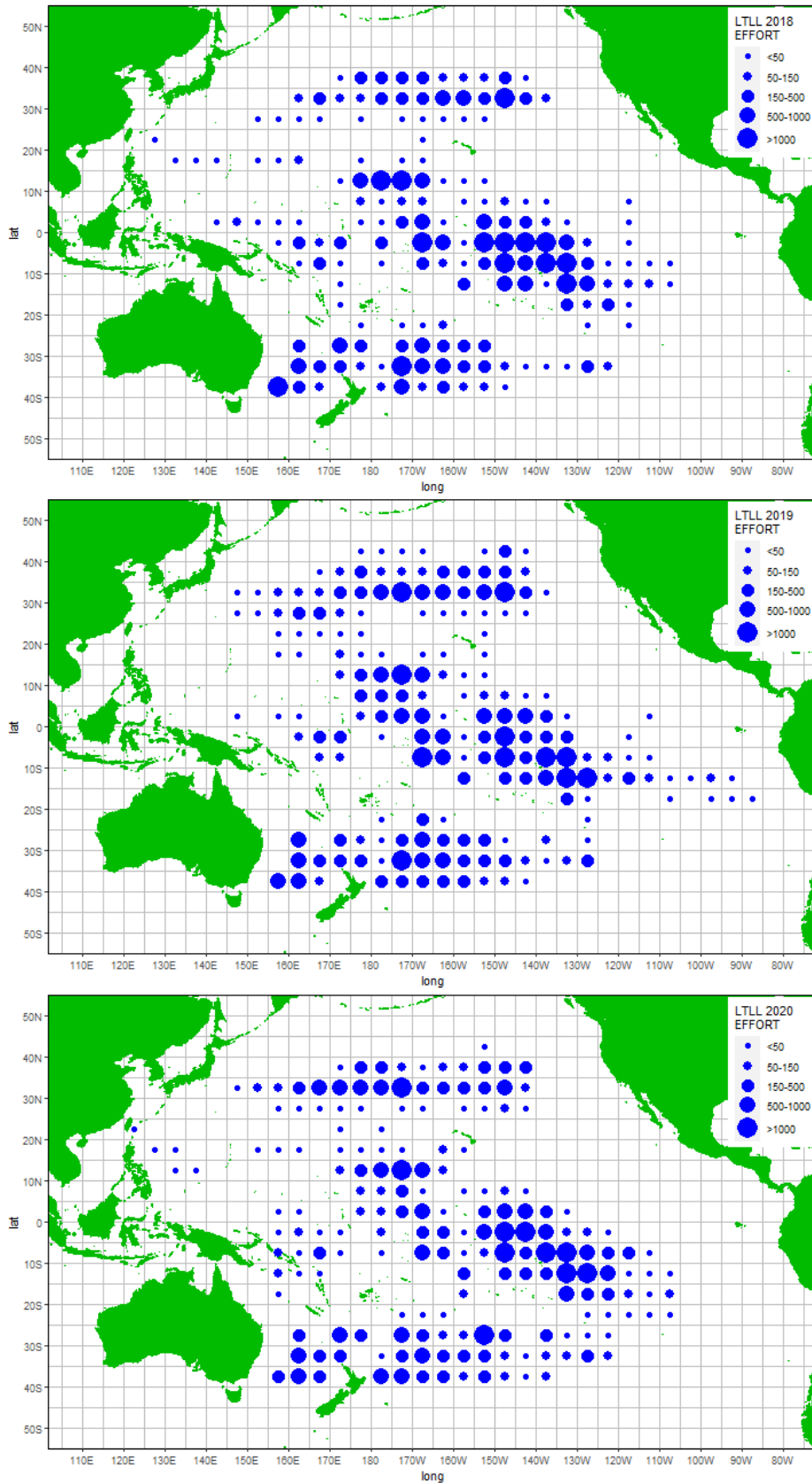


Figure 1. Distributions of fishing effort for the Taiwanese LTLV vessels operating in the Pacific Ocean during 2018-2020. (Note: Map of 2020 is still preliminary and will be updated.)

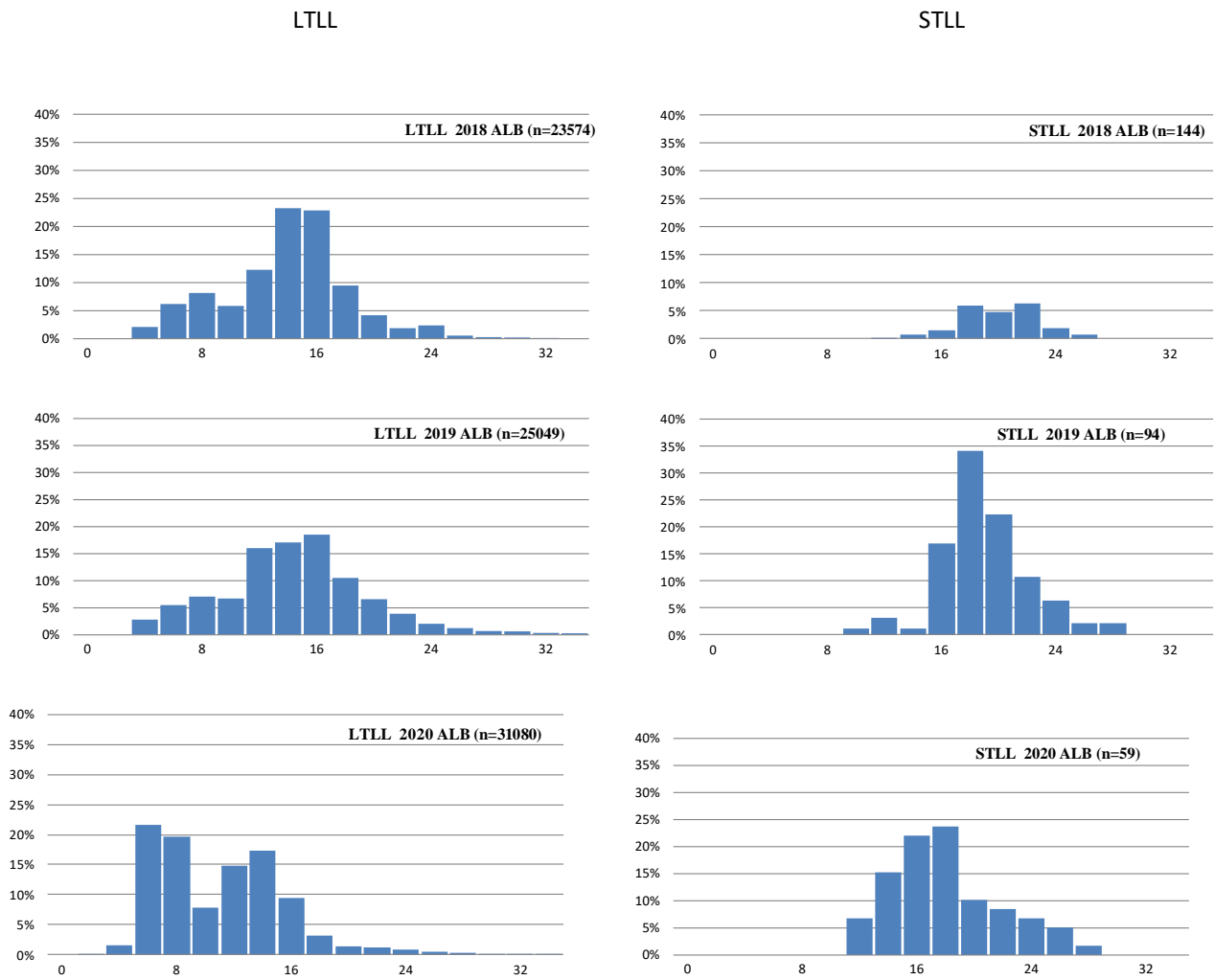


Figure 2. Weight frequency distributions of albacore caught by the Taiwanese LTLL and STLL vessels in the North Pacific Ocean during 2018-2020.

\* The size data of STLL have been sourced from port sampling conducted at main domestic fish markets.

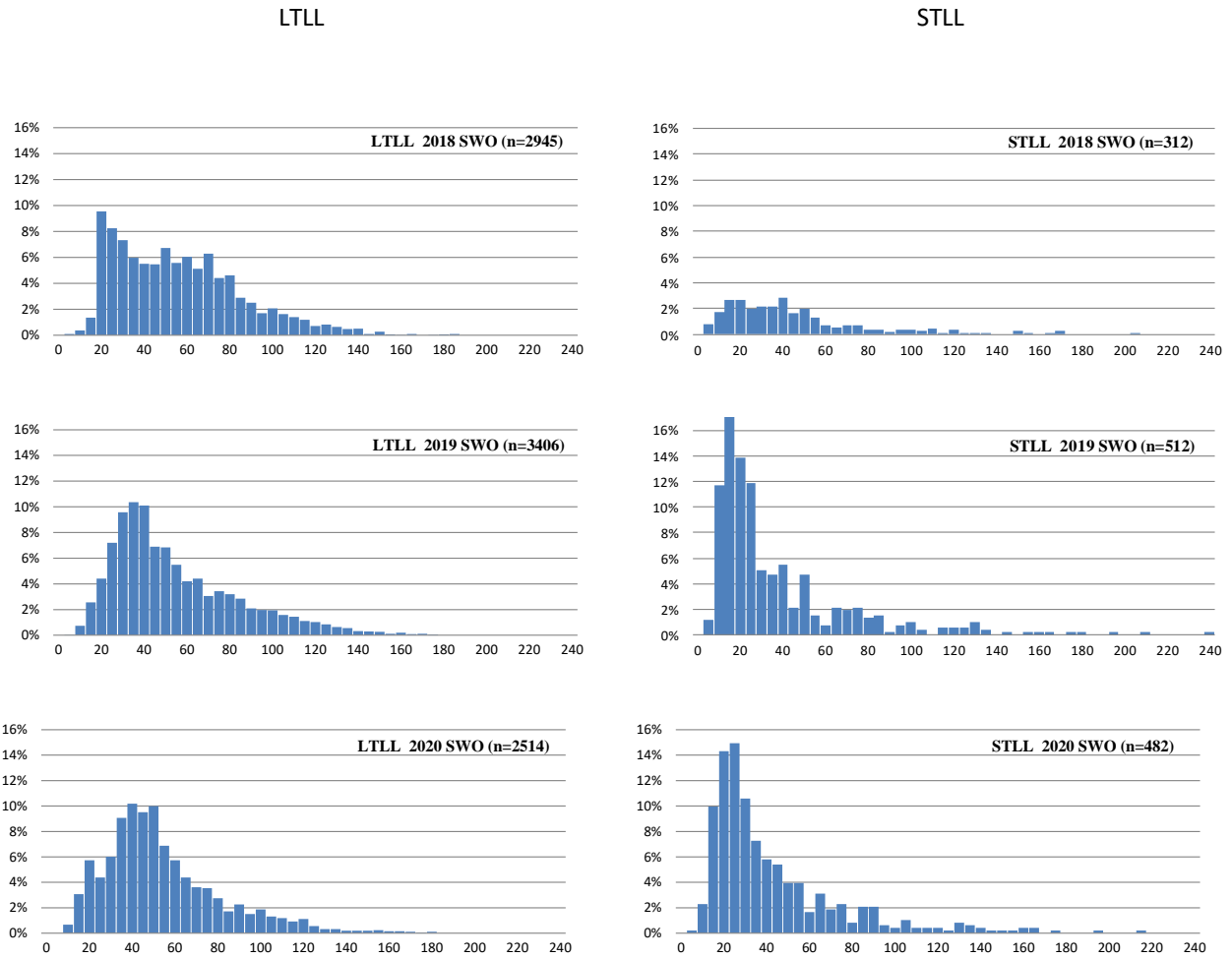


Figure 3. Weight frequency distributions of swordfish caught by the Taiwanese LTLL and STLL vessels in the North Pacific Ocean during 2018-2020.

\* The size data of STLL have been sourced from port sampling conducted at main domestic fish markets.

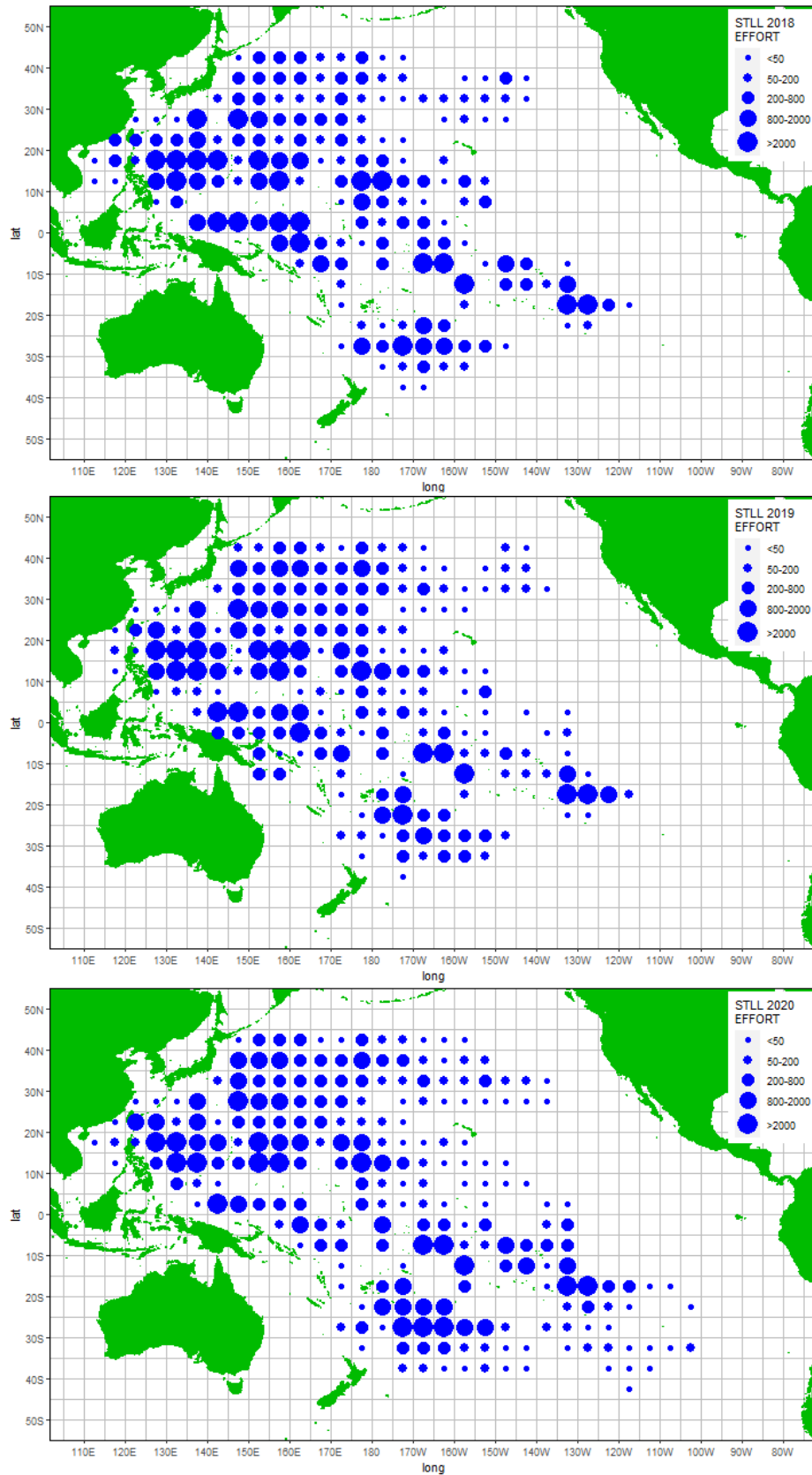


Figure 4. Distributions of fishing effort for the Taiwanese STLL vessels operating in the Pacific Ocean during 2018-2020. (Note: Distributions of 2020 is still preliminary and will be updated.)



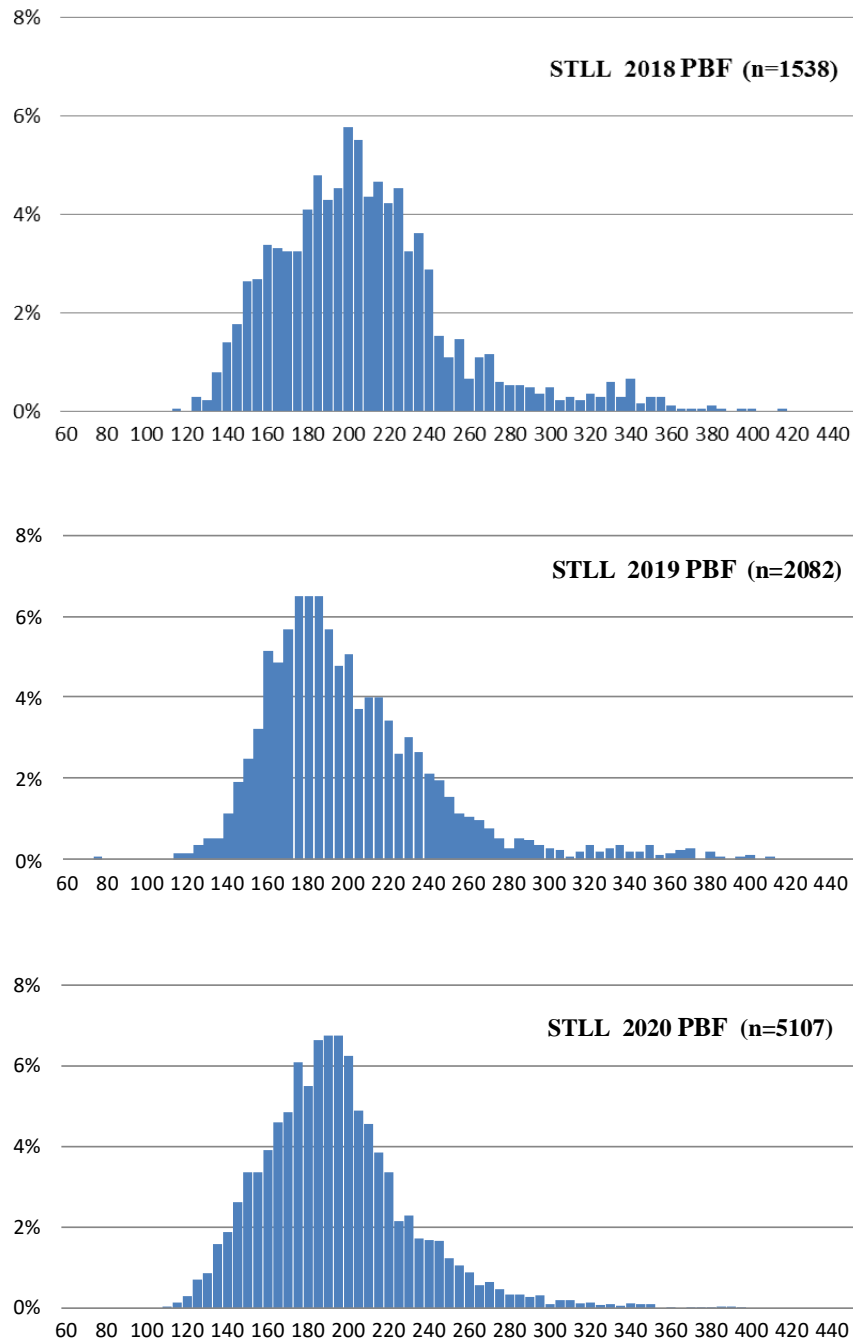
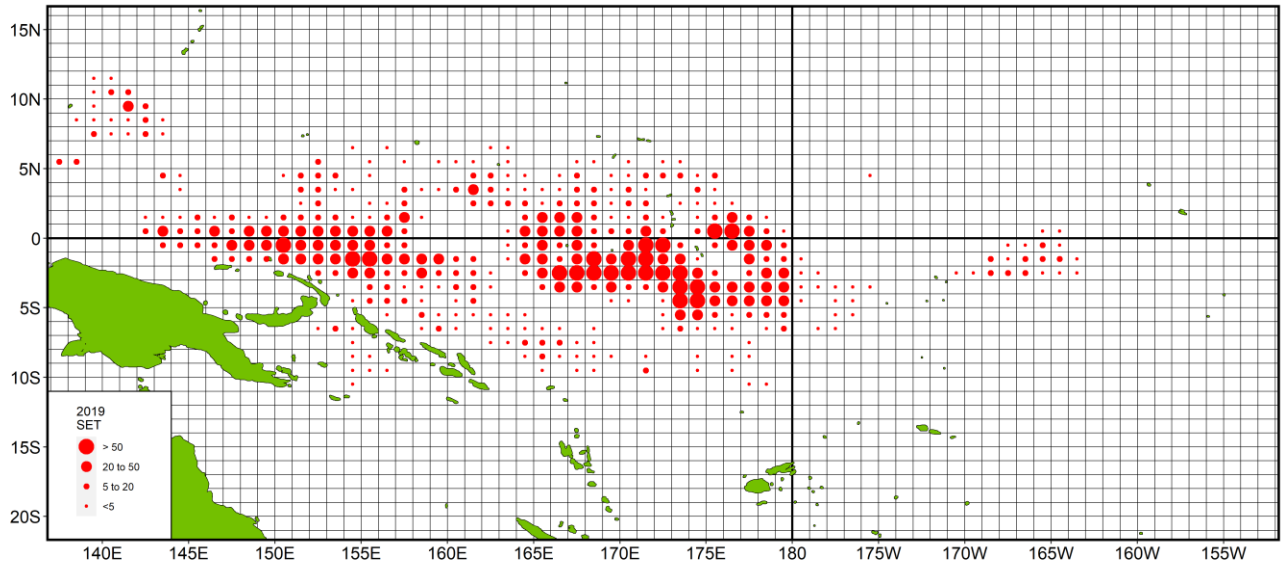
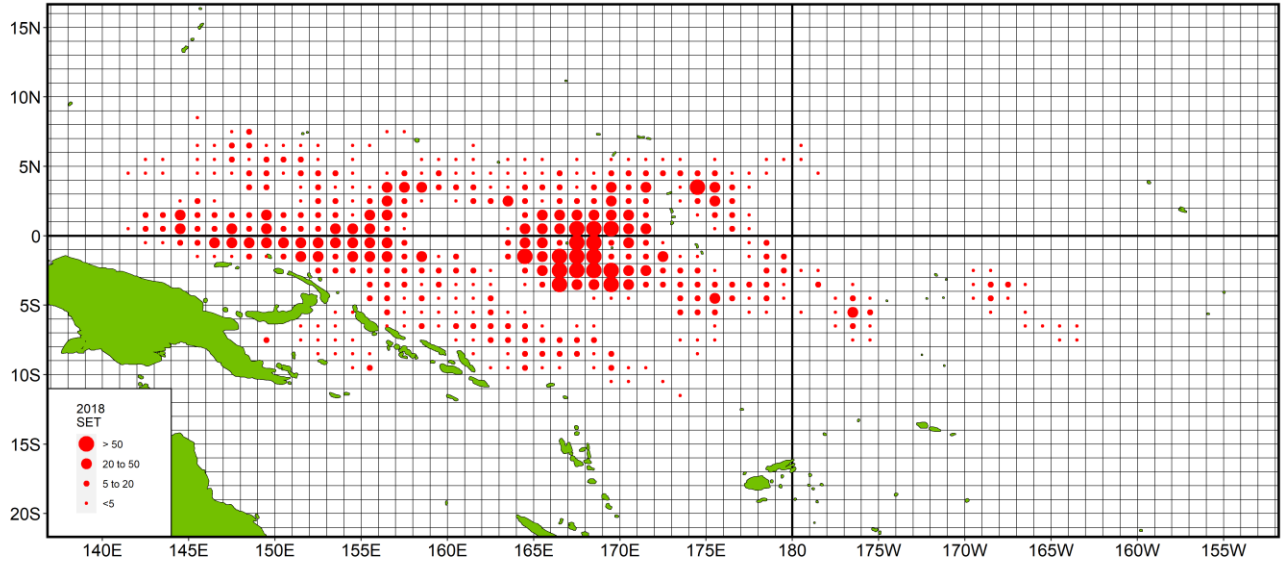


Figure 5. Weight frequency distributions of Pacific bluefin tuna caught by the Taiwanese STLL vessels in the North Pacific Ocean during 2018-2020.



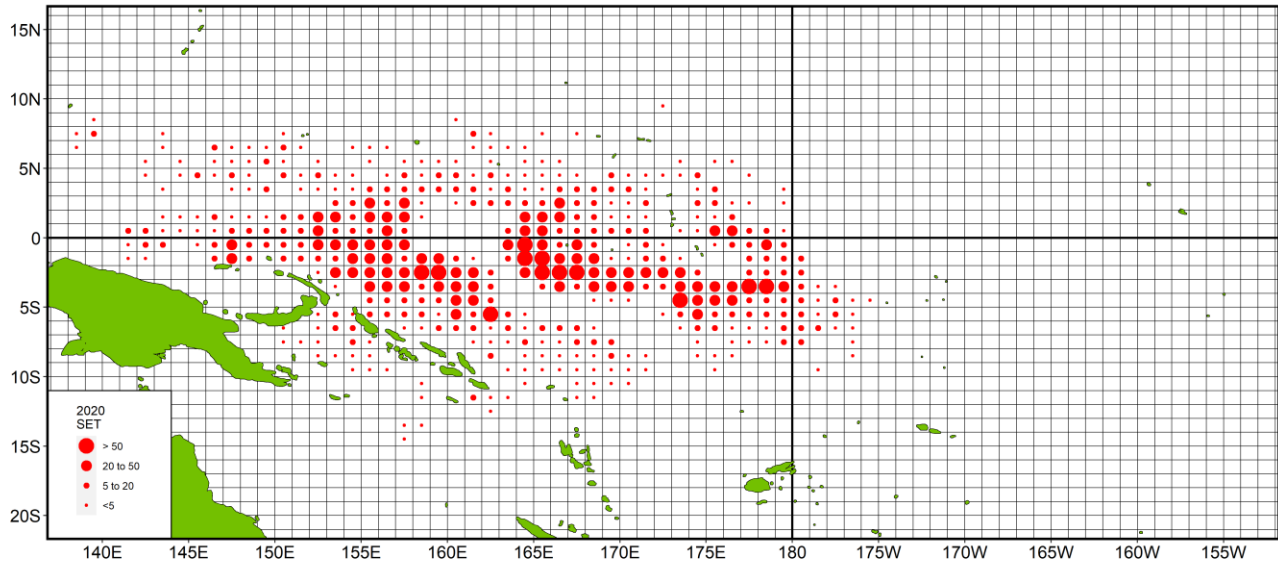


Figure 6. Distributions of fishing efforts (number of sets) for the Taiwanese purse seine vessels operating in the Pacific Ocean during 2018-2020. (Note: Distributions of 2020 is still preliminary and will be updated.)