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Chinese-Taipei 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, ≥ 100 GRT) and small-scale tuna longline fleet (STLL, previous named OSLL, < 100 GRT). The catch of tuna and tuna-like species of tuna longline fishery in the North Pacific Ocean was 31,228 mt in 2017. For purse seine fishery, the total catch was 167,239 mt in the whole Pacific Ocean for 2017. To support Close-Kin Mark-Recapture project, there were 1,480 tissue samples of Pacific bluefin tuna had been collected in 2017.

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 gross register ton (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 (Table 1).

Table 2 shows catch estimates of Taiwanese LTLL fishing vessels operating in North Pacific Ocean during 1997-2017. 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, reaching the lowest level, and then rebounding to 3,836 mt in 2013. Since then, the albacore catch showed a decreasing trend. The catch in 2017 was preliminarily estimated at 1,986 mt. 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 2017 was at 632 mt, which was similar to the catch of 2016 (692mt). Table 3 shows sharks catch by species for Taiwanese LTLL fishery in the North Pacific Ocean during 2009-2017. The annual shark catch was preliminary estimated at 1,864 mt in 2017. The distribution of fishing efforts (in 1000 hooks) of Taiwanese LTLL fishing vessels in the Pacific Ocean during 2015-2017 is shown in Figure 1.

The weight frequency of albacore and swordfish caught by LTLL in the North Pacific, compiling from logbook data, are shown in Figures 2 and 3. The predominant weight range for albacore caught by LTLL from 2015-2017 located between 10 and 18 kg, 6 and 18 kg, and 6 and 16 kg, in whole weight, respectively. The dominant weight range for swordfish caught by LTLL from 2015-2017 located between 30 and 60 kg, 25 and 70 kg, and 15 and 55 kg in dressed weight, respectively. It is noted that the weight data of 2016 and 2017 are not recovered completely and therefore still preliminary.

1.1.2 Small-scale tuna longline fleet

The small-scale tuna longline (STLL) vessels generally refer to those vessels 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 2017. STLL vessels are mainly targeting tropical tuna with some bycatch of albacore. The catch estimation of albacore in the North Pacific Ocean ranged between 315 and 930 mt during 2002 to 2015, and then had increased since 2016. A preliminary albacore catch was estimated at 2,347 mt in 2017. The catch of swordfish fluctuated between 1,200 mt to 4,000 mt from 1997 to 2016. The catch of swordfish in 2017 was preliminary estimated at 1,565 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 in 2017 was 415 mt, which was similar to the 2016 catch. Table 5 shows sharks catch by species for Taiwanese STLL operating in the North Pacific Ocean during 2009-2017. The annual total catch of shark species was preliminary estimated at 13,459 mt in 2017. The distribution of fishing efforts for STLL vessels from 2015 to 2017 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 amount of weight measurements for albacore from 2015-2017 are 529, 589 and 655 fishes. The dominant weight ranges for albacore caught by STLL from 2015-2017 are 16-22 kg, 16-22 kg and 16-22 kg in whole weight (Figure 2). The amount of weight measurement for swordfish from 2015-2017 are 1,537, 1,260 and 1,085. The dominant weight ranges for swordfish caught by STLL from 2015-2017 are 15-35 kg, 10-35 kg and 15-35 kg in dressed weight, separately (Figure 3). The number of weight measurements for Pacific bluefin tuna from 2015-2017 are 2,139, 1,939 and 1,628. The weight frequency of Pacific bluefin tuna in 2015 and 2016 reveal two modes at 145-200 kg and 280-350 kg. However, the dominant weight frequency of Pacific bluefin tuna caught by STLL in 2017 distributes from 160-230 kg (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, it maintained around 34 authorized vessels. In 2017, 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 where El Niño phenomena occur (e.g., 2015), 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.

In 2017, the authorized distant water purse seine vessel was 30. The fishing effort distribution in recent three years is shown in Figure 6. In 2017, the fishing activities concentrated in the western and central areas. The total catches of SKJ, YFT and BET by the purse seine fishery in 2017 decreased to 167,239 mt from 185,692 mt in 2016 (Table 6). Catch by species for Taiwanese DWPS 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 2016 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

There are two types of fisheries data routinely collected for LTLL: the commercial data (for estimation of total catches), and the logbook data (for compilation of catch and effort data). Several sources of commercial information are available including traders, Taiwan Tuna Association, certified weight reports provided by the Organization for the Promotion of Responsible Tuna Fisheries (OPRT) and so on. After cross-checking and compilation, the commercial information is used to estimate total catches of the Category I data.

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. Categories II and III data are all compiled from this data set. Besides paper logbook, Taiwan has also introduced

electronic logbook system in the Pacific Ocean since 2014. 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 of fishery data in a real-time manner.

2.1.2 Small-scale tuna longline fleet

Two categories of STLL are defined: one is that station and unload their catches at domestic fishing ports (domestic-based STLL), and the other is that station and unload catches at foreign ports (foreign-based STLL). For domestic-based STLL, the landing records from local fishing markets is the main source of ISC Category I data. For foreign-based STLL, Category I data are mainly estimated from landing reports collected from foreign-based agents and monthly catch report from individual vessel. In addition, the electronic logbook system is also included as the sources for the estimation of Category I and verified these commercial data.

Since 1997, logbook data of STLL have been collected, and port sampling at domestic fish markets has also been strengthened by collecting size data of major tuna species (mainly bigeye tuna and yellowfin tuna). However, at the beginning, the recovery rate of logbook was about 2%-5% which was too low to be compiled for Category II data, and insufficient 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, interview with fishermen so as to obtain fisheries information, and conduct size sampling program at main domestic fishing ports of Donggang, Nanfangao and Hsinkang since April 2007. Through this program, the recovery rate of logbook has been gradually improved. In 2015, Fisheries Agency started implementing the electronic logbook system on STLL vessels, and from 2016 all STLL vessels operating outside the EEZ of Taiwan have to report their catches through the satellite transmission daily.

For the purpose of conservation and management of Pacific bluefin tuna resource and well collection of catch data, Fisheries Agency has imposed the Catch Documentation Scheme (CDS) since March 2010. According to the regulation, all longline vessels fishing for Pacific bluefin tuna shall be authorized by Fisheries Agency every year and satellite-based vessel monitoring system (VMS) is required to be installed on board. Once Pacific bluefin tuna was caught, fisherman shall attach a tag issued by Fisheries Agency to each Pacific bluefin tuna, record the location, number and individual weight of Pacific bluefin tuna.

To develop the Pacific Bluefin Close-Kin Mark Recapture project, ISC members decided to collect tissue samples for genetics analysis. In 2017, Taiwan has already collected 1,480 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 from 162 cm to 273 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 requested 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. Table 9 shows the number of observers in each year during 2002-2017. The observer program has been carried out in the Pacific Ocean since 2002. In accordance with the government's policy of establishing an observers 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 2017 was 66 in total, including 15 observers for LTLL vessels and 51 observers for STLL vessels respectively.

2.5 VMS monitoring

Vessel monitoring system (VMS) were installed on some longliners (over 100 tons) prior to 2005. Since 2005, Taiwanese tuna fishing vessels with GRT over 20 tons fishing for highly migratory fish stocks in the area beyond national jurisdiction are all required to install VMS. In addition to monitoring the fishing activities, those data are also used to verify the operating location information recorded in logbook.

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 2017 as follows :

1. Studies on abundance index and stock assessment of tropical tuna in the Western and Central Pacific and bluefin tuna in the Pacific Ocean.
2. A study on CPUE standardization and stock status for swordfish and billfishes in the three oceans.
3. Study on the Pacific albacore resource.
4. Fishery Dynamics and Statistics Analyses on Taiwanese Small-scale Tuna Longline Fishery.
5. Investigate the shark by-catch, abundance index and non-detriment findings in the Pacific Ocean.
6. Research on Bycatch of Ecological Related Species by Taiwanese Distant Water Tuna Longline Fisheries
7. Feasibility analysis on the fishing condition forecast of albacore tunas for the Taiwanese tuna longline fishery in the three oceans Taiwanese tuna longline fishery in the three oceans.
8. Feasibility analysis on the fishing condition forecast of albacore tunas for the Taiwanese tuna longline fishery in the three oceans.

9. Feasibility analysis on the fishing condition forecast of swordfish for the Taiwanese tuna longline fishery in the three oceans.
10. The feasibility analysis on purse seine fishing condition of skipjack tuna in the western and central Pacific Ocean.
11. Stock assessment of the Pacific Saury (*Cololabis saira*) in the North Pacific Ocean.

Besides, the scientific papers presented at recent ISC meetings during 2017 to 2018 were as follows:

1. Standardized PBF CPUE Series for Taiwanese Longline Fishery. (ISC/17/PBFWG-1/02)
2. Length distributions of albacore catch made by Taiwanese albacore-targeting longline fishery in the Pacific Ocean north of 25°N, 2003-2015. (ISC/17/ALBWG/02)
3. Evaluating stock structure hypotheses for swordfish (*Xiphias gladius*) in the Pacific Ocean using size composition statistics of Taiwanese distant water longliners. (ISC/17/BILLWG-1/4)
4. Determination of length-at-the first age for the Pacific blue marlin (*Makaira nigricans*) using dual hard-parts of fin-spines and otoliths. (ISC/17/BILLWG-1/4)
5. Environmental effects on the spatial distribution of swordfish as inferred from data for the Taiwanese distant-water tuna longline fishery in the Pacific Ocean. (ISC/17/BILLWG-1/6)
6. Standardized CPUE and historical catch estimate of shortfin mako shark by Taiwanese large-scale tuna longline fishery in the North Pacific Ocean. (ISC/17/SHARKWG-1/09)
7. Size composition of shortfin mako shark caught by the Taiwanese tuna longline fishery in the North Pacific Ocean. (ISC/17/SHARKWG-1/12)
8. The relation between weight and length of the shortfin mako shark in the North Pacific Ocean. (ISC/17/SHARKWG-1/13)
9. Standardized PBF CPUE Series and size frequency for Taiwanese longline fishery up to 2017 calendar year. (ISC/18/PBFWG-1/02)
10. Catch and length data of swordfish (*Xiphias gladius*) for the WCNPO and EPO areas from the Taiwanese fisheries. (ISC/18/BILLWG-1/4)
11. Standardized catch-rates of swordfish (*Xiphias gladius*) for the Taiwanese distant-water tuna longline fishery in the North Pacific Ocean for 1964-2016. (ISC/18/BILLWG-1/6)
12. A Base-case Model in Stock Synthesis 3.30 for the 2018 North Pacific Swordfish (*Xiphias gladius*) Stock Assessment. (ISC/18/BILLWG-2/02)

Regarding international cooperation in research, NRISF 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, NRISF 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 3 tags recovered and returned to NRISF as by end of June 2017.

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

Year \ Fishery	Longline Fishery		Purse Seine Fishery
	LTLL	STLL	
2008	84	1,260	34
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

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

* Data of 2017 is still preliminary.

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

Year											Unit: mt
	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	0	2,224	1,649	632	98	498	8	2	133	7,230

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 2017 is still preliminary.

Table 3. Shark catch by species for Taiwanese LTLL 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	6	1,864

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).

* Data of 2017 is still preliminary

Table 4. Catch by species for 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	1,565	291	3,479	196	367	23,998

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 2017 is still preliminary

Table 5. Shark catch by species for 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

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).

The catches of shark species in frozen form still need to be converted to process the round weight.

* Data of 2017 is still preliminary

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

Unit: mt

Year	SKJ	YFT	BET	Total
2005	165,289	27,572	2,178	195,039
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

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

* Data of 2017 is still preliminary

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

Unit: mt

Year	ALB	PBF	BET	YFT	SWO	MLS	BUM	BLM	SFA	SKJ	TOTAL
2005	-	-	1,167	11,166	-	-	-	-	-	69,500	81,833
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

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 2017 is still preliminary

+:bellow 499kg catch.

Table 8. The annual catch of Taiwanese coastal and offshore fisheries in the North Pacific Ocean for 2017

Unit: mt

Fisheries	PBF	ALB	BET	YFT	SKJ	SWO	MLS	BUM	BLM	SFA	SSP	SKX	TOTAL
Offshore Gillnet	0	0	0	0	33	+	0	0	0	1	-	68	102
Offshore Others	0	0	1	238	1,013	+	+	+	+	5	-	263	1,520
Coastal Gillnet	+	+	5	5	42	3	3	23	29	77	-	115	304
Coastal Setnet	0	+	3	29	1,117	2	0	3	4	62	-	5	1,225
Coastal Harpoon	0	0	0	0	0	+	21	158	115	176	-	+	470
Costal Longline	0	0	0	0	0	0	0	0	0	+	-	2	2
Coastal Others	0	0	0	2	85	+	+	3	0	0	-	5	95

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).

Data of 2017 is still preliminary.

+:bellow 499kg catch.

Table 9. The number of observers deployed on tuna longline vessels in the Pacific Ocean during 2002-2017

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	*2017
Number of observers	1	3	4	5	10	15	14	22	17	15	32	24	24	32	28	66

* Data of 2017 is still preliminary

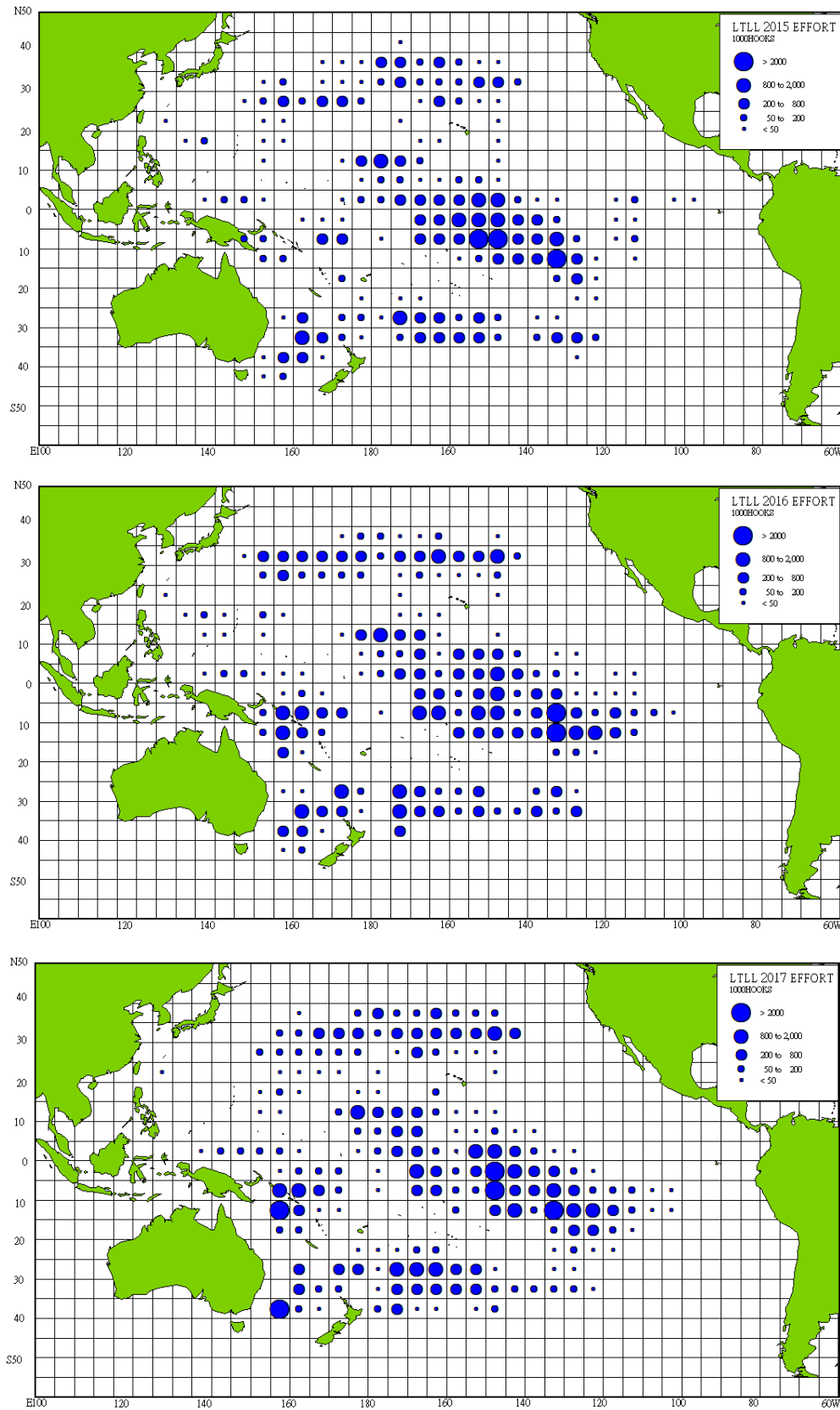


Figure 1. Distributions of fishing effort for Taiwanese LTLL vessels operating in the Pacific Ocean during 2015-2017 (Note: Map of 2016 and 2017 is still preliminary and will be revised shortly.)

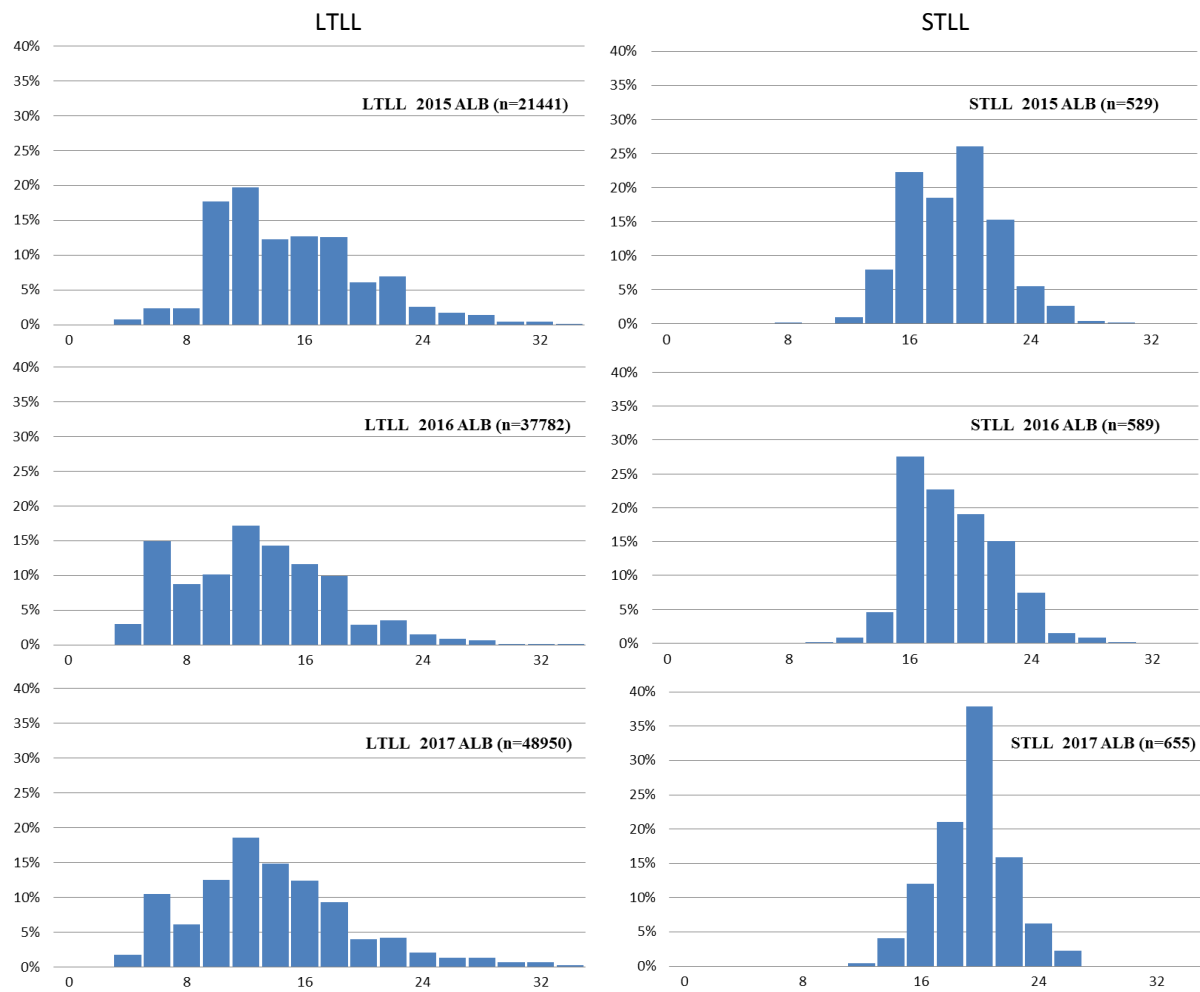


Figure 2. Weight frequency distributions of albacore caught by Taiwanese LTLL and STLL vessels in the North Pacific Ocean during 2015-2017.

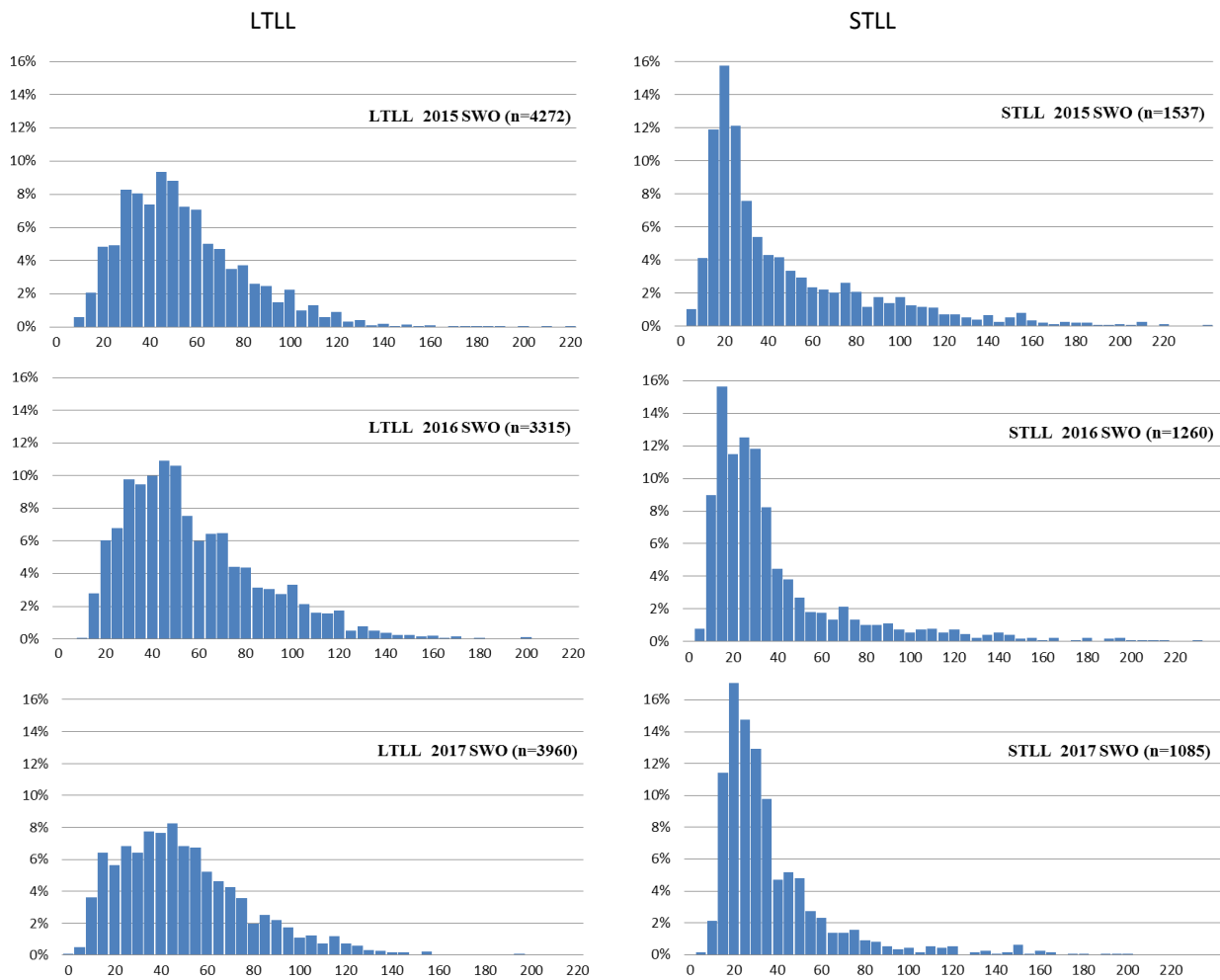


Figure 3. Weight frequency distributions of swordfish caught by Taiwanese LTLL and STLL vessels in the North Pacific Ocean during 2015-2017 (measurement: low jaw-fork length for LTLL, eye-fork length for STLL).

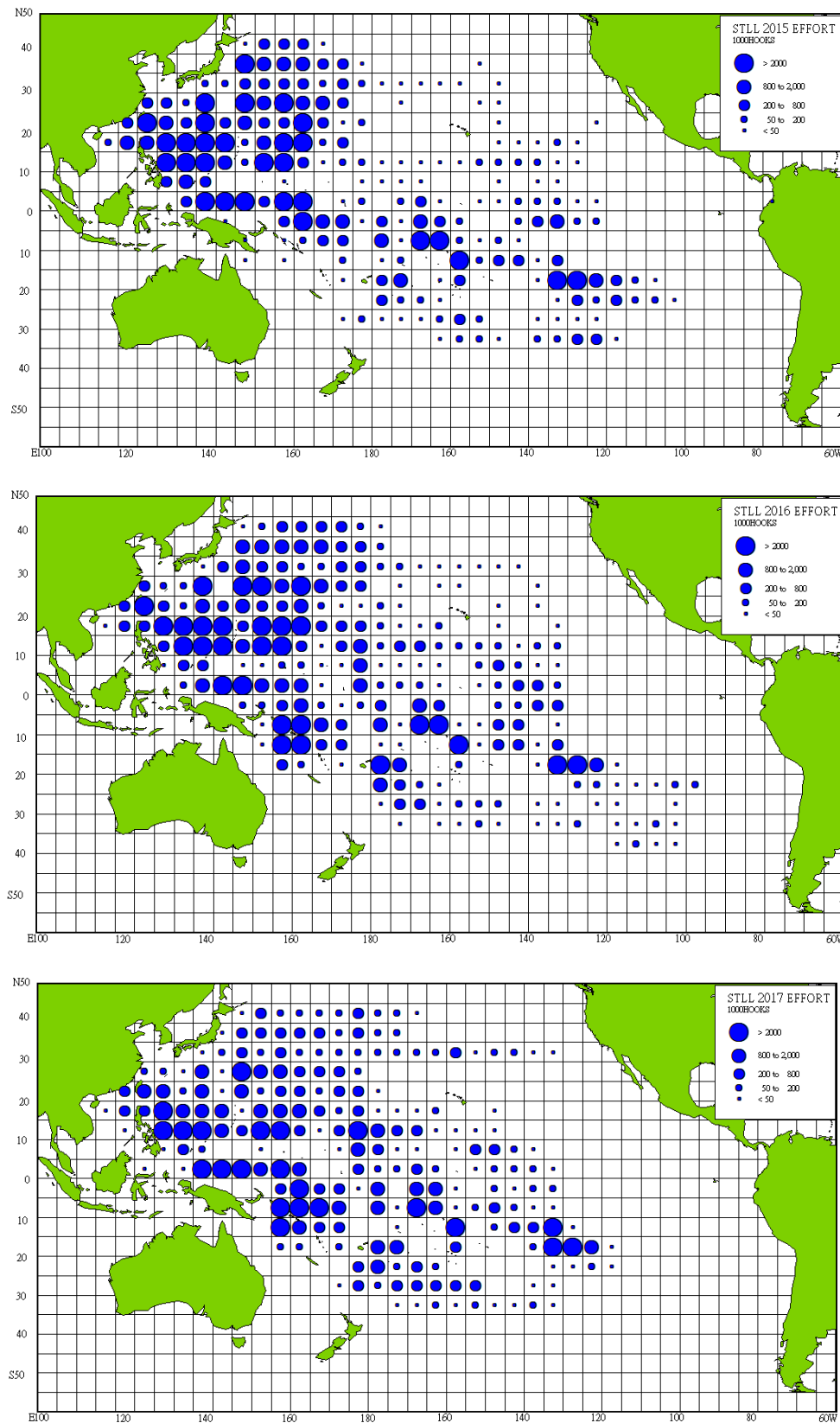


Figure 4. Distributions of fishing effort for Taiwanese STLL vessels operating in the Pacific Ocean during 2015-2017. (Note:

Distributions of 2016 and 2017 is still preliminary and will be revised shortly.)

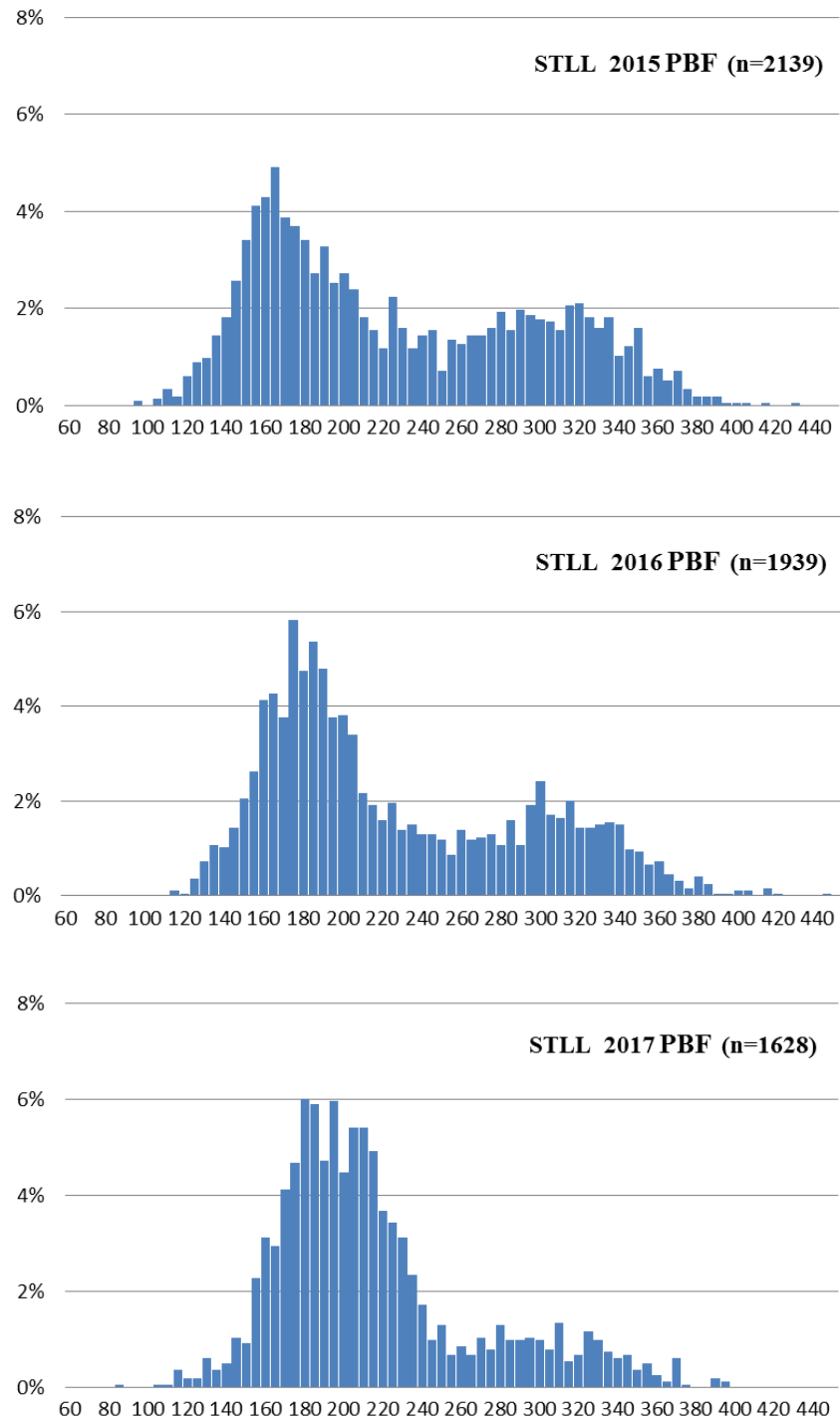
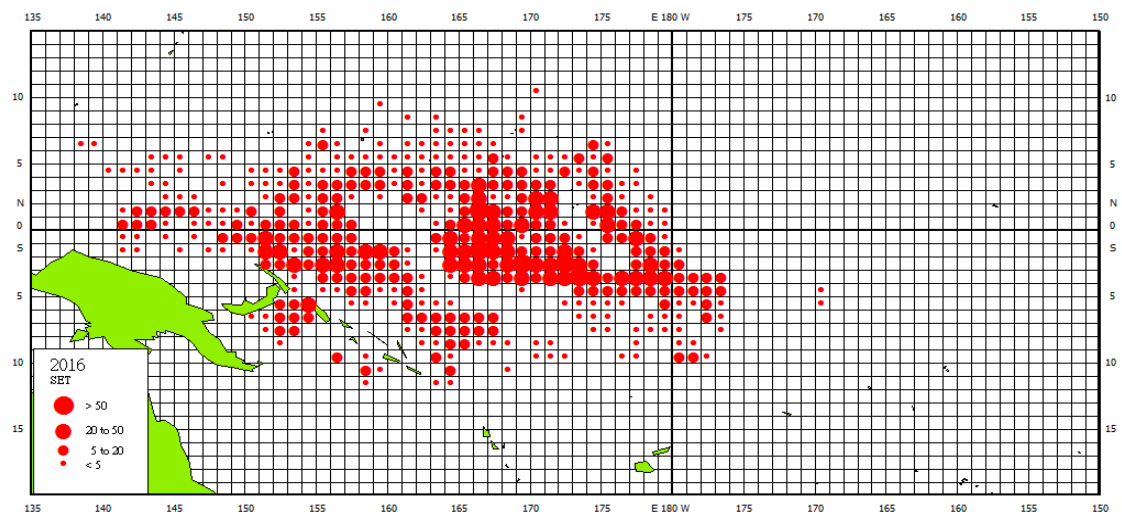
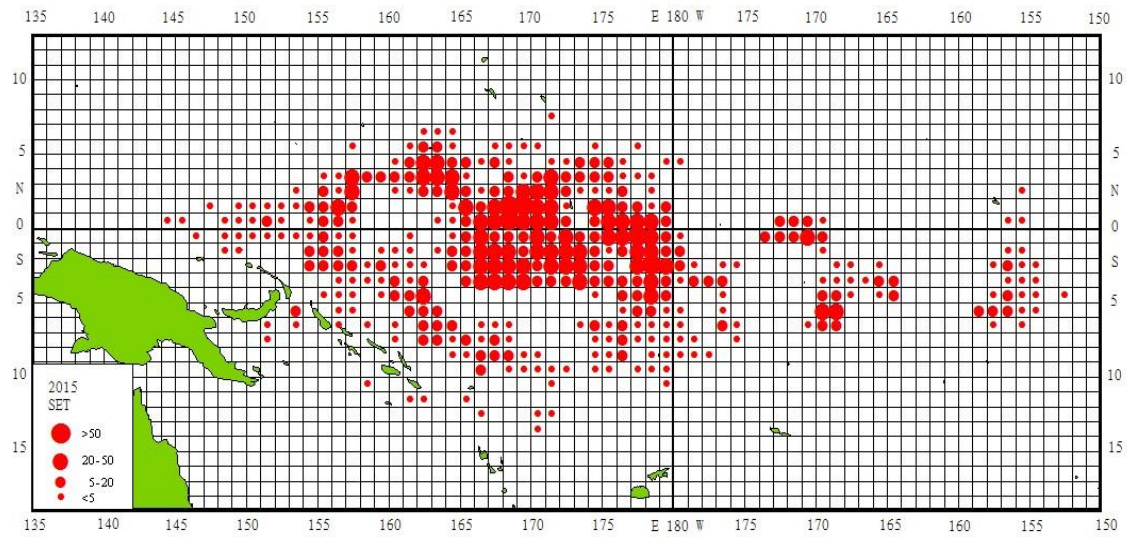


Figure 5. Weight frequency distributions of Pacific bluefin tuna caught by Taiwanese STLL vessels in the North Pacific Ocean during 2015-2017.



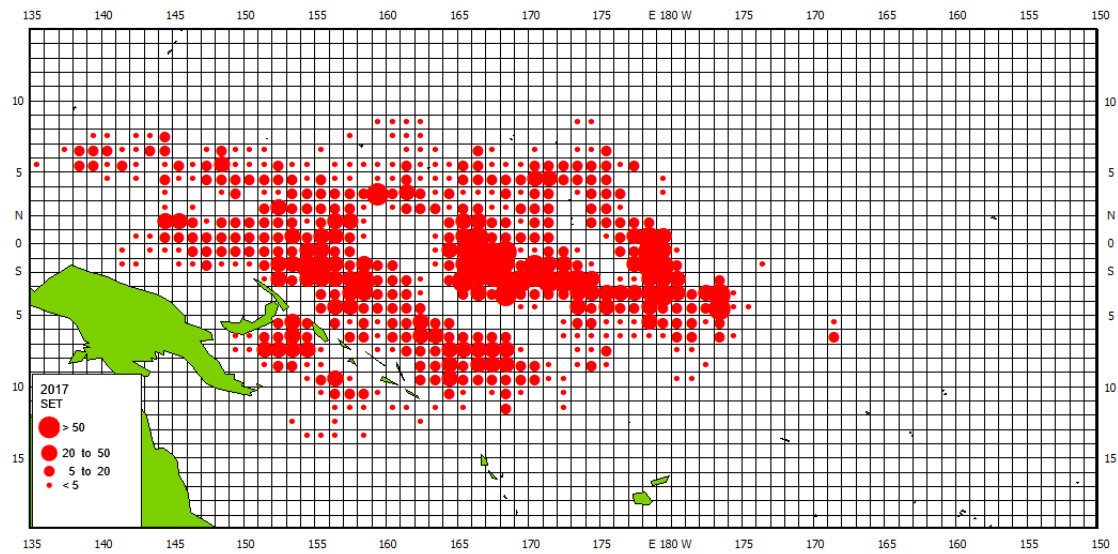


Figure 6. Distributions of fishing efforts (number of sets) for Taiwanese purse seine vessels operating in the Pacific Ocean during 2015-2017.