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## **Taiwanese Tuna and Tuna-like Fisheries in the North Pacific Ocean<sup>1</sup>**

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

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### Introduction

Taiwanese tuna fisheries are comprised of two major fisheries, longline, and purse seine fisheries, and other small scale fisheries, such as harpoon, set net, gill net in the North Pacific Ocean (North of equator). Longline and purse seine fisheries occupy around 99% of the total tuna catch of Taiwanese fisheries. For longline fishery, it consists of large-scale tuna longline fleet (LTLL, previous named DWLL,  $\geq 100$  GRT) and small-scale tuna longline fleet (STLL, previous named OSLL,  $< 100$  GRT). The total catch of tunas and billfish (including swordfish, striped marlin, blue marlin, black marlin, and sailfish) for longline fishery (including the catch of LTLL and STLL) in the North Pacific Ocean was 31,774 mt (metric ton) in 2011. The active vessels of LTLL operating in the Pacific Ocean in 2011 were 95 and STLL were 1,376. For purse seine fishery, the total catch was 175,935 mt caught by 34 vessels in the Pacific Ocean in 2011. This paper described the recent trend of Taiwanese tuna fishery in the North Pacific Ocean, and purse seine fishery in the Pacific Ocean.

### 1. Fisheries Monitoring

#### 1.1. Tuna Longline fishery

##### 1.1.1 Large-scale tuna longline fleet

Large-scale tuna longline (LTLL) vessels refer to those vessels larger than or equal to 100 gross register ton (GRT). Those vessels mostly operate in the high sea areas or in the EEZs of coastal countries under fisheries cooperation agreements. Table 1 shows the number of Taiwanese vessels actually engaged in fishing in the Pacific Ocean from 2005 to 2011. For the purpose of sustainable use of fishery resources, Taiwan imposed a fleet size reduction program on its large-scale tuna longline vessels from 2005 to 2007. Through this program, 32 large-scale tuna longline vessels were reduced in the Pacific Ocean during 2005 - 2007. The number of active vessels reached low level in 2008 and 2009 for high fuel price with some fishing vessels ceasing operation temporarily, and the vessel number returned to 90 in 2010 and slight increased to 95 for some shifting from Indian Ocean for pirate issue in 2011.

Table 2 shows catch and effort of Taiwanese LTLL vessels operated in North Pacific Ocean during 1997-2011. Before mid 90s, the catch and effort of albacore in the North Pacific was very low. Thereafter, because of constraint of accessing agreements in the South Pacific, the fishing effort in the North Pacific shows increased trend from 1997 to 2004. Since 2005, due to reasons as the above mentioned, the fishing efforts reduced year by year. The active vessels targeting

albacore in the North Pacific Ocean decreased from 24 in 2006, 21 in 2007, 18 in 2008, to 13 in 2009, but increased respectively to 20 and 21 in 2010 and 2011.

From 1997 to 2000, albacore is the main catch of Taiwanese LTLL in the North Pacific Ocean, occupied more than 70% of total catch, but since 2001, the catch of bigeye tuna, yellowfin tuna and swordfish increased significantly. The albacore catch in 2009 and 2010 was estimated as 1,866 mt and 2,281 mt respectively. The catch in 2011 was preliminarily estimated as 2,972 mt. For LTLL, Pacific bluefin tuna is just incidentally caught, and the amount has been very minor. Before 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 reducing efforts. The catch of swordfish increased to more than 500 mt since 2010, the catch of swordfish was 502 mt in 2011. Table 3 shows sharks catch by species for Taiwanese LTLL operated in the North Pacific Ocean during 2009-2011. The annual sharks total catch was preliminary estimated as 1,302 mt in 2011.

The length frequency of albacore, swordfish caught by LTLL in the North Pacific are shown in Figure 1 and Figure 2. For LTLL, the catch at length data is from logbook. Fishermen are requested to measure the length of the first 30 fish caught each day. The amount of length measurement for albacore from 2009 to 2011 was 25,360, 19,368 and 13,713. The predominant size range for albacore caught by LTLL from 2009-2011 were 88-98cm, 86-98cm and 82-94cm in fork length. The length measurement for swordfish is measured from low jaw fork length and the amount of length measurement from 2009-2011 was 2,705, 4,303 and 3,305 separately. The dominant size range for swordfish caught by LTLL from 2009-2011 was 152-170cm, 150-174cm and 154-172cm.

The distribution of fishing efforts of Taiwanese LTLL vessels operating in the Pacific Ocean during 2009-2011 is shown in Figure 3. These vessels fish for northern albacore seasonally from September to March of the following year, and shift to the South Pacific for southern albacore from April to August. In 2011, the distribution of fishing effort for Taiwanese LTLL operated in the North Pacific Ocean concentrate on the area 165-180° W and 0-15° N compared with 2009 and 2010.

### 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 catch of domestic-based and foreign-based STLL vessels operated in the North Pacific by species from 1997 to 2011. The main catch of STLL vessels is yellowfin tuna rather than albacore. The catch of albacore fluctuated between 450 and 930 mt within recent ten years. A preliminary estimated catch of albacore in 2011 was 462 mt. The catch of swordfish fluctuated between 1,200 mt to 4,000 mt from 1997 to 2010. The catch of swordfish in 2011 was preliminary estimated as 3,075 mt. As for Pacific bluefin tuna, in 2008, the catch was 979 mt, but in 2009 and 2010 it declined to 877 and 373 mt. The preliminary

estimated catch in 2011 was 292 mt. Table 5 shows sharks catch by species for Taiwanese STLL operated in the North Pacific Ocean during 2009-2011. The annual sharks total catch was preliminary estimated as 17,903 mt in 2011.

The length frequency of albacore, swordfish, and Pacific bluefin tuna caught by STLL vessels in the North Pacific are shown in Figure 1, Figure 2, and Figure 4 separately. For STLL, the size measurements for albacore, swordfish and Pacific bluefin tuna were sampled from domestic fishing ports. The amount of size measurements for albacore from 2009-2011 were 724, 601 and 851. The dominant size range for albacore caught by STLL from 2009-2011 was 88-102cm, 88-100cm and 86-100cm. Since the low jaw of swordfish was generally cut on board, eye-fork length was then measured instead. The amount of length measurement for swordfish from 2009-2011 was 1,491, 1,225 and 995. The dominant size range for swordfish caught by STLL from 2009-2011 was 90-180cm, 100-165cm and 95-145cm, separately. The amount of size measurements for Pacific bluefin tuna from 2009-2011 were 2,845, 1,335 and 952. The dominant size range for Pacific bluefin tuna caught by STLL from 2009-2011 was 215-245cm, 220-250cm and 225-245cm.

The distribution of fishing efforts for STLL vessels based at domestic ports from 2009 to 2011 is shown in Figure 5. The fishing area mainly distributed between north of equator and south of 40°N and between eastern of 120°E and western of 165°W.

## 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 to 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.

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 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 likewise do the fishing activities.

In 2011, the number of active distant water purse seine vessels was 34. The fleet distribution was within the areas 5°N-10°S, and between 142°E-168°W of the western and central Pacific Ocean (Figure 6). The total catch by purse seine fishery in 2011 was 175,935 mt (Table 6), which was 11.5% lower than the catch of 198,851 mt in 2010. Fishing effort and catch by species for

Taiwanese DWPS operated 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 may also catch tunas and tuna-like species in the Taiwanese coastal and offshore waters. Table 8 shows the annual catch of 2011 for Taiwanese small scale coastal and offshore fisheries in the North Pacific Ocean. The total catch of tunas and tuna-like species of these fisheries was estimated about 3,320 mt in 2011.

## 2. DATA COLLECTION

### 2.1 Tuna longline fishery

#### 2.1.1 Large-scale tuna longline fleet

Two types of fisheries statistical data are routinely collected for LTLL: the commercial data (for estimation of total catches), and the logbook data (for stock assessment purposes). Several sources of commercial information were 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 was 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 day. Categories II and III data were all compiled based on this data set.

#### 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 provide the best information for estimating the ISC Category I data. For foreign-based STLL, preliminary estimations of Category I data were based on fishing vessels activities, import statistics of Japanese markets and monthly catch report.

Since 1997, logbooks 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 have launched a data improving program by dispatching its staffs to collect logbooks, to interview with fishermen so as to

obtain fisheries information, and to conduct size sampling program at main domestic fishing ports of Tong-Kang, Suao and Sin-Kang since April 2007. Through the program, the recovery rate of logbook was improved to 18% in 2011.

For the purpose of conservation and management of Pacific bluefin tuna resource and well collection of catch data, Fisheries Agency has imposed a Catch Documentation Scheme (CDS) since March 2010. According to the regulation, all 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, fisher shall attach a tag issued by Fisheries Agency to each Pacific bluefin tuna, record the number and individual weight of Pacific bluefin tuna. The record shall be reported to Fisheries Agency on a daily basis. When the catch of Pacific bluefin tuna is landing, Fisheries Agency would dispatch its staffs to fishing ports to measure individual weight and length. In addition, Catch Documentation shall be validated by local authorities before the first sale whether the catch is for domestic consumption or for export. Through the program, the data collection of individual weight and length of Pacific bluefin tuna has reached 100% in 2010 and 2011.

## 2.2 Distant water purse seine fishery

The logbook recovery rate for distant water purse seine fishery has always been satisfactory, reaching 100% since the development of the fishery.

## 2.3 Other fisheries

The annual catch data of small scale coastal and offshore fisheries was collected from yearbook directly. For collecting information and developing estimation system of these coastal and offshore fisheries, a new program is under construction.

## 2.4 Observer program

For the purposes of better understanding the fishing activities of the longline fishery, including target and non-target fish species and to be in line with the international requirement for conserving marine resources, Fisheries Agency has launched a pilot observer program since 2001 in the Indian Ocean. Table 9 shows the number of observational trips in each year during 2002-2011. The observer program has been carried out in Pacific Ocean since 2002. In accordance with the government's policy in establishing an observers program and availability of budgets to support the increase of observers, the observational trips gradually increased year by year. The number of observation trips was 19 in 2011.

The duty of observer on board is to collect catch and effort data, and biological data, such as otoliths, gonads and muscles.

## 2.5 VMS monitoring

Vessel monitoring system (VMS) has been installed voluntarily on some longliners prior to 2005. Since 2005, all of Taiwanese large-scale tuna vessels were required to install VMS. In addition to monitoring fishing activities, those data were also used to verify logbook data for improving data quality.

## 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 as follows :

1. Research on the catch at size/age and CPUE standardization of North Pacific albacore.
2. Research on CPUE standardization of Pacific bluefin tuna.
3. Studies on CPUE standardization and stock assessment of swordfish, blue marlin and striped marlin.
4. Environmental effects on blue marlin and striped marlin CPUE in the North Pacific.
5. Research on CPUE standardization of bigeye and yellow fin tuna.
6. Billfish and tuna tagging program.
7. Population characteristics of longtail tuna (*Thunnus tonggol*).
8. Estimation of historical catches and standardization of CPUEs for dominant sharks.
9. Estimation on the ratio between fins and body weight, and growth parameters for shark by-catch species in Pacific Ocean.
10. Research on Incidental Catch of Ecological Related Species by Taiwanese Distant Water Tuna Longline Fisheries.

And the scientific papers presented at recent ISC meetings were as follows:

1. Reproductive biology of the blue shark, *Prionace glauca*, in the northwestern Pacific. (ISC/11/SHARKWG-2/12)
2. Stock assessment of striped marlin (*Kajikia audax*) in the western and central North Pacific Ocean using an age-structured model. (ISC/11/BILLWG-3/02)
3. A sensitivity study for striped marlin (*Kajikia audax*) in the western and central North Pacific Ocean using an age-structured model (ASPM). (ISC/11/BILLWG-3/06)
4. A review of Taiwan's blue marlin fisheries in the Pacific Ocean, 1958-2010. (ISC/12/BILLWG-1/04)
5. Standardized catch-rates of blue marlin for Taiwanese distant-water longline fishery in the Pacific Ocean for 1964-2010. (ISC/12/BILLWG-1/05)
6. A review of life history parameters for the Pacific Blue Marlin. (ISC/12/BILLWG-1/06)
7. Activities and data collection of Pacific Bluefin tuna by Taiwanese fishery. (ISC/12/PBFWG-2/13)
8. Abundance index of Pacific Bluefin tuna (*Thunnus orientalis*) by Taiwanese small-scale longline fleet in the southwestern North Pacific Ocean. (ISC/12/PBFWG-2/14)
9. The catch of shark caught by Taiwanese offshore longline fisheries in 2001-2010 (ISC/12/SHARKWG-1/10)

# 10. Age and growth of the blue shark, *Prionace glauca*, in the central and south Pacific (ISC/12/SHARKWG-1/16)

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

Year	Longline Fishery		Purse Seine Fishery
	LTLL	STLL	
2005	133	1,420	34
2006	104	1,490	34
2007	90	1,750	34
2008	84	1,260	34
2009	75	1,220	33
2010	90	1,236	34
*2011	95	1,376	34

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

Table 2. Fishing effort and catch by species for Taiwanese LTLL operated in the North Pacific Ocean

Unit: MT

Year	Hooks	ALB	PBF	BET	YFT	SWO	MLS	BUM	BLM	SFA	SKJ	TOTAL
1997	5,254,704	9,119	-	112	41	15	59	20	1	13	72	9,452
1998	9,752,453	8,617	-	156	39	20	90	21	5	34	444	9,426
1999	15,129,625	8,186	-	360	122	70	66	53	8	5	114	8,984
2000	24,950,519	7,898	-	1,450	584	325	153	75	19	49	195	10,748
2001	22,232,830	7,852	-	4,569	1,882	1,039	121	209	4	4	243	15,923
2002	32,474,088	7,055	-	7,257	2,689	1,633	251	138	5	1	16	19,045
2003	20,676,890	6,454	-	2,936	1,105	1,084	241	218	4	7	40	12,089
2004	34,997,887	4,061	-	4,939	1,230	884	261	372	2	11	191	11,951
2005	29,897,156	3,990	-	3,963	1,552	392	199	376	15	63	175	10,725
2006	22,532,898	3,848	1	2,756	1,035	438	204	363	5	11	8	8,669
2007	20,775,642	2,465	-	2,965	657	345	102	275	1	2	3	6,815
2008	17,301,213	2,490	0.16	2,840	484	338	78	255	1	20	129	6,635
2009	11,789,456	1,866	-	2,302	303	373	37	225	0	8	175	5,289
2010	16,415,997	2,281	-	3,139	467	531	53	409	32	4	44	6,960
*2011	24,739,013	2,972	-	3,318	448	502	74	675	16	40	85	8,131

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 2011 is still preliminary

Table 3. Shark catch by species for Taiwanese LTLL operated 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	54	43	9	0	29	1,302

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 2011 is still preliminary



Table 4. Tuna and billfish catch by species for Taiwanese STLL operated in the North Pacific Ocean

Unit: MT

Year	PBF		ALB		BET		YFT		SKJ	
	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based
1997	1,814	-	337	-	3,506	-	9,419	-	59	-
1998	1,910	-	193	-	3,520	-	8,955	-	32	-
1999	3,089	-	207	-	2,578	-	8,961	-	27	-
2000	2,780	-	944	-	2,041	-	7,848	-	31	-
2001	1,839	-	832	-	1,898	-	8,166	-	26	-
2002	1,523	-	910	-	2,150	-	9,145	-	67	-
2003	1,863	0	712	0	2,299	3,837	10,567	5,122	14	0
2004	1,714	0	927	0	1,340	2,727	7,756	4,861	32	0
2005	1,368	0	477	5	1,425	3,889	8,219	3,962	33	0
2006	1,148	0	453	16	887	5,317	7,027	6,089	24	0
2007	1,401	0	321	130	1,188	3,887	6,792	5,093	17	0
2008	979	0	353	226	722	5,333	7,886	4,681	15	0
2009	877	0	320	192	859	2,948	9,048	4,074	66	0
2010	373	0	401	136	427	1,540	9,950	3,742	169	0
*2011	292	0	358	104	602	2,167	8,090	3,292	235	0

Year	SWO		MLS		BUM		BLM		SFA	
	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based
1997	1,358	-	290	-	3,625	-	611	-	527	-
1998	1,178	-	205	-	3,603	-	469	-	868	-
1999	1,385	-	128	-	3,362	-	563	-	402	-
2000	1,531	-	161	-	4,056	-	453	-	499	-
2001	1,691	-	129	-	4,524	-	428	-	640	-
2002	1,557	-	226	-	4,310	-	173	-	504	-
2003	2,196	1,491	91	590	4,289	3,178	305	805	380	1,699
2004	1,828	1,536	95	166	3,354	2,946	620	886	514	1,567
2005	1,813	1,759	76	508	3,949	3,305	636	508	709	624
2006	2,587	1,357	87	450	3,842	1,524	275	686	425	63
2007	2,907	847	133	66	3,230	1,612	215	44	527	532
2008	2,471	936	144	48	3,347	1,875	202	47	348	570
2009	2,323	854	170	55	3,210	1,203	259	39	330	42
2010	1,917	396	173	27	3,553	997	333	50	814	146
*2011	2,501	574	236	33	3,257	693	311	24	798	78

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 2011 is still preliminary

Table 5. Shark catch by species for Taiwanese STLL operated in the North Pacific Ocean

Unit: MT

Year	BSH		FAL		SMA		OCS		THR	
	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based
2009	9,680	1,444	178	212	405	72	8	7	549	79
2010	6,720	712	132	14	562	58	6	1	452	46
*2011	11,377	1,070	160	56	890	86	2	0.22	720	68

Year	SPN		POR		SKX	
	domestic-based	foreign-based	domestic-based	foreign-based	domestic-based	foreign-based
2009	483	69	0	0	2,815	402
2010	289	31	0	0	1,731	194
*2011	354	34	0	0	2,807	280

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 2011 is still preliminary

Table 6. Fishing effort and catch for Taiwanese DWPS operated in the Pacific Ocean

Unit: MT

Year	Fishing days	SKJ	YFT	BET	Total
2005	4,823	165,289	27,572	2,178	195,039
2006	4,493	189,392	19,793	978	210,163
2007	4,873	209,002	21,147	2,386	232,535
2008	4,783	165,007	35,770	3,196	203,973
2009	4,363	173,725	16,237	2,113	192,075
2010	5,129	166,211	29,203	3,437	198,851
*2011	5,359	155,641	18,143	2,151	175,935

DWPS: distant water purse seiner

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

\* Data of 2011 is still preliminary

Table 7. Fishing effort and catch by species for Taiwanese DWPS operated in the North Pacific Ocean

Unit: MT

Year	Fishing days	ALB	PBF	BET	YFT	SWO	MLS	BUM	BLM	SFA	SKJ	TOTAL
2005	-	-	-	1,167	11,166	-	-	-	-	-	69,500	81,833
2006	1,873	-	-	182	7,717	-	-	-	-	-	75,442	83,341
2007	2,082	-	-	564	8,037	-	-	-	-	-	87,232	95,833
2008	1,370	-	-	1,243	9,994	-	-	-	-	-	50,587	61,824
2009	1,859	-	-	568	6,319	-	-	-	-	-	69,026	75,913
2010	1,370	-	-	121	1,215	-	-	-	-	-	42,397	43,733
*2011	1,463	-	-	724	4,037	-	-	2	3	-	42,796	47,562

DWPS: distant water purse seiner

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 2011 is still preliminary

Table 8. The annual catch of 2011 for Taiwanese small scale coastal and offshore fisheries in the North Pacific Ocean

Unit: MT

Fosheries	PBF	ALB	BET	YFT	SKJ	SWO	MLS	BUM	BLM	SFA	SSP	SKX	TOTAL
Offshore Gillnet	0	0	0	0	2	9	0	2	0	0	-	125	138
Offshore Others	1	2	29	160	566	1	4	8	0	25	-	307	1,103
Coastal Gillnet	7	1	1	15	65	8	27	16	80	264	-	277	761
Coastal Setnet	16	0	0	9	537	8	1	3	1	60	-	11	646
Coastal Harpoon	0	0	0	0	52	95	17	124	240	0	-	1	529
Costal Longline	0	0	0	0	98	0	0	0	0	0	-	20	118
Coastal Others	0	0	0	11	-	0	0	0	0	0	-	14	25

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 2011 is still preliminary

Table 9. Observational trips of observer program in Pacific Ocean during 2002-2011

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Observational trips	1	3	4	5	10	15	14	22	25	19

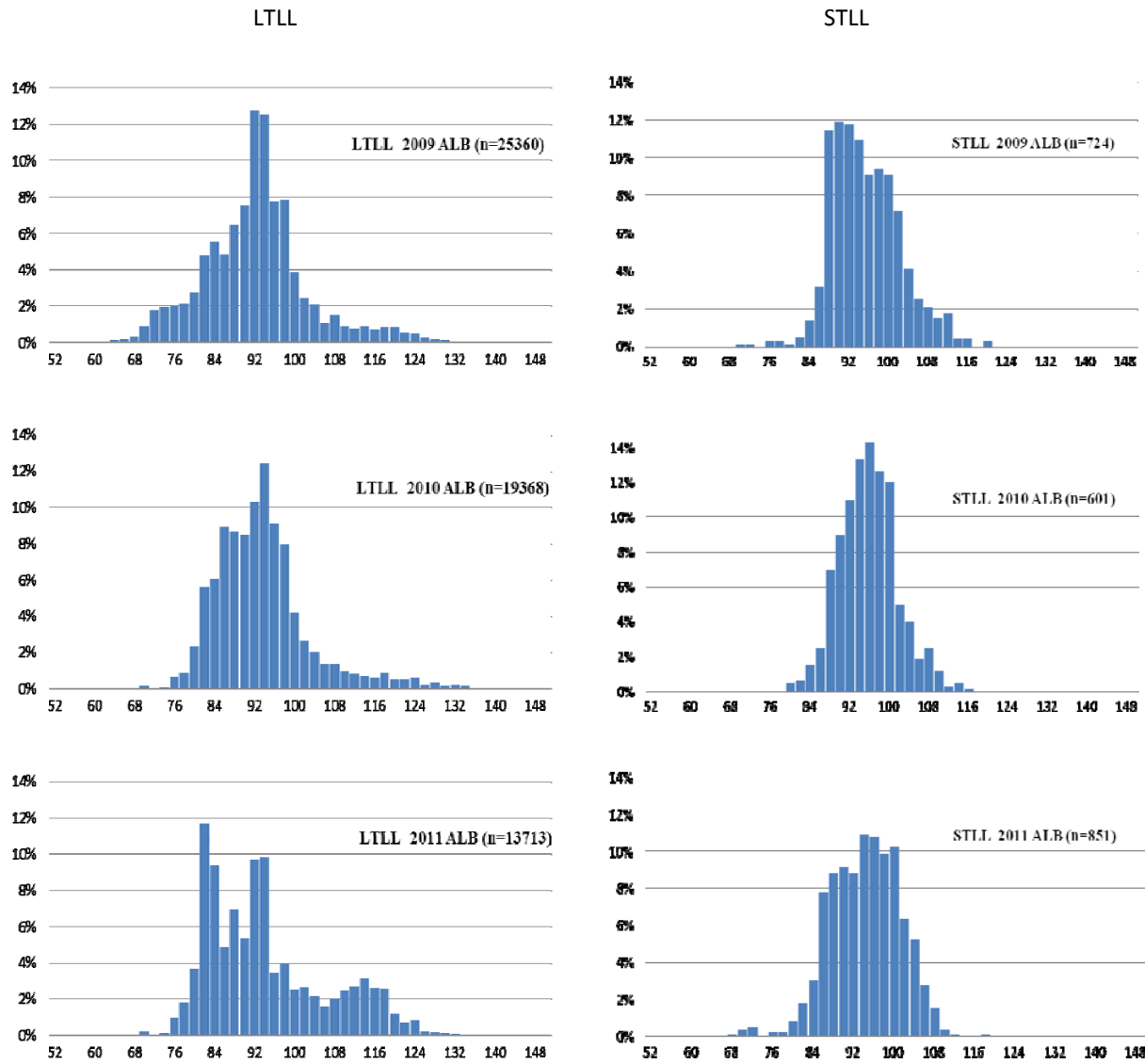


Figure 1. Length frequency distribution of albacore caught by Taiwanese LTLL and STLL vessels in the North Pacific Ocean during 2009-2011.

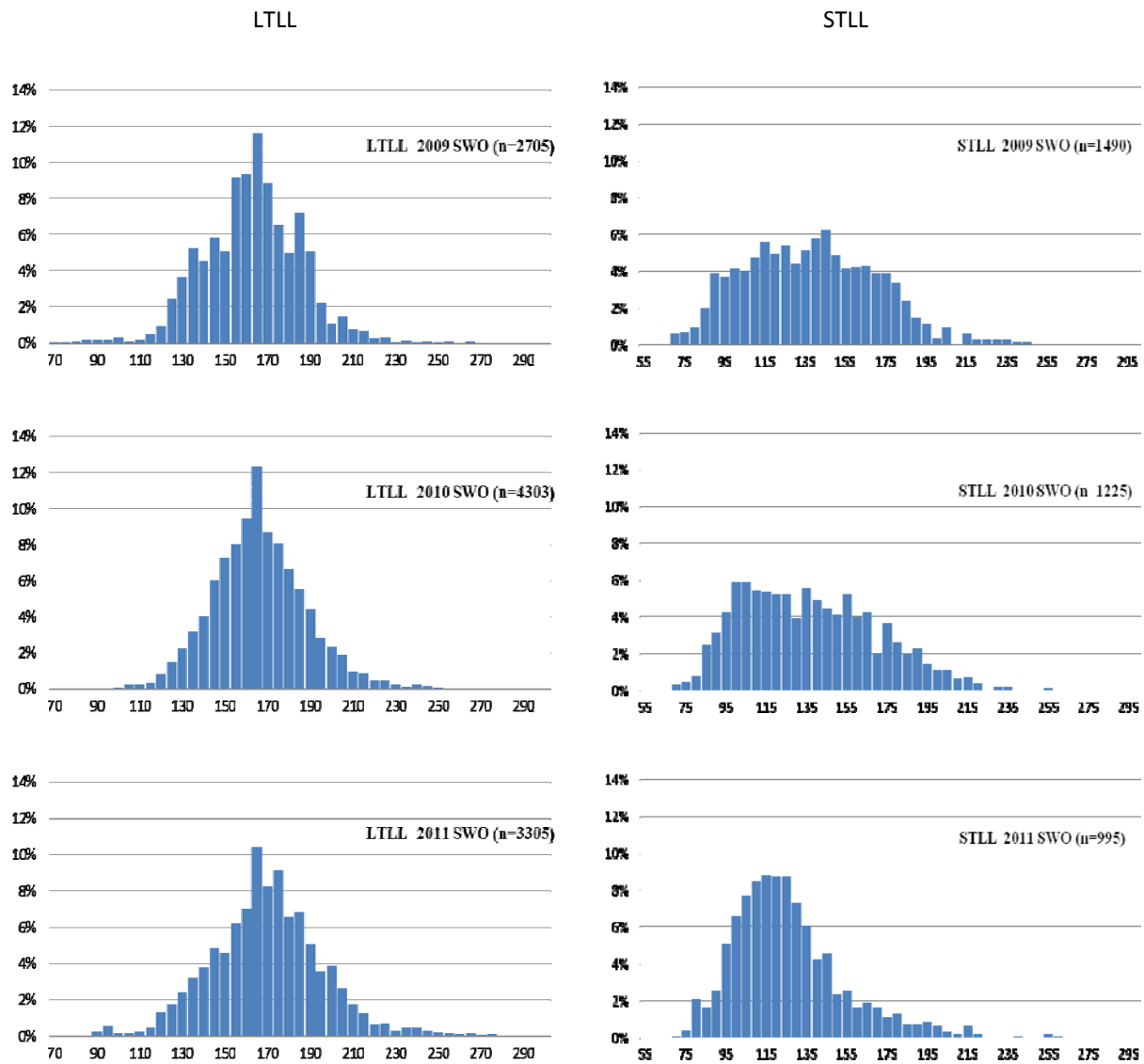


Figure 2. Length frequency distribution of swordfish caught by Taiwanese LTLL and STLL vessels in the North Pacific Ocean during 2009-2011(measurement: low jaw-fork length for LTLL, eye-fork length for STLL).

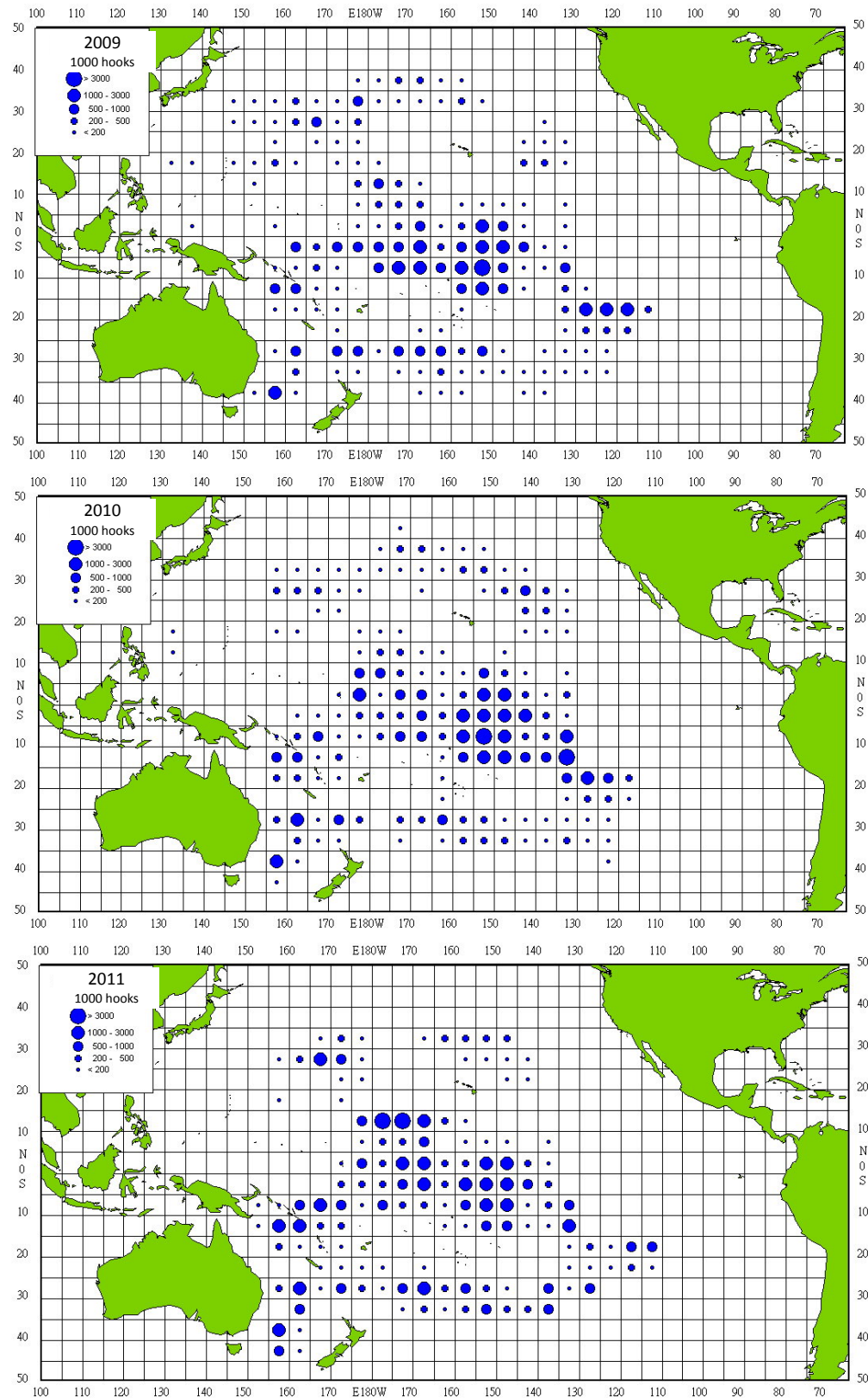


Figure 3. Distribution of fishing effort for Taiwanese LTLL vessels operated in the Pacific Ocean during 2009-2011 (Note: Map of 2010 and 2011 is still preliminary and will be revised shortly.)

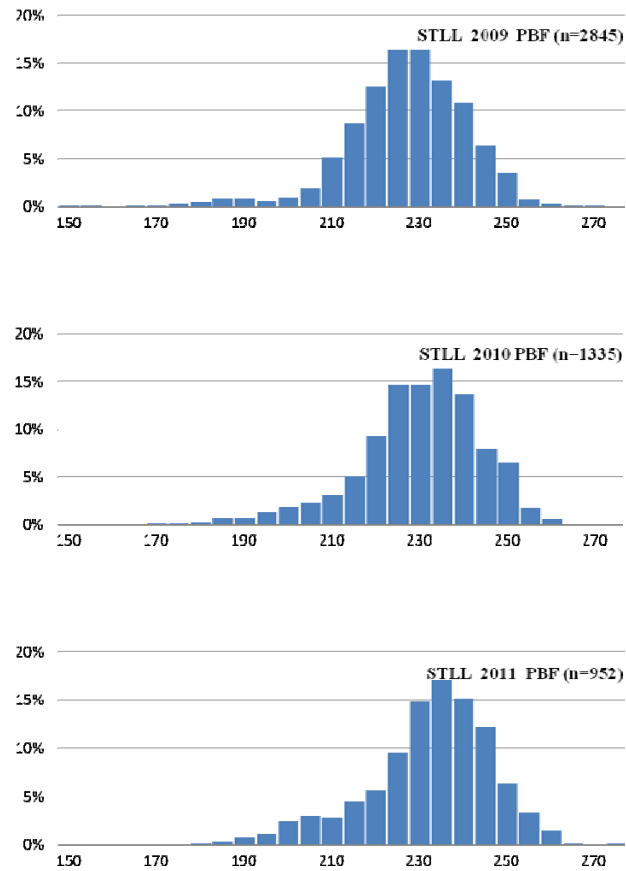


Figure 4. Length frequency distribution of Pacific bluefin tuna caught by Taiwanese STLL vessels in the North Pacific Ocean during 2009-2011.

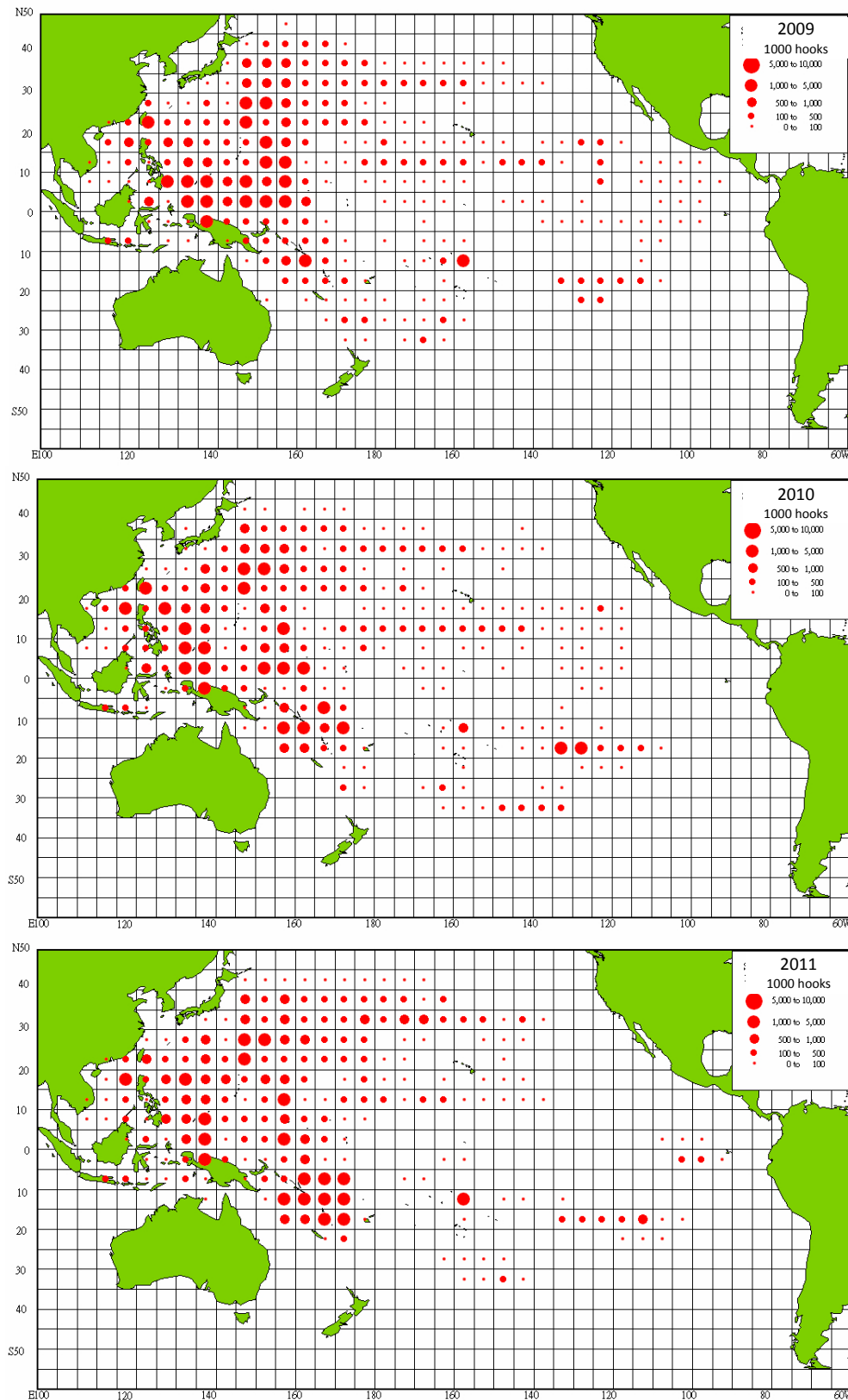


Figure 5. Distribution of fishing effort for Taiwanese STLL vessels based at domestic fishing ports during 2009-2011.  
(Note: Map of 2010 and 2011 is still preliminary and will be revised shortly.)



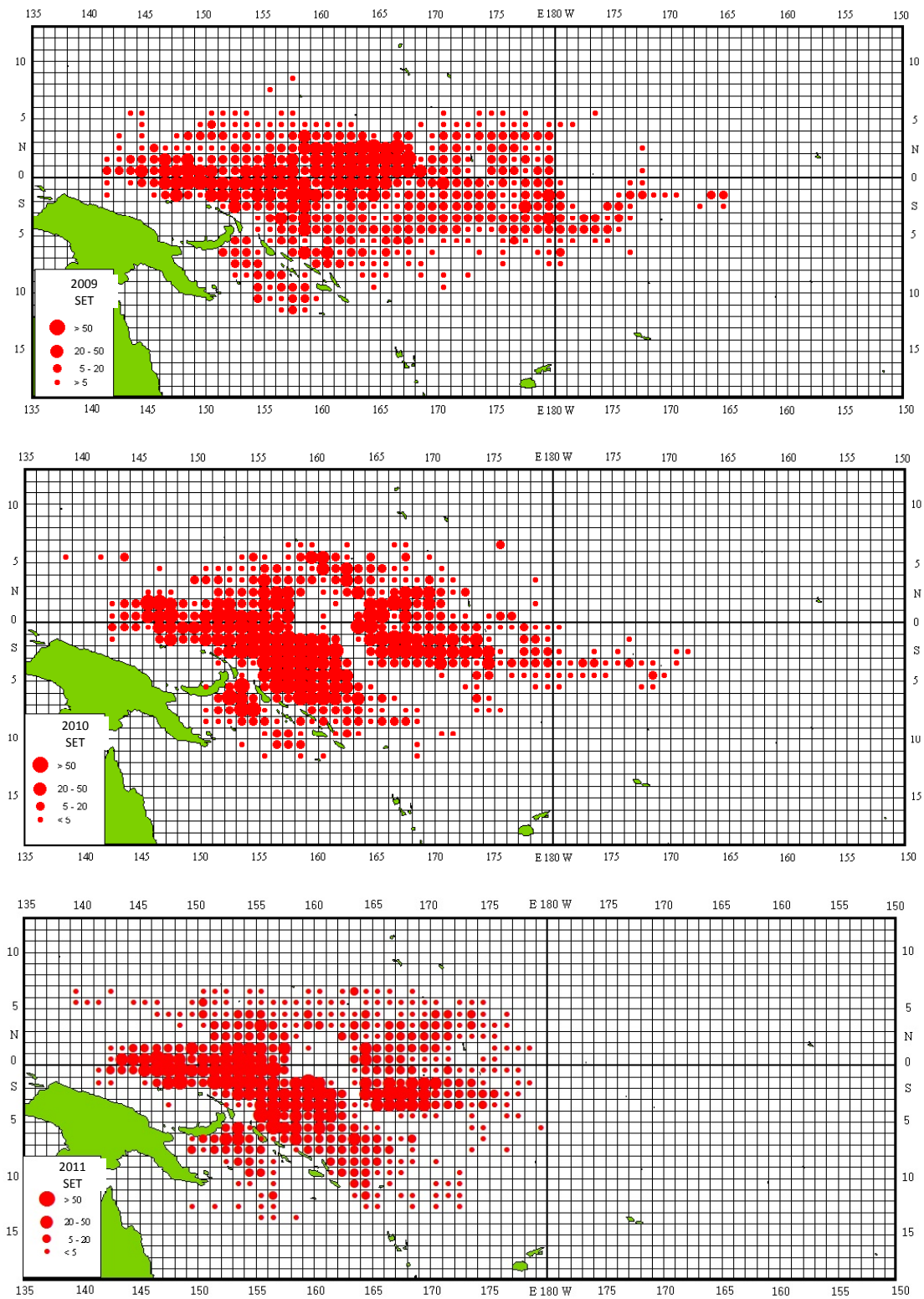


Figure 6. Distribution of fishing effort for Taiwanese distant water purse seine vessels operated in Pacific Ocean during 2009-2011.