

Review of Taiwan SBT Fishery of 2015/2016

1. Introduction

In the 1970s, the main target species of the Taiwanese conventional tuna longline fishery was albacore. Since 1980s, some operators began to build new vessels and switch to super freezer tuna longline fishing for bigeye tuna and yellowfin tuna, then started fishing SBT seasonally in early 1990s. In the meantime, some tropical tuna fishing vessels shift southward and mainly operate in the central south Indian Ocean (Area 2 and 14) for SBT during April to September, and some operate in the high seas area off South Africa (Area 14 and 9) for SBT during October to February of following year.

The annual catches of SBT were less than 250 tons in early 1980s but from that time, with the increase of fleet size and the expansion of fishing grounds, the catches of SBT fluctuated between about 900 tons to 1,600 tons from 1990 to 2002. Since 2002, Taiwan has become a member of the Extend Commission of CCSBT and its national allocation has been set at 1,140 tons. The annual catches of SBT fluctuated between 500 tons and 1,300 tons from 2002 to 2015. In 2016, 60 fishing vessels were authorized to catch SBT and the SBT catch was 1,023 tons for calendar year and 1,026 tons for quota year.

2. Catch and Effort

Taiwanese SBT longline fishery mainly operates in Areas2, Areas14, Areas8 and Areas9 (here after: major Areas) seasonally. The catch and efforts by calendar year are provided in Table 1 and Figure 1.

The annual catches of SBT ranged from 494 to 1,298 tons between 2002 and 2016 (Table 1) with the highest catch in number and weight in 2004. The catch declined significantly to about 530 tons in 2011 for the shared quota of 2010 and 2011, which had been mostly used in 2010 and less fishing vessels engaging in SBT. The low catch in 2012 was because of good catch rate in tropical Indian Ocean, most of fishing vessels shifted to target bigeye tuna. The annual catches of SBT resumed from

2013 to 2016 because of the return of fishing vessels for SBT.

Figure 1 shows the variation of annual catches in number between 2002 and 2016. Most of the catches were made in Area 2 and 14. The aggregated number of SBT, which were caught in major Areas fluctuated between 28,000 and 41,000 during 2002-2010. After that, the total number declined rapidly in the next two years (2011-2012) and resumed to the level of 26,000-33,000 from 2013 to 2016.

The fishing efforts of 2002 and 2003 shown in Table 1 were aggregated all fishing efforts made by SBT fishing vessels, including the fishing efforts deployed in the tropical areas for bigeye tuna. Since 2004, only the fishing efforts of SBT vessels operated in the area south 20°S were included as fishing efforts for SBT.

The area-specific and monthly catches and fishing efforts of Taiwanese SBT longline fishing vessels in recent 5 years (2012-2016) are provided in Tables 2 and 3. It is observed that most of fishing efforts and catch were made in major Areas, and it should be noted that the fishing efforts made in Area 9 were mainly from the fishing vessels targeting Oilfish or Escolar in the Indian Ocean, and the fishing efforts made in Area 15 were mainly from fishing vessels targeting albacore with by-catch of SBT.

3. Nominal CPUE

The annual nominal CPUE of calendar years is shown in Table 1 and Figure 1. The nominal CPUE aggregated by the data from all areas reached the highest level in 2005, while the nominal CPUE aggregated by the data from major Areas reached the highest level in 2012.

It was noted that catches were mainly made in Areas 2 and 14 (Table 2), but the fishing efforts were mainly deployed in Area 9 except for 2014 (Table 3). The area-specific and monthly nominal CPUE in recent 5 years are provided in Table 4 and Figure 2. It was observed that the nominal CPUEs in Area 2 were generally higher than those in other areas and reached the highest level in 2012.

4. Size composition

Before 2002 SBT fishing vessels had to report their operation position, weights of SBT catches on weekly basis, they were requested to report the length of individual SBT catch between 2002 to 2009, and the CDS scheme applied to Taiwanese SBT

fishery and the length data of all SBT were collected through CDS scheme after 2010.

The annual area-specific size compositions are shown in Figure 3 and Figure 4. It was observed that the size composition mainly concentrated at the range of 110 cm to 125 cm among all areas of 2010s, and the mode at 150 cm was observed in other areas. (Figure 3).

In recent 5 years (2012-2016), the size composition generally concentrated at the range of 106 cm to 126 cm among all areas (Figure 4). However, it was observed that modes of 106 cm to 116 cm occurred between 2012 and 2016, but a mode at 126 cm occurred in 2015.

5. Fleet size and fishing efforts distributions

According to the weekly reports and trading documents, there were more than 100 fishing vessels were engaged in SBT fishery during 1998 to 2001. Since Taiwan became a member of the Extend Commission of CCSBT in 2002, all SBT fishing vessels have to be authorized to access this fishery, and the Fisheries Agency (FA) of Taiwan reviews and renews their authorizations annually.

The numbers of fishing vessels engaged in SBT fishery ranged from 36 to 100 during 2002 to 2016 (Table 5). During 2005 to 2008, the number of fishing vessels decreased significantly because some of fishing vessels shifted to the waters off South Africa for targeting Oilfish or Escolar. In 2009 and 2010, the number of fishing vessels increased due to Somalian piracy. The number of fishing vessels decreased to 56 in 2011 as national SBT allocation was set at 578 tons, and decreased further to 36 in 2012 because most of fishing vessels remained in tropical area for bigeye tuna. Owing to poor catch of tropical tuna, fishing vessels returned to SBT fishing ground and the number of SBT longline fishing vessel increased substantially to 76 in 2013 with a slight decrease to 71 and 72 in 2014 and 2015. The number of fishing vessel decrease to 60 in 2016 as some fishing vessels remained in tropical area for yellowfin tuna.

Taiwanese SBT fishing vessels seasonally targeting SBT mainly operate in the waters of 20°S - 40°S in the Indian Ocean and the areas adjacent to the Atlantic Ocean. The distributions of fishing efforts and SBT catch in number are shown in Figure 5 to Figure 8. There are two major fishing grounds in general with one in the southern

central Indian Ocean around 50°E-105°E, 20°S-40°S, and one in the high seas area off South Africa around 20°E-50°E, 25°S-45°S. The fishing season for Taiwanese SBT fishery in the southern central Indian Ocean is from April to September, and the fishing season in the southwest Indian Ocean is from October to February of following year. It was observed that the fishing efforts and SBT catches were mainly made in Areas 2, 14 and 9 in the second and the third quarters, and it was also observed that the catches and efforts in Areas 2 and 14 decreased in 2011 and 2012. The fishing efforts deployed in Area 9 are mainly from the fishing vessels targeting Oilfish or Escolar with some targeting SBT in the first and the fourth quarters.

6. Development and implementation of scientific observer programs

Appendix 1 provides the summary report on the implementation of scientific observer program.

7. Other relevant information

The collaboration between Taiwan and Australia on SBT archival tagging program had been conducted during 2004 to 2007. The observers dispatched to Taiwanese SBT fishing vessels carried out the SBT tagging program. There were 37, 48, 25 and 50 archival tags successfully settled during 2004 to 2007. The results were incorporated into the documents of CCSBT-ESC/0709/20 and CCSBT-ESC/0809/23.

Table 1 Annual catches of SBT in weight and in number, fishing efforts and nominal CPUE of Taiwanese SBT longline fishery

Unit : Hooks_N : thousand hooks ;
SBT_W: round weight in ton. ;
CPUE : SBT catch in number /total hooks;

Calendar year	Hooks_N		SBT_N		SBT_W		CPUE	
	All Area	Area 2、 14、8、9						
2002	102,908	39,188	34,841	34,754	1,137	1,132	0.34	0.89
2003	144,620	44,570	31,606	28,768	1,129	1,045	0.22	0.65
2004	36,055	34,993	42,151	41,733	1,298	1,279	1.17	1.19
2005	20,471	19,375	33,319	33,266	941	937	1.63	1.72
2006	20,444	18,919	30,667	30,660	846	845	1.50	1.62
2007	26,185	25,532	33,776	33,772	841	841	1.29	1.32
2008	28,724	26,656	35,144	35,082	913	911	1.22	1.32
2009	37,236	32,380	31,801	31,639	921	913	0.85	0.98
2010	40,916	33,897	33,407	33,263	1,208	1,201	0.82	0.98
2011	27,062	20,327	15,156	14,884	533	520	0.56	0.73
2012	18,414	9,702	17,578	17,198	494	472	0.95	1.77
2013	34,817	25,188	33,583	33,186	1,004	980	0.96	1.33
2014	30,823	21,067	26,659	26,300	944	922	0.86	1.27
2015	31,753	22,875	33,004	32,663	1,162	1,143	1.04	1.44
2016	32,067	27,861	30,392	30,204	1,023	1,013	0.95	1.09

Table 2 SBT catch in number by area, by month and by year of Taiwanese SBT longline fishery

Year	Month	Area1	Area2	Area3	Area4	Area5	Area6	Area7	Area8	Area9	Area10	Area11	Area12	Area13	Area14	Area15
2012	Total	-	12192	-	110	-	-	10	50	1312	0	0	0	-	3644	260
	1	-	-	-	-	-	-	-	-	0	0	-	-	-	0	0
	2	-	-	-	-	-	-	-	-	98	0	-	-	-	0	-
	3	-	-	-	-	-	-	-	0	8	0	0	-	-	0	-
	4	-	4	-	0	-	-	5	5	41	0	-	-	-	0	0
	5	-	352	-	48	-	-	5	43	5	0	-	-	-	11	26
	6	-	2122	-	26	-	-	-	2	89	-	0	0	-	0	29
	7	-	6347	-	36	0	-	-	-	261	-	0	0	-	263	43
	8	-	2894	-	0	0	-	-	-	27	-	-	0	-	2050	122
	9	-	473	-	-	-	-	-	-	72	-	-	-	-	1320	40
	10	-	-	-	-	-	-	-	-	0	-	0	-	-	-	0
	11	-	-	-	-	-	-	-	-	217	-	-	-	-	-	0
	12	-	-	-	-	-	-	-	-	494	-	0	-	-	-	0
2013	Total	-	19504	-	158	-	-	13	252	1284	0	42	0	-	12146	184
	1	-	-	-	-	-	-	-	-	386	0	-	-	-	-	0
	2	-	-	-	-	-	-	-	-	0	0	0	-	-	0	-
	3	-	-	-	-	-	-	-	0	0	0	0	-	-	0	-
	4	-	1	-	0	-	-	13	13	9	0	0	-	-	0	0
	5	-	442	-	30	-	-	0	207	87	0	0	0	-	177	0
	6	-	2905	-	98	-	-	-	32	136	0	6	0	-	1073	109
	7	-	7145	-	27	-	-	-	-	212	0	4	0	-	3641	0
	8	-	6775	-	3	-	-	-	-	262	-	14	0	-	4529	9
	9	-	2236	-	-	-	-	-	-	154	-	18	0	-	2726	44
	10	-	-	-	-	-	-	-	-	1	-	-	-	-	0	0
	11	-	-	-	-	-	-	-	-	22	-	-	-	-	0	21
	12	-	-	-	-	-	-	-	-	15	-	-	-	-	0	1
2014	Total	-	15872	-	151	-	7	61	453	1041	15	18	0	-	8934	107
	1	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	0	0	0	-	-	0	-
	3	-	-	-	-	-	-	-	0	0	0	0	-	-	0	-
	4	-	0	-	18	-	4	17	74	38	0	0	-	-	0	-
	5	-	521	-	53	-	3	44	361	136	6	-	0	-	48	0
	6	-	2645	-	49	-	-	0	18	61	4	0	-	-	1143	26
	7	-	4275	-	30	-	-	-	-	16	5	11	0	-	1882	36
	8	-	6583	-	1	-	-	-	-	31	-	7	0	-	4030	5
	9	-	1785	-	-	-	-	-	-	0	-	0	-	-	1831	40
	10	-	63	-	-	-	-	-	-	0	-	-	-	-	0	-
	11	-	-	-	-	-	-	-	-	388	-	-	-	-	0	-
	12	-	-	-	-	-	-	-	-	371	-	-	-	-	0	-
2015	Total	0	15049	0	179	1	0	24	7595	895	1	0	18	0	9124	118
	1	-	-	-	-	-	-	-	-	288	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	0	138	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	0	0	-	0	-	-	0	-
	4	-	-	-	18	-	-	2	1332	0	0	0	0	-	10	0
	5	-	379	-	140	0	-	22	4667	38	1	-	0	-	8	32
	6	-	6247	-	21	1	-	-	1596	39	0	0	0	-	1507	23
	7	-	5394	-	0	0	-	-	-	21	0	0	10	-	4830	0
	8	-	1753	-	0	0	-	-	-	44	0	0	2	-	2133	59
	9	-	1276	-	0	-	-	-	-	0	-	-	3	-	636	4
	10	-	-	-	-	-	-	-	-	0	-	-	3	-	0	0
	11	-	-	-	-	-	-	-	-	159	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	168	-	-	-	-	-	0
2016	Total	0	16026	0	33	0	3	0	2311	659	0	0	2	0	11208	150
	1	-	-	-	-	-	-	-	-	1	0	0	-	-	-	0
	2	-	-	-	-	-	-	-	-	0	-	0	-	-	-	0
	3	-	0	-	-	-	-	-	-	0	-	0	-	-	0	-
	4	-	0	-	0	-	-	0	474	0	-	-	-	-	0	6
	5	-	250	-	24	-	3	-	1153	48	-	-	-	-	3	59
	6	-	4292	-	9	-	-	-	684	104	-	-	0	-	805	74
	7	-	5911	-	0	0	-	-	-	60	-	-	0	-	5112	11
	8	-	4356	-	-	0	-	-	-	88	-	-	2	-	5268	0
	9	-	1217	-	-	-	-	-	-	15	-	0	0	-	20	0
	10	-	-	-	-	-	-	-	-	0	-	0	-	-	0	0
	11	-	-	-	-	-	-	-	-	222	-	-	-	-	0	-
	12	-	-	-	-	-	-	-	-	121	-	0	-	-	0	-

Table 3 Number of hooks (thousand hooks) deployed by area, by month and by year of Taiwanese SBT longline fishery

Year	Month	Area1	Area2	Area3	Area4	Area5	Area6	Area7	Area8	Area9	Area10	Area11	Area12	Area13	Area14	Area15
2012	Total	-	1916	-	1671	16	-	243	397	6301	1364	285	676	-	1088	4459
	1	-	-	-	-	-	-	-	-	508	142	-	-	-	17	16
	2	-	-	-	-	-	-	-	-	798	343	-	-	-	19	-
	3	-	-	-	-	-	-	-	40	1222	215	11	-	-	37	-
	4	-	22	-	54	-	-	109	216	1283	330	-	-	-	14	8
	5	-	168	-	561	-	-	134	137	813	333	18	-	-	79	647
	6	-	420	-	691	-	-	-	4	490	-	245	13	-	36	768
	7	-	724	-	338	10	-	-	-	232	-	4	278	-	206	1293
	8	-	476	-	27	6	-	-	-	168	-	-	385	-	433	823
	9	-	106	-	-	-	-	-	-	177	-	-	-	-	247	703
	10	-	-	-	-	-	-	-	-	240	-	4	-	-	-	144
	11	-	-	-	-	-	-	-	-	179	-	-	-	-	-	7
	12	-	-	-	-	-	-	-	-	192	-	4	-	-	-	51
2013	Total	0	5554	0	2556	0	0	405	1102	12097	1186	1343	992	0	6436	3149
	1	-	-	-	-	-	-	-	-	561	165	-	-	-	-	4
	2	-	-	-	-	-	-	-	-	1048	75	125	-	-	18	-
	3	-	-	-	-	-	-	-	117	1346	73	165	-	-	12	-
	4	-	55	-	39	-	-	156	478	1655	353	58	-	-	50	3
	5	-	360	-	668	-	-	249	475	2042	471	17	4	-	551	94
	6	-	1170	-	1023	-	-	-	32	1086	46	237	9	-	1552	765
	7	-	1666	-	669	-	-	-	-	1180	3	309	493	-	1630	729
	8	-	1750	-	157	-	-	-	-	964	-	249	477	-	1763	441
	9	-	553	-	-	-	-	-	-	807	-	183	9	-	697	438
	10	-	-	-	-	-	-	-	-	656	-	-	-	-	25	328
	11	-	-	-	-	-	-	-	-	415	-	-	-	-	81	271
	12	-	-	-	-	-	-	-	-	337	-	-	-	-	57	76
2014	Total	-	6337	-	3212	-	51	756	1753	6318	1030	876	1366	-	6659	2466
	1	-	-	-	-	-	-	-	-	88	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	300	7	97	-	-	12	-
	3	-	-	-	-	-	-	-	54	490	164	70	-	-	22	-
	4	-	9	-	105	-	27	314	755	823	338	39	-	-	17	-
	5	-	554	-	992	-	24	317	930	857	409	-	4	-	499	303
	6	-	1490	-	1238	-	-	125	14	921	104	172	-	-	1402	732
	7	-	1822	-	775	-	-	-	-	486	8	223	631	-	2120	691
	8	-	1950	-	102	-	-	-	-	481	-	185	731	-	1742	473
	9	-	492	-	-	-	-	-	-	507	-	90	-	-	746	267
	10	-	20	-	-	-	-	-	-	581	-	-	-	-	15	-
	11	-	-	-	-	-	-	-	-	437	-	-	-	-	39	-
	12	-	-	-	-	-	-	-	-	347	-	-	-	-	45	-
2015	Total	0	6291	0	2270	341	0	88	3700	7146	708	328	2827	0	5738	2314
	1	-	-	-	-	-	-	-	-	375	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	25	376	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	94	458	-	43	-	-	114	-
	4	-	-	-	141	-	-	27	1164	913	67	11	4	-	43	126
	5	-	163	-	500	56	-	61	1848	851	314	-	169	-	637	375
	6	-	1795	-	296	118	-	-	569	891	173	129	881	-	813	353
	7	-	2058	-	698	159	-	-	-	648	111	134	561	-	2033	365
	8	-	1700	-	600	8	-	-	-	869	43	11	798	-	1726	463
	9	-	575	-	35	-	-	-	-	659	-	-	344	-	327	506
	10	-	-	-	-	-	-	-	-	481	-	-	70	-	45	122
	11	-	-	-	-	-	-	-	-	209	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	416	-	-	-	-	-	4
2016	Total	0	4958	0	515	73	59	4	2069	15237	2	151	250	0	5595	3149
	1	-	-	-	-	-	-	-	-	626	-	31	-	-	-	3
	2	-	20	-	-	-	-	-	-	1460	-	8	-	-	49	-
	3	-	3	-	12	-	-	4	1061	2038	-	-	-	-	43	70
	4	-	412	-	136	-	59	-	881	2608	-	-	-	-	247	431
	5	-	1430	-	197	-	-	-	127	2092	-	-	3	-	995	690
	6	-	1622	-	170	49	-	-	-	1667	-	-	12	-	1520	796
	7	-	1193	-	-	24	-	-	-	1648	-	-	227	-	1897	601
	8	-	278	-	-	-	-	-	-	836	-	60	8	-	751	431
	9	-	-	-	-	-	-	-	-	617	-	38	-	-	87	123
	10	-	-	-	-	-	-	-	-	536	-	-	-	-	3	-
	11	-	-	-	-	-	-	-	-	296	-	10	-	-	3	-
	12	-	-	-	-	-	-	-	-	813	2	4	-	-	-	4

Table 4 Nominal CPUE by area, by month and by year of Taiwanese SBT longline fishery

Unit: CPUE=Numbers/Thousand hooks

Year	Month	Area1	Area2	Area3	Area4	Area5	Area6	Area7	Area8	Area9	Area10	Area11	Area12	Area13	Area14	Area15
2012	Total	-	6.36	-	0.07	-	-	0.04	0.13	0.22	0.00	0.00	0.00	-	3.35	0.06
	1	-	-	-	-	-	-	-	-	0.00	0.00	-	-	-	0.00	0.00
	2	-	-	-	-	-	-	-	-	0.12	0.00	-	-	-	0.00	-
	3	-	-	-	-	-	-	-	0.00	0.01	0.00	0.00	-	-	0.00	-
	4	-	0.18	-	0.00	-	-	0.05	0.02	0.03	0.00	-	-	-	0.00	0.00
	5	-	2.10	-	0.09	-	-	0.04	0.31	0.01	0.00	0.00	-	-	0.14	0.04
	6	-	5.05	-	0.04	-	-	-	0.45	0.18	-	0.00	0.00	-	0.00	0.04
	7	-	8.77	-	0.11	0.00	-	-	-	1.13	-	0.00	0.00	-	1.27	0.03
	8	-	6.08	-	0.00	0.00	-	-	-	0.16	-	-	0.00	-	4.73	0.15
	9	-	4.48	-	-	-	-	-	-	0.41	-	-	-	-	5.34	0.06
	10	-	-	-	-	-	-	-	-	0.00	-	0.00	-	-	-	0.00
	11	-	-	-	-	-	-	-	-	1.21	-	-	-	-	-	0.00
	12	-	-	-	-	-	-	-	-	2.57	-	0.00	-	-	-	0.00
2013	Total	-	3.51	-	0.06	-	-	0.03	0.23	0.11	0	0.03	0	-	1.89	0.06
	1	-	-	-	-	-	-	-	-	0.69	0	-	-	-	-	0
	2	-	-	-	-	-	-	-	-	0	0	0	-	-	0	-
	3	-	-	-	-	-	-	-	0	0	0	0	-	-	0	-
	4	-	0.02	-	0	-	-	0.08	0.03	0.01	0	0	-	-	0	0
	5	-	1.23	-	0.04	-	-	0	0.44	0.04	0	0	0	-	0.32	0
	6	-	2.48	-	0.1	-	-	-	1	0.13	0	0.03	0	-	0.69	0.14
	7	-	4.29	-	0.04	-	-	-	-	0.18	0	0.01	0	-	2.23	0
	8	-	3.87	-	0.02	-	-	-	-	0.27	-	0.06	0	-	2.57	0.02
	9	-	4.04	-	-	-	-	-	-	0.19	-	0.1	0	-	3.91	0.1
	10	-	-	-	-	-	-	-	-	0	-	-	-	-	0	0
	11	-	-	-	-	-	-	-	-	0.05	-	-	-	-	0	0.08
	12	-	-	-	-	-	-	-	-	0.04	-	-	-	-	0	0.01
2014	Total	-	2.5	-	0.05	-	0.14	0.08	0.26	0.16	0.01	0.02	0	-	1.34	0.04
	1	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	0	0	0	-	-	0	-
	3	-	-	-	-	-	-	-	0	0	0	0	-	-	0	-
	4	-	0	-	0.17	-	0.15	0.05	0.1	0.05	0	0	-	-	0	-
	5	-	0.94	-	0.05	-	0.12	0.14	0.39	0.16	0.01	-	0	-	0.1	0
	6	-	1.78	-	0.04	-	-	0	1.29	0.07	0.04	0	-	-	0.82	0.04
	7	-	2.35	-	0.04	-	-	-	-	0.03	0.62	0.05	0	-	0.89	0.05
	8	-	3.38	-	0.01	-	-	-	-	0.06	-	0.04	0	-	2.31	0.01
	9	-	3.63	-	-	-	-	-	-	0	-	0	-	-	2.45	0.15
	10	-	3.15	-	-	-	-	-	-	0	-	-	-	-	0	-
	11	-	-	-	-	-	-	-	-	0.89	-	-	-	-	0	-
	12	-	-	-	-	-	-	-	-	1.07	-	-	-	-	0	-
2015	Total	-	2.39	-	0.08	0	-	0.27	2.05	0.13	0	0	0.01	-	1.59	0.05
	1	-	-	-	-	-	-	-	-	0.77	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	0	0.37	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	0	0	-	0	-	-	0	-
	4	-	-	-	0.13	-	-	0.07	1.14	0	0	0	-	-	0.23	0
	5	-	2.33	-	0.28	0	-	0.36	2.53	0.04	0	-	0	-	0.01	0.09
	6	-	3.48	-	0.07	0.01	-	-	2.8	0.04	0	0	0	-	1.85	0.07
	7	-	2.62	-	0	0	-	-	-	0.03	0	0	0.02	-	2.38	0
	8	-	1.03	-	0	0	-	-	-	0.05	0	0	-	-	1.24	0.13
	9	-	2.22	-	0	-	-	-	-	0	-	-	0.01	-	1.94	0.01
	10	-	-	-	-	-	-	-	-	0	-	-	0.04	-	0	0
	11	-	-	-	-	-	-	-	-	0.76	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	0.4	-	-	-	-	-	0
2016	Total	-	3.23	-	0.06	0	0.05	0	1.12	0.04	0	0	0.01	-	2	0.05
	1	-	-	-	-	-	-	-	-	0	0	0	-	-	-	0
	2	-	-	-	-	-	-	-	-	0	-	0	-	-	-	0
	3	-	0	-	-	-	-	-	-	0	-	0	-	-	0	-
	4	-	0	-	0	-	-	0	0.45	0	-	-	-	-	0	0.09
	5	-	0.61	-	0.18	-	0.05	-	1.31	0.02	-	-	-	-	0.01	0.14
	6	-	3	-	0.05	-	-	-	5.39	0.05	-	-	0	-	0.81	0.11
	7	-	3.64	-	0	0	-	-	-	0.04	-	-	0	-	3.36	0.01
	8	-	3.65	-	-	0	-	-	-	0.05	-	-	0.01	-	2.78	0
	9	-	4.38	-	-	-	-	-	-	0.02	-	0	0	-	0.03	0
	10	-	-	-	-	-	-	-	-	0	-	0	-	-	0	0
	11	-	-	-	-	-	-	-	-	0.41	-	-	-	-	0	-
	12	-	-	-	-	-	-	-	-	0.41	-	0	-	-	0	-

Table 5 Number of fishing vessel engaged in SBT fishery during 2002-2016

Year	No. of seasonal target vessels	No. of by-catch vessels	Total vessels
2002	21	50	71
2003	76	24	100
2004	79	18	97
2005	49	8	57
2006	33	3	36
2007	27	3	30
2008	35	6	41
2009	34	33	67
2010	65	17	82
2011	28	28	56
2012	12	24	36
2013	39	37	76*
2014	37	34	71
2015	45	27	72
2016	34	26	60

* There was one vessel shipwreck.

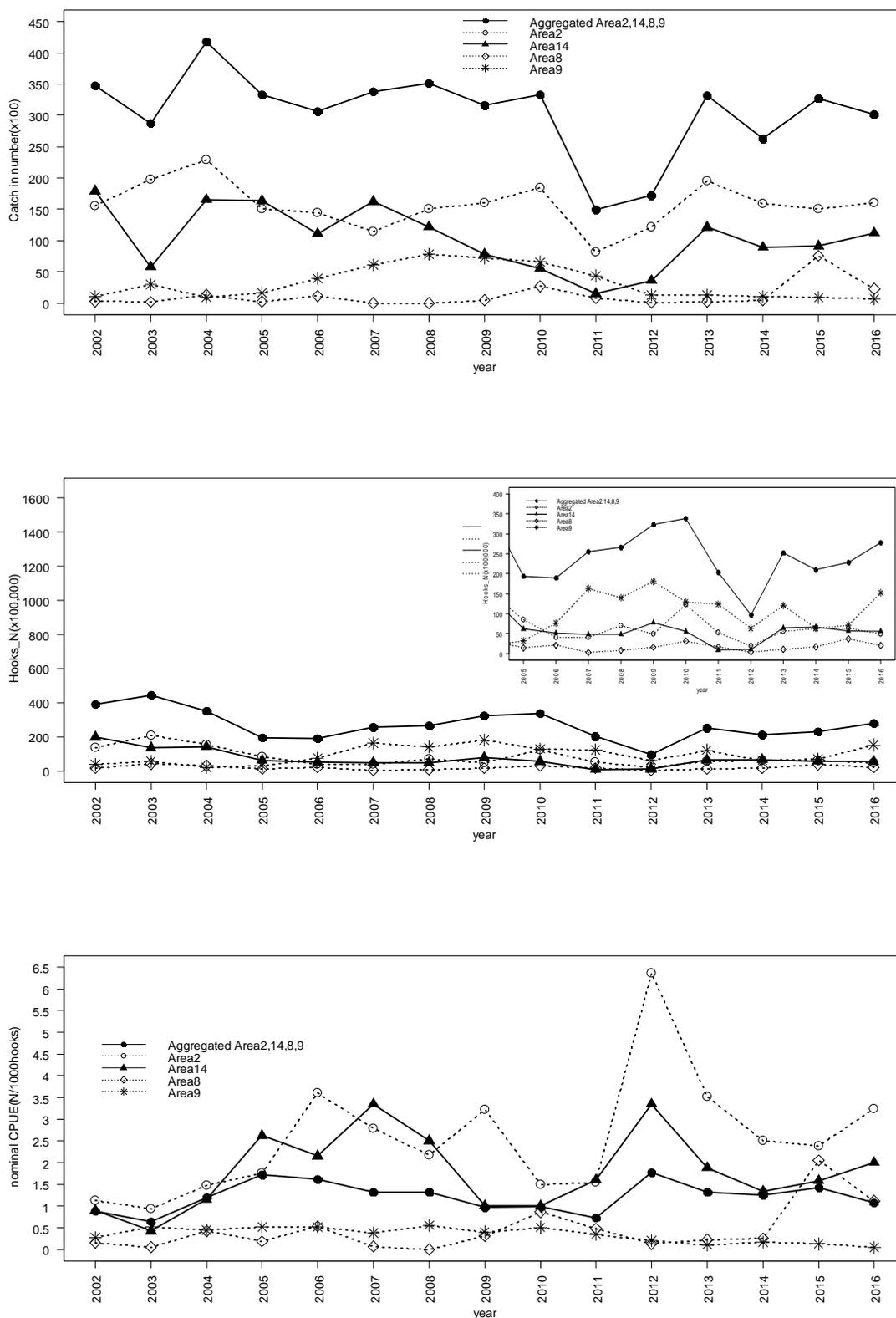


Fig. 1 Annual SBT catches in number, fishing effort and nominal CPUE of Taiwanese SBT longline fishery in main fishing ground

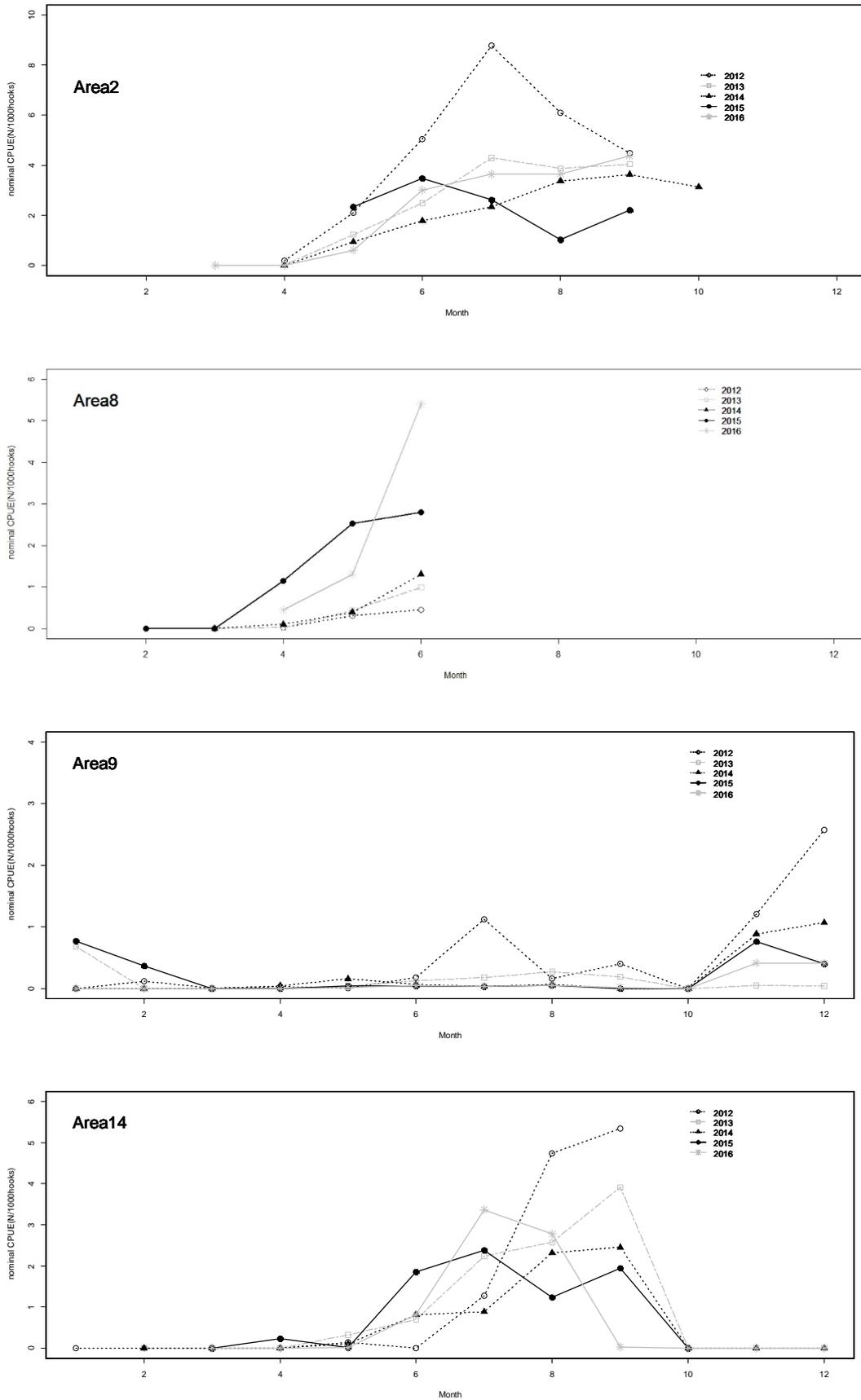


Fig. 2 Annual nominal CPUE by area, by month and by year of Taiwanese SBT longline fishery in main fishing ground

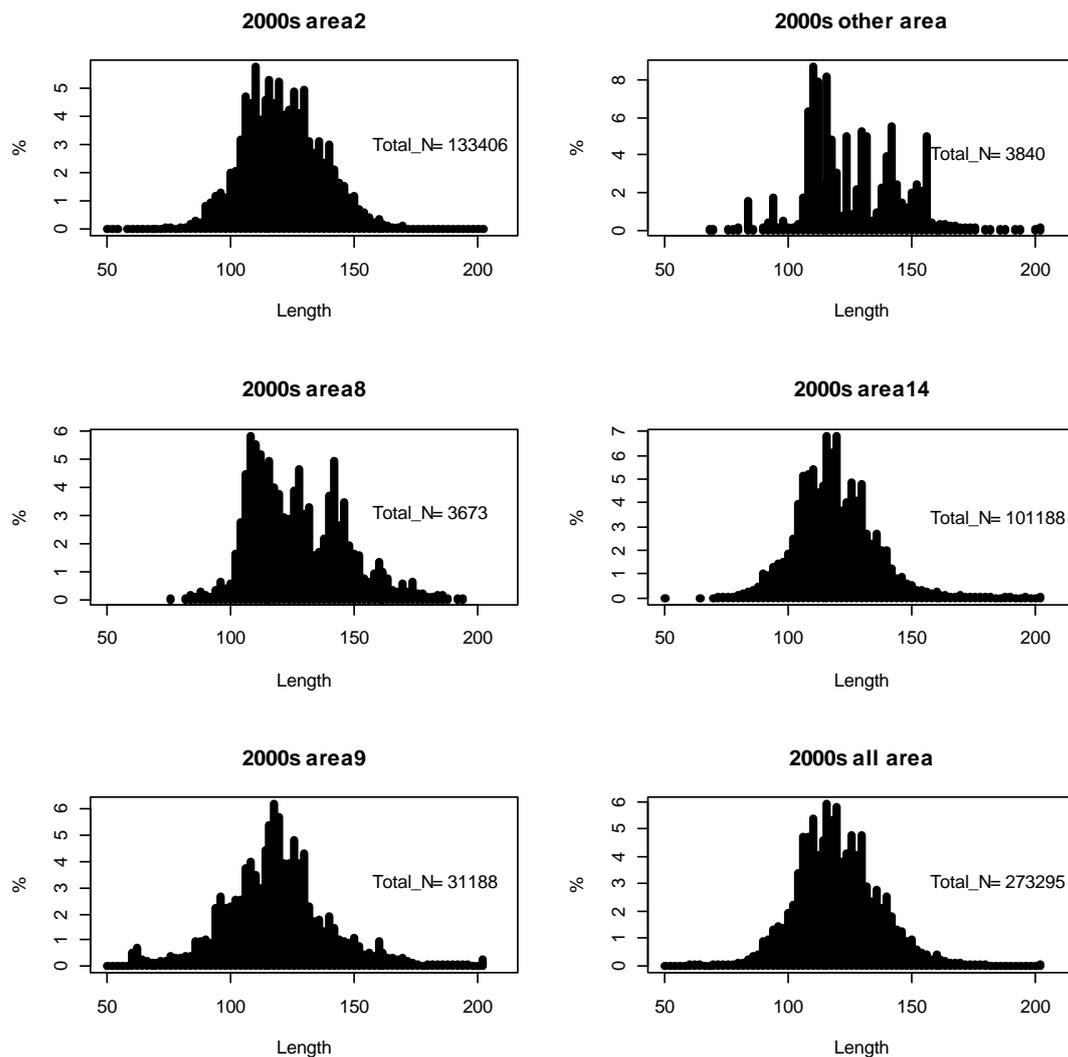


Fig.3 (1) SBT catch length frequency by area of Taiwanese SBT longline fishery in 2000s

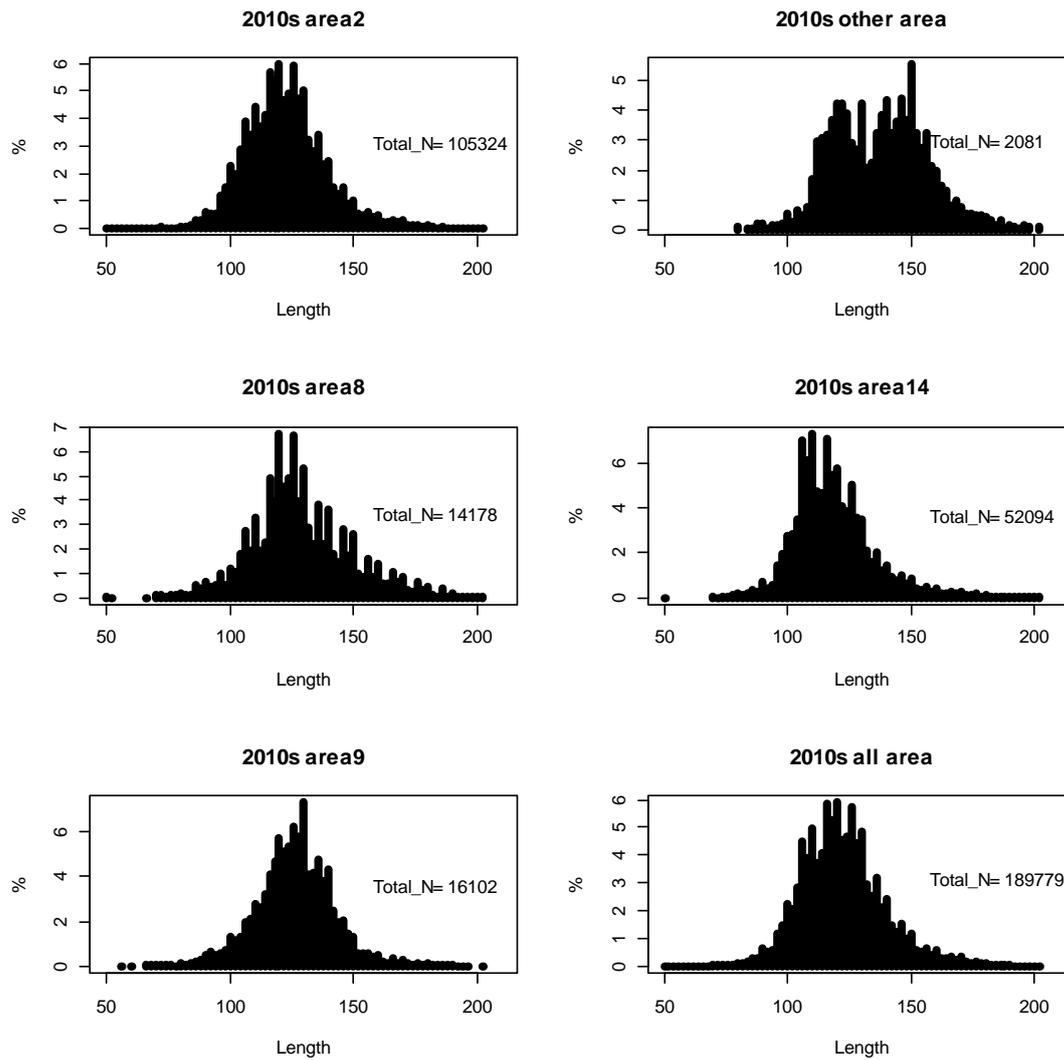


Fig.3 (2) SBT catch length frequency by area of Taiwanese SBT longline fishery during 2010-2016

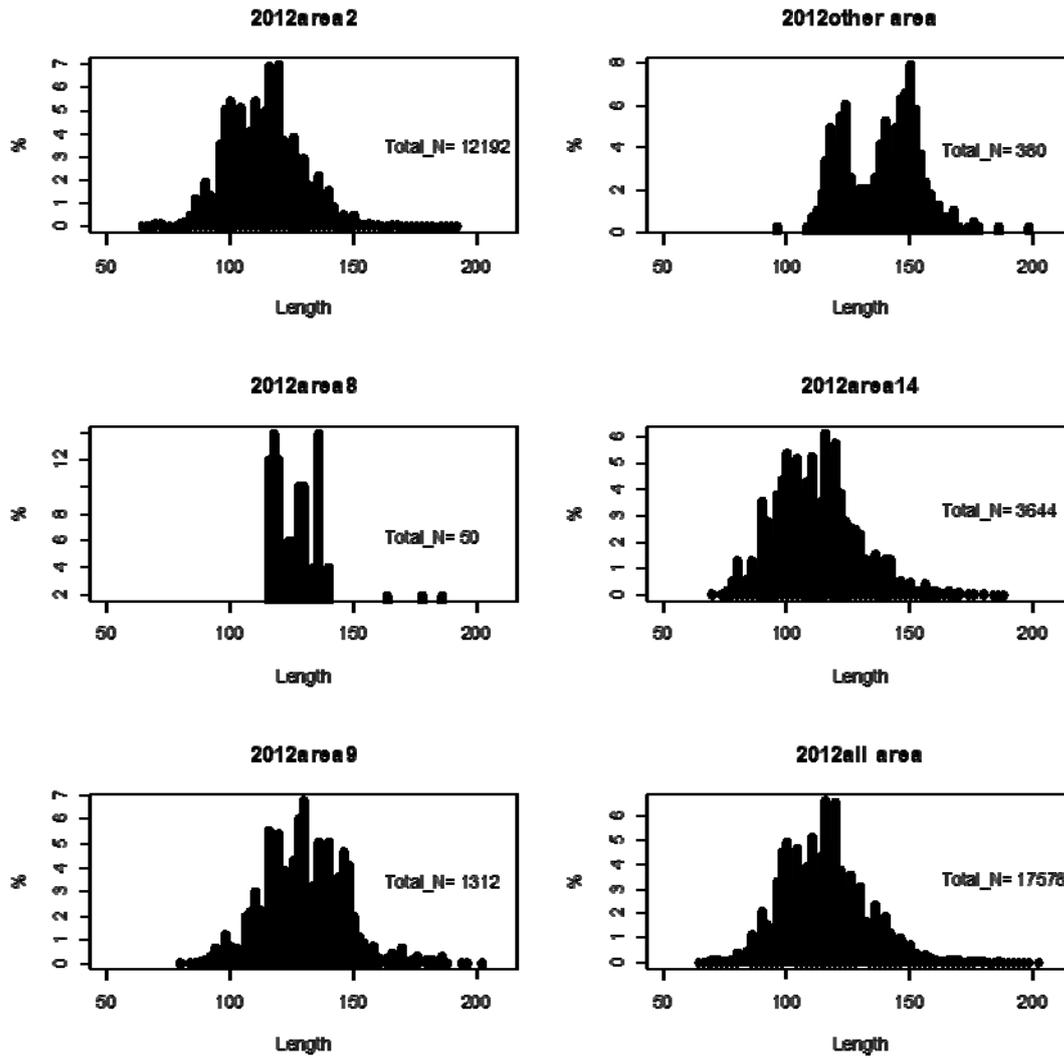


Fig.4 (1) SBT catch length frequency by area of Taiwanese SBT longline fishery in 2012

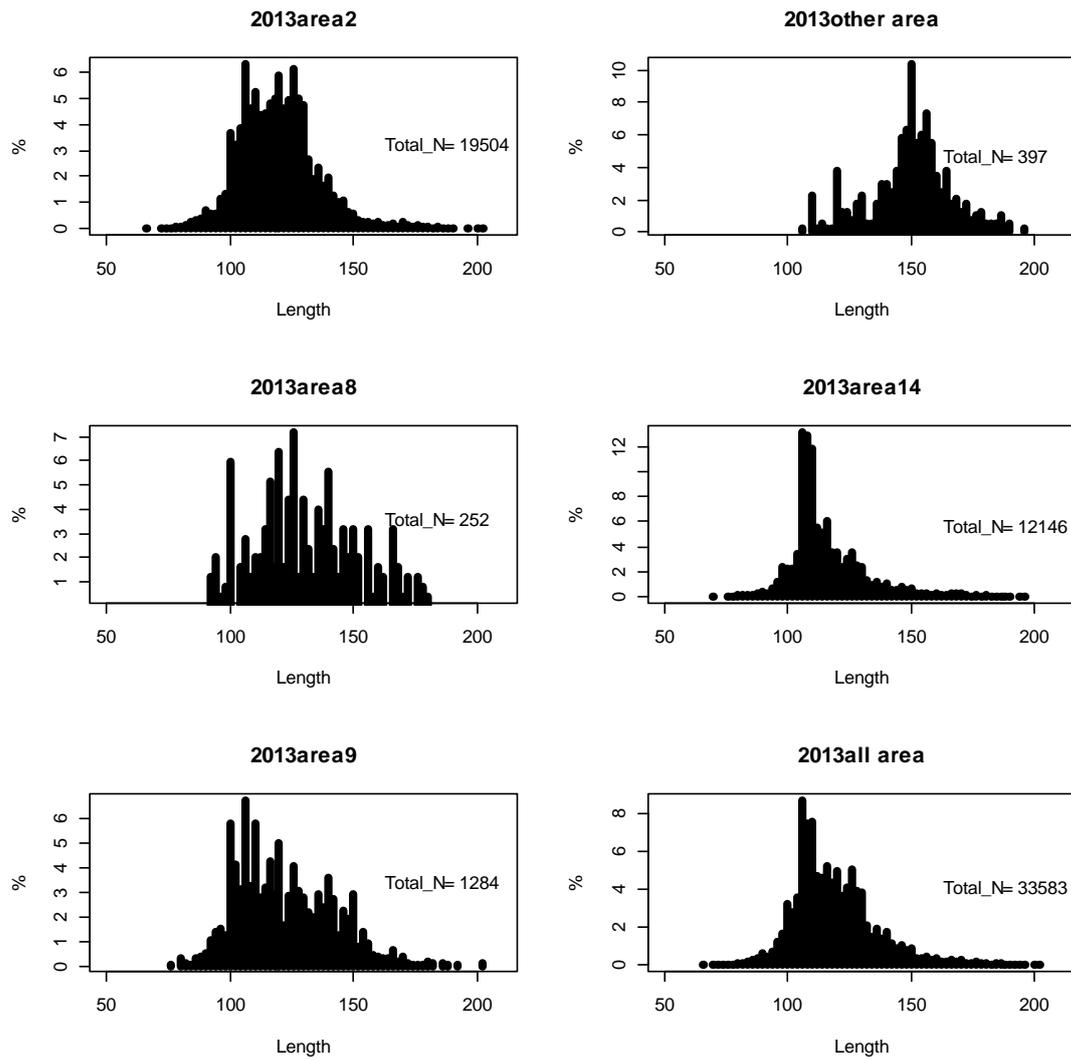


Fig.4 (2) SBT catch length frequency by area of Taiwanese SBT longline fishery in 2013

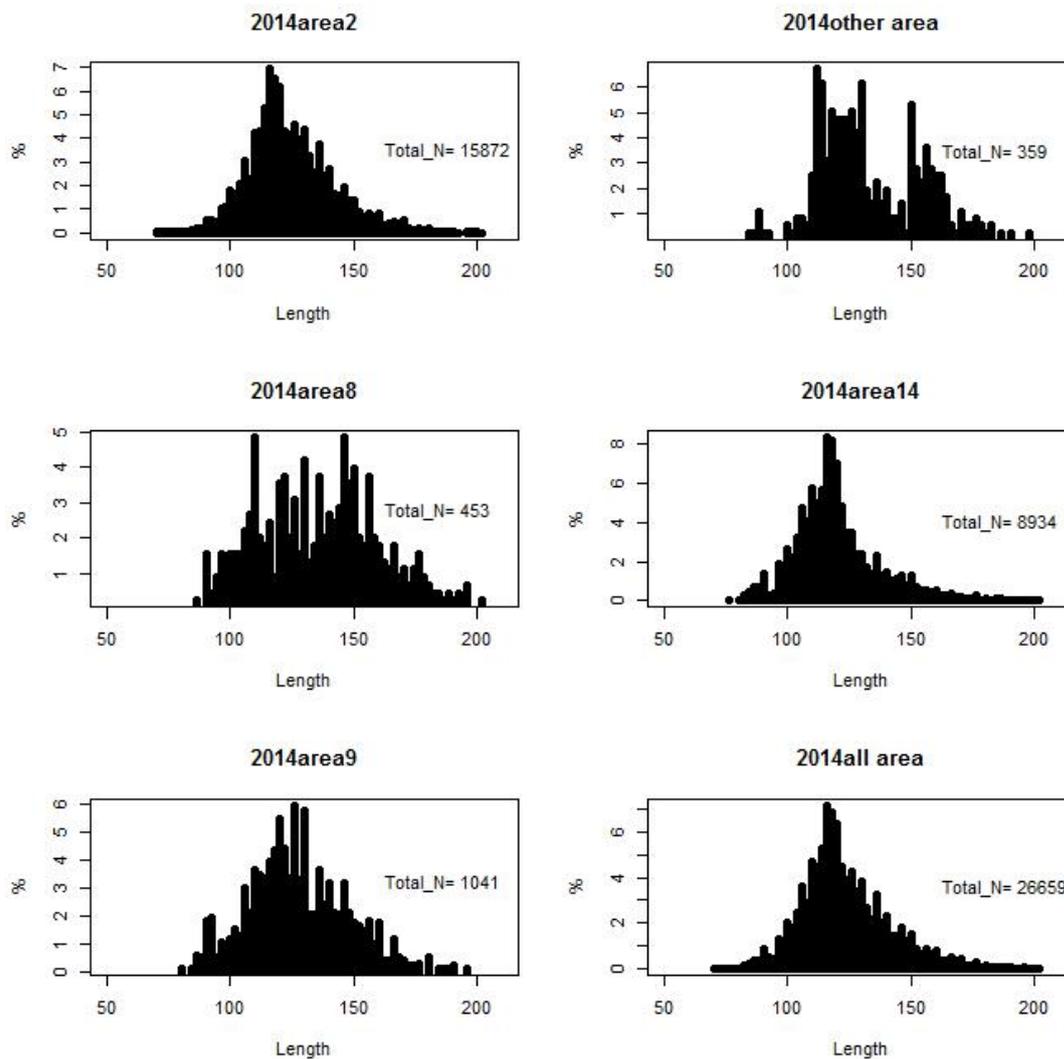


Fig.4 (3) SBT catch length frequency by area of Taiwanese SBT longline fishery in 2014

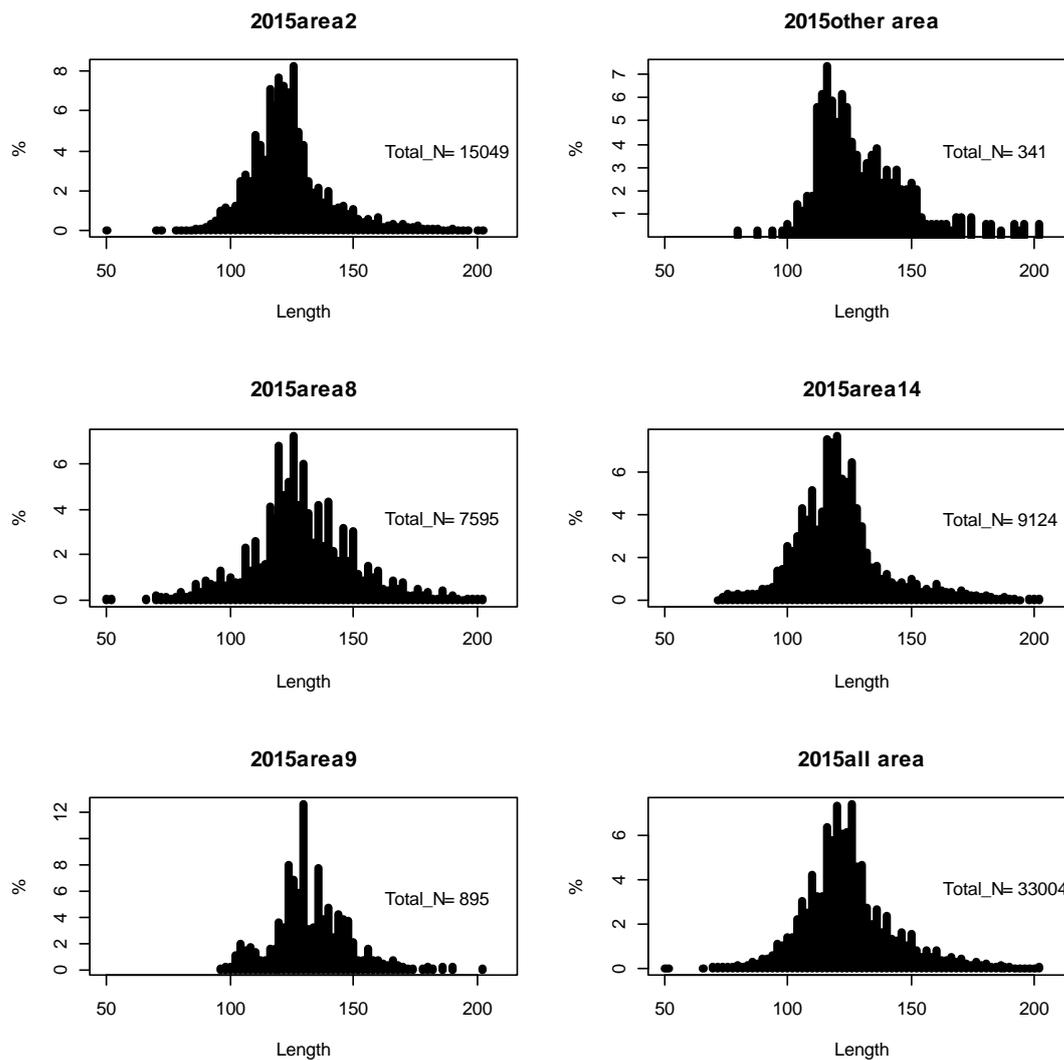


Fig.4 (4) SBT catch length frequency by area of Taiwanese SBT longline fishery in 2015

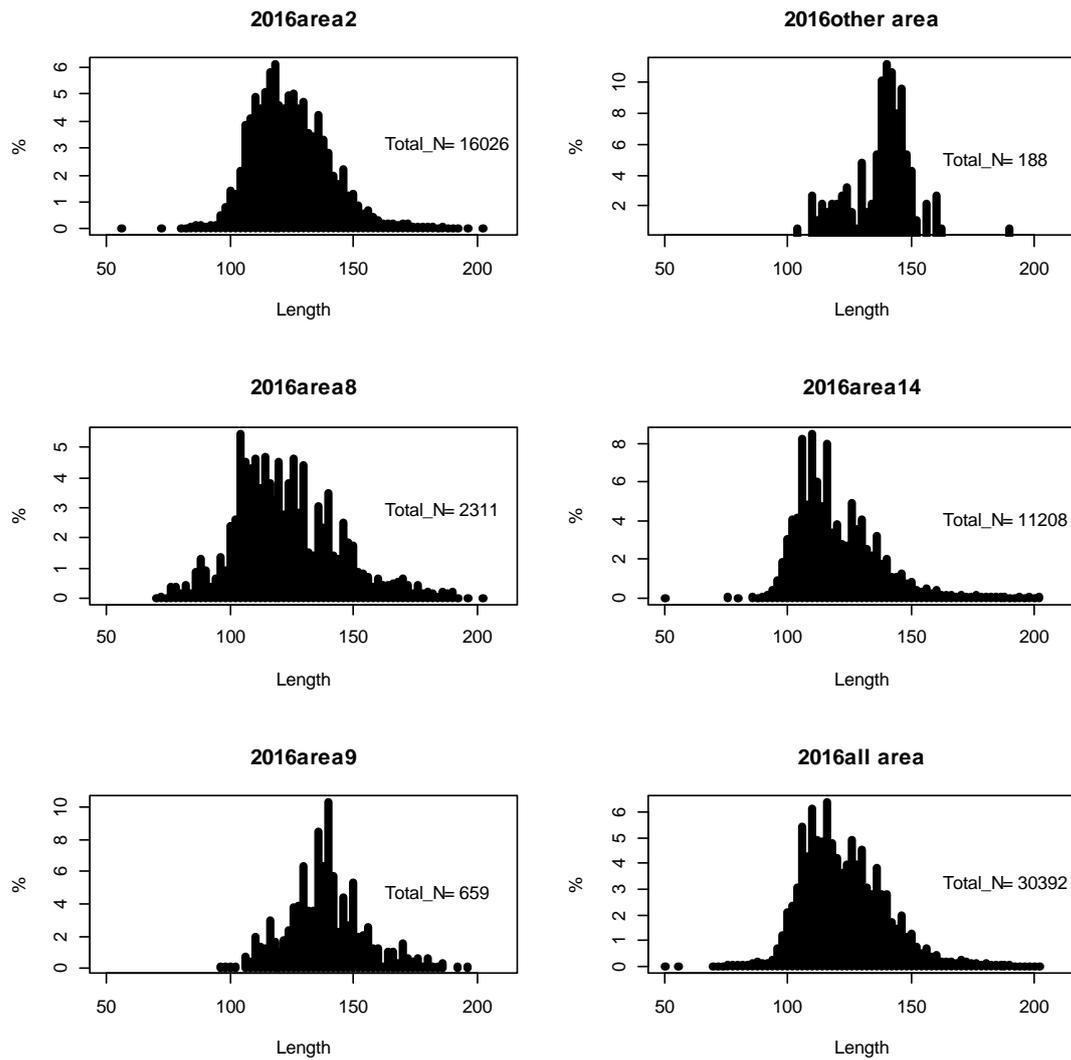


Fig.4 (5) SBT catch length frequency by area of Taiwanese SBT longline fishery in 2016

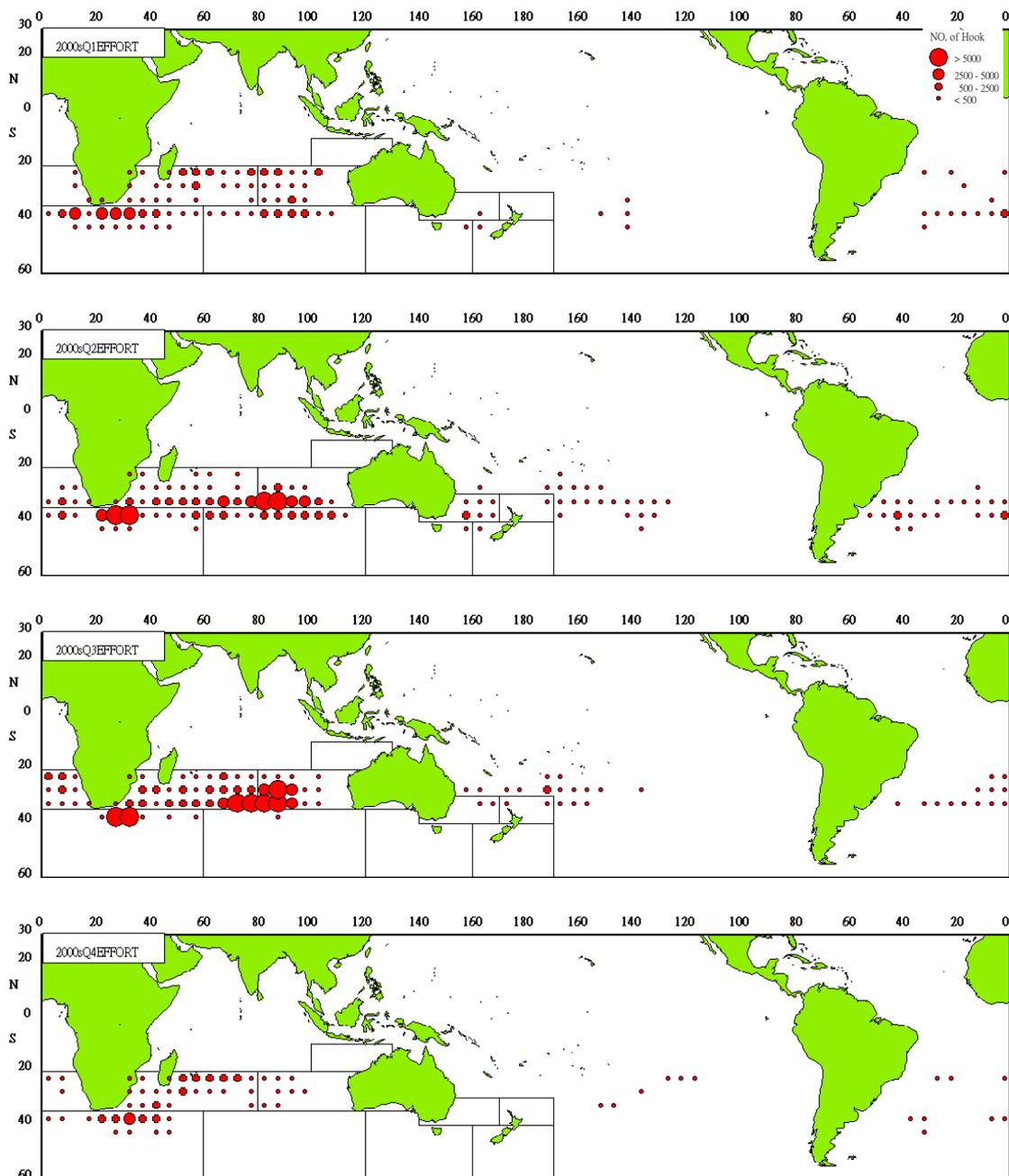


Fig.5 (1) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2000s

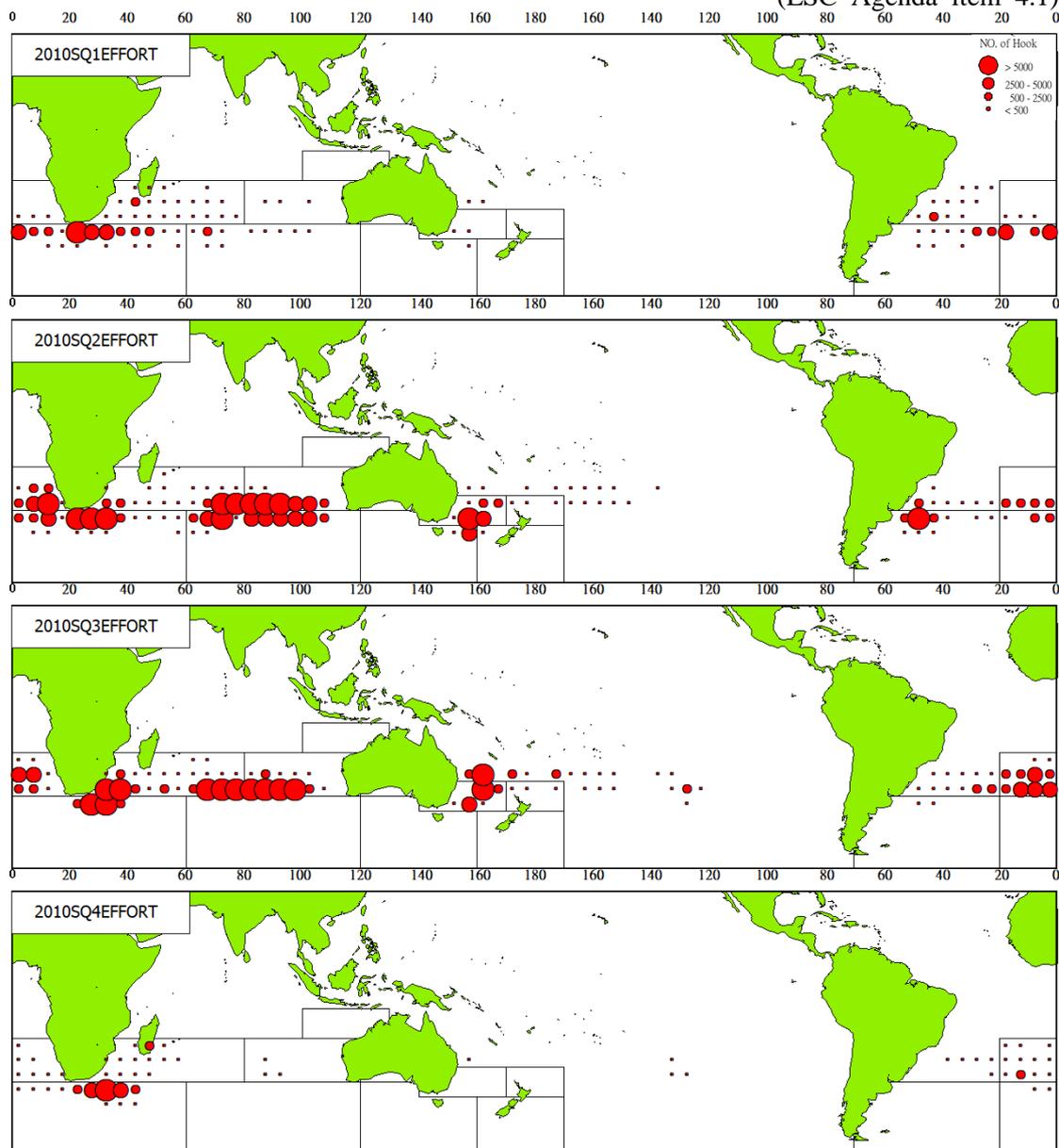


Fig.5 (2) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery during 2010-2016

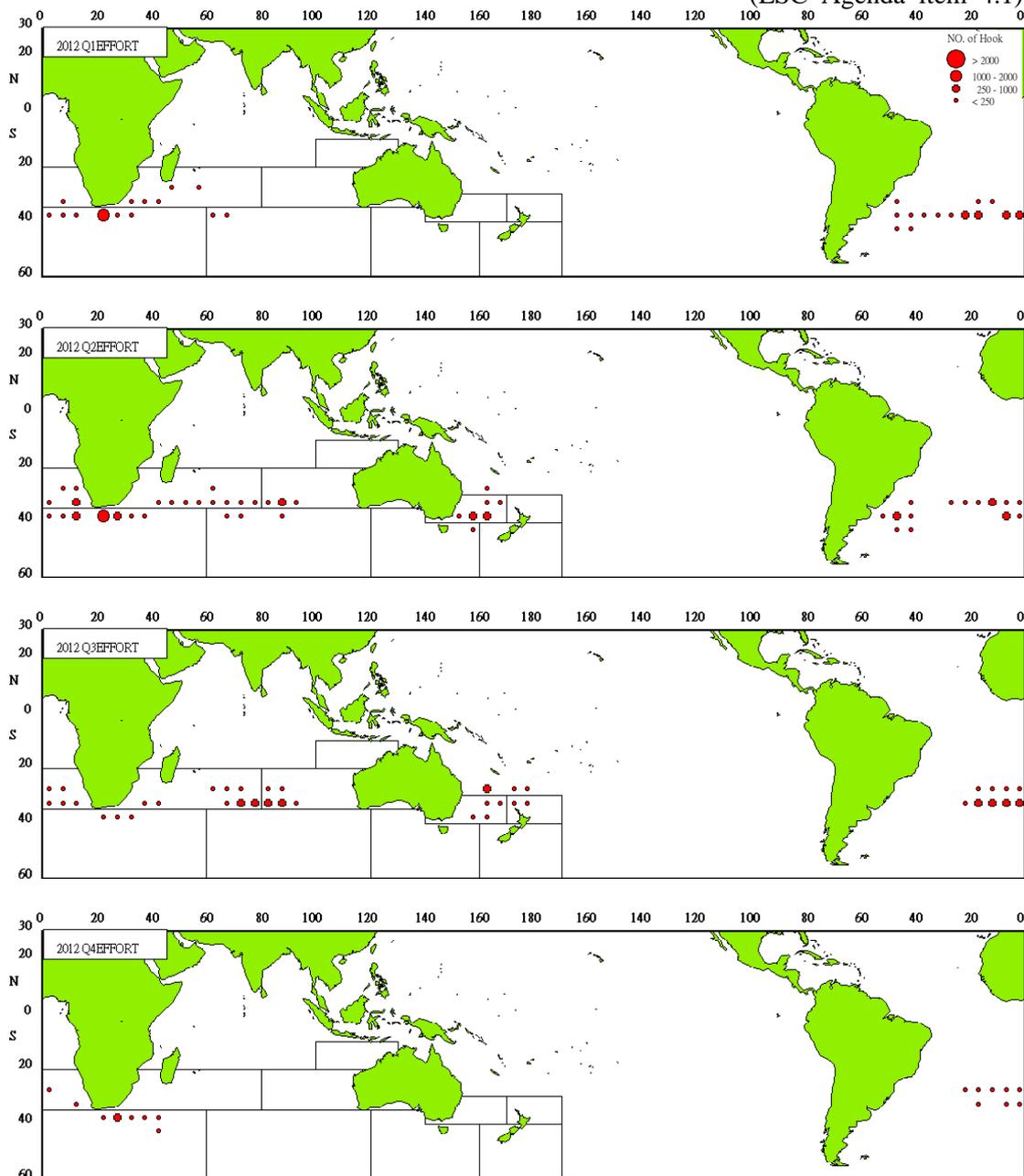


Fig.6 (1) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2012

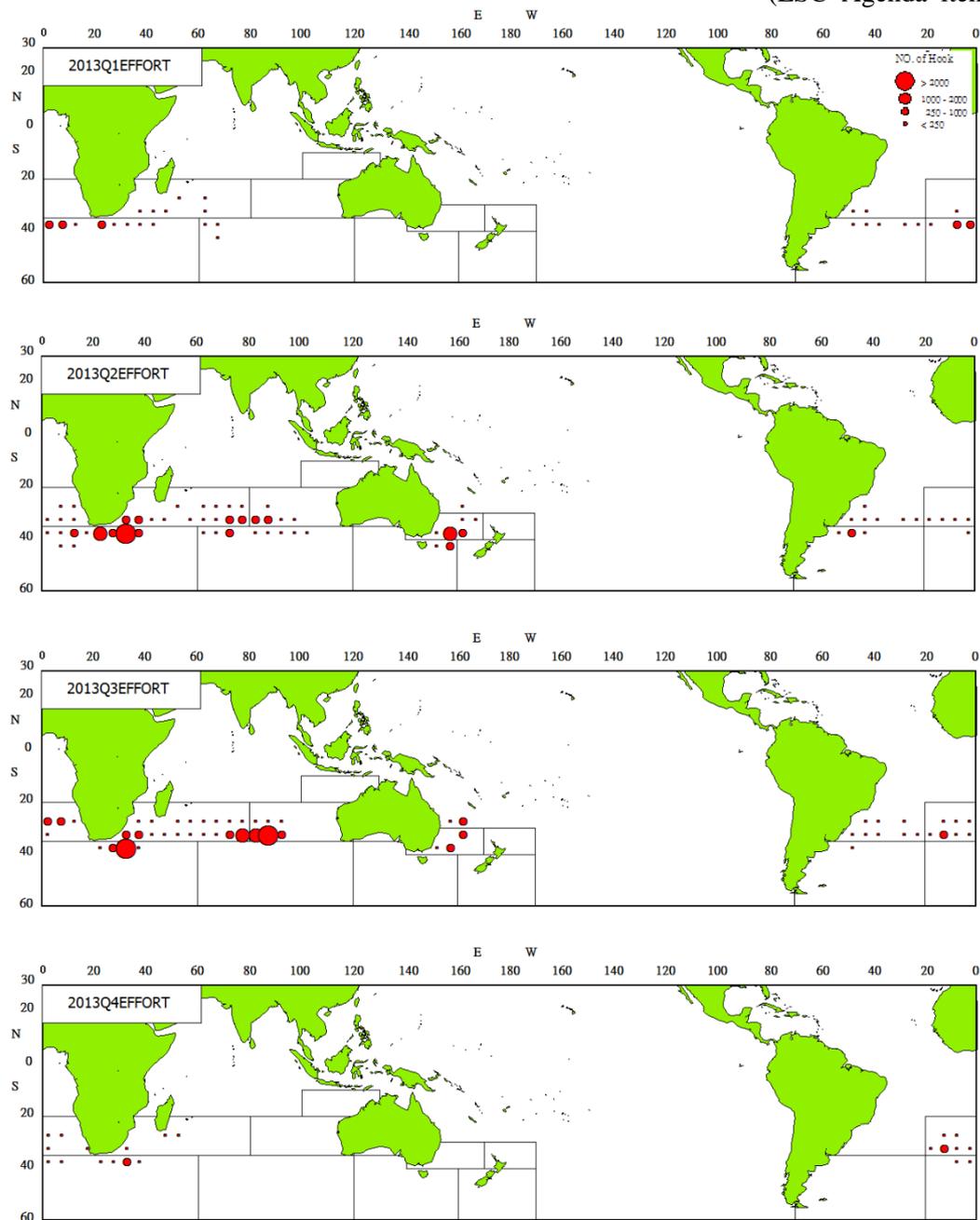


Fig.6 (2) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2013

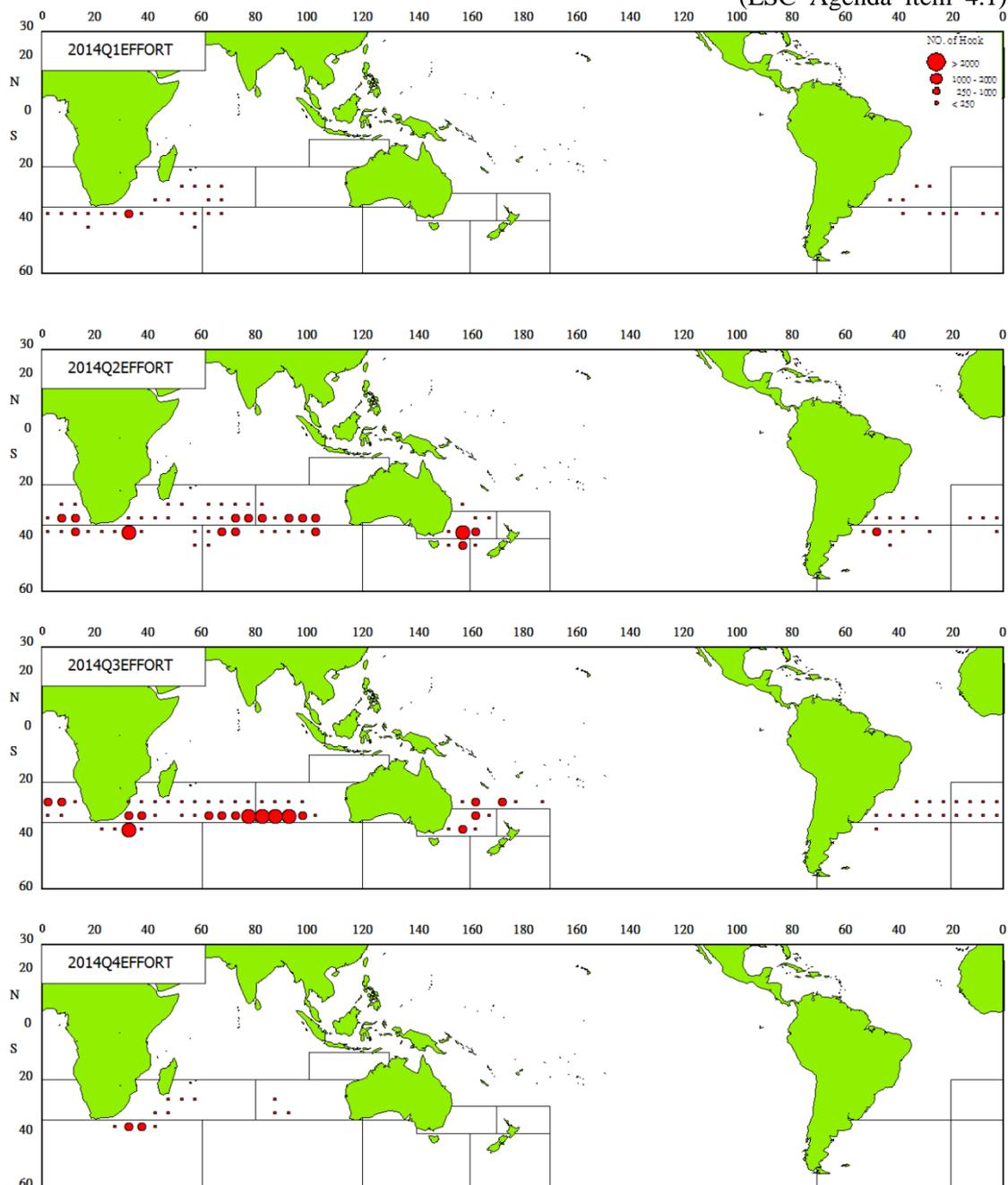


Fig.6 (3) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2014

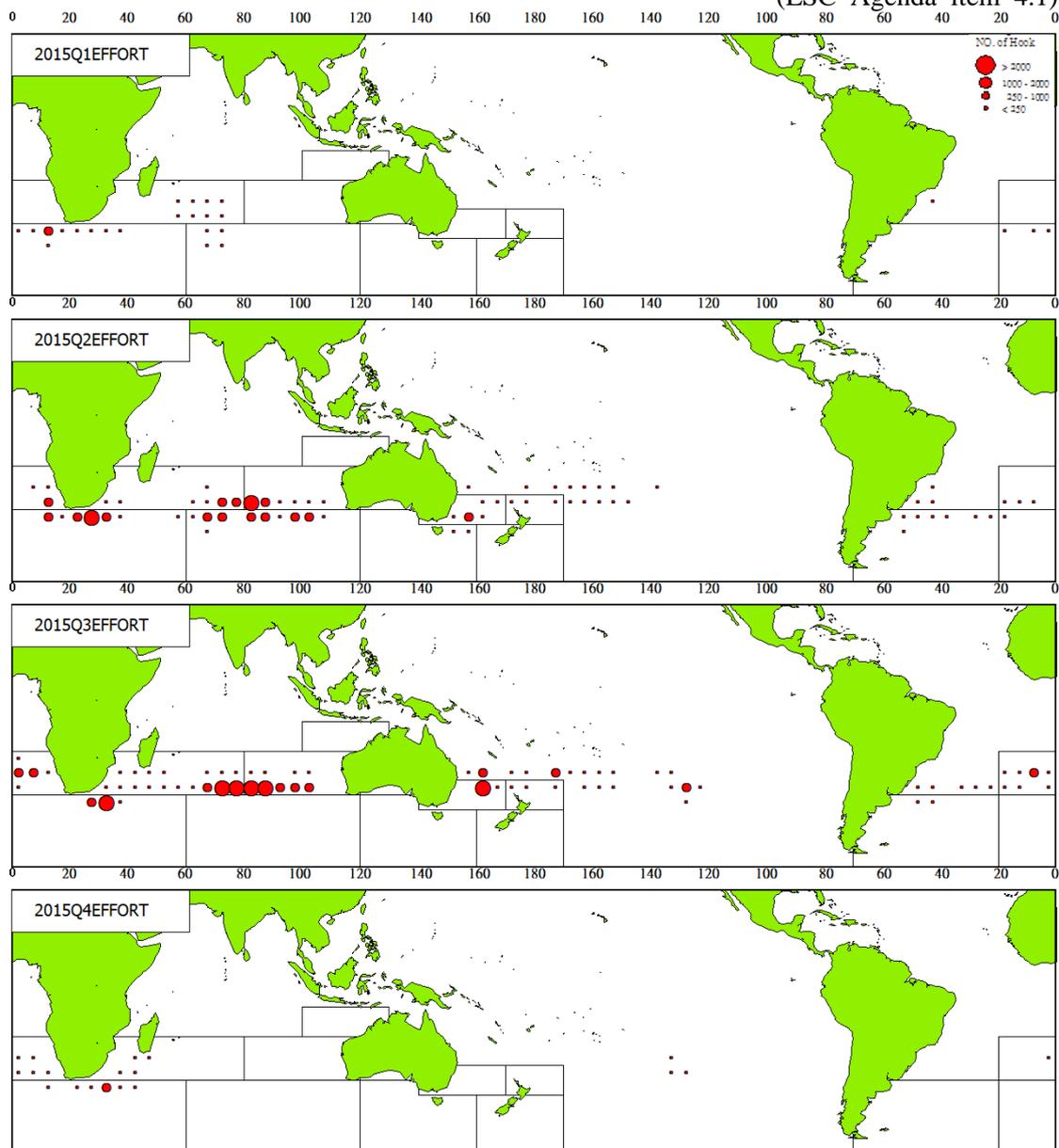


Fig.6 (4) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2015

CCSBT-ESC/1708/SBT Fisheries – Taiwan (Rev.1)
 (ESC Agenda item 4.1)

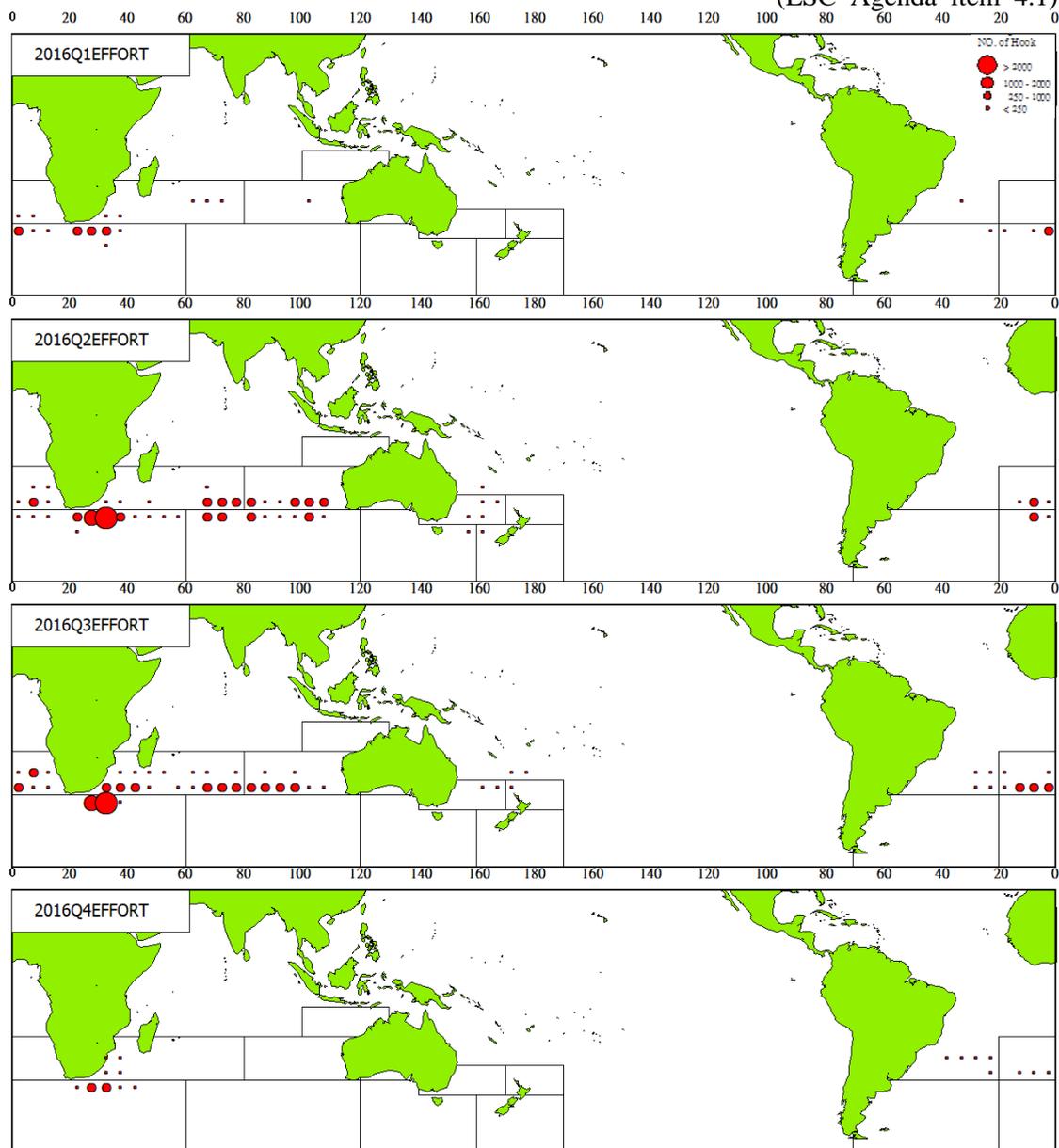


Fig.6 (5) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2016

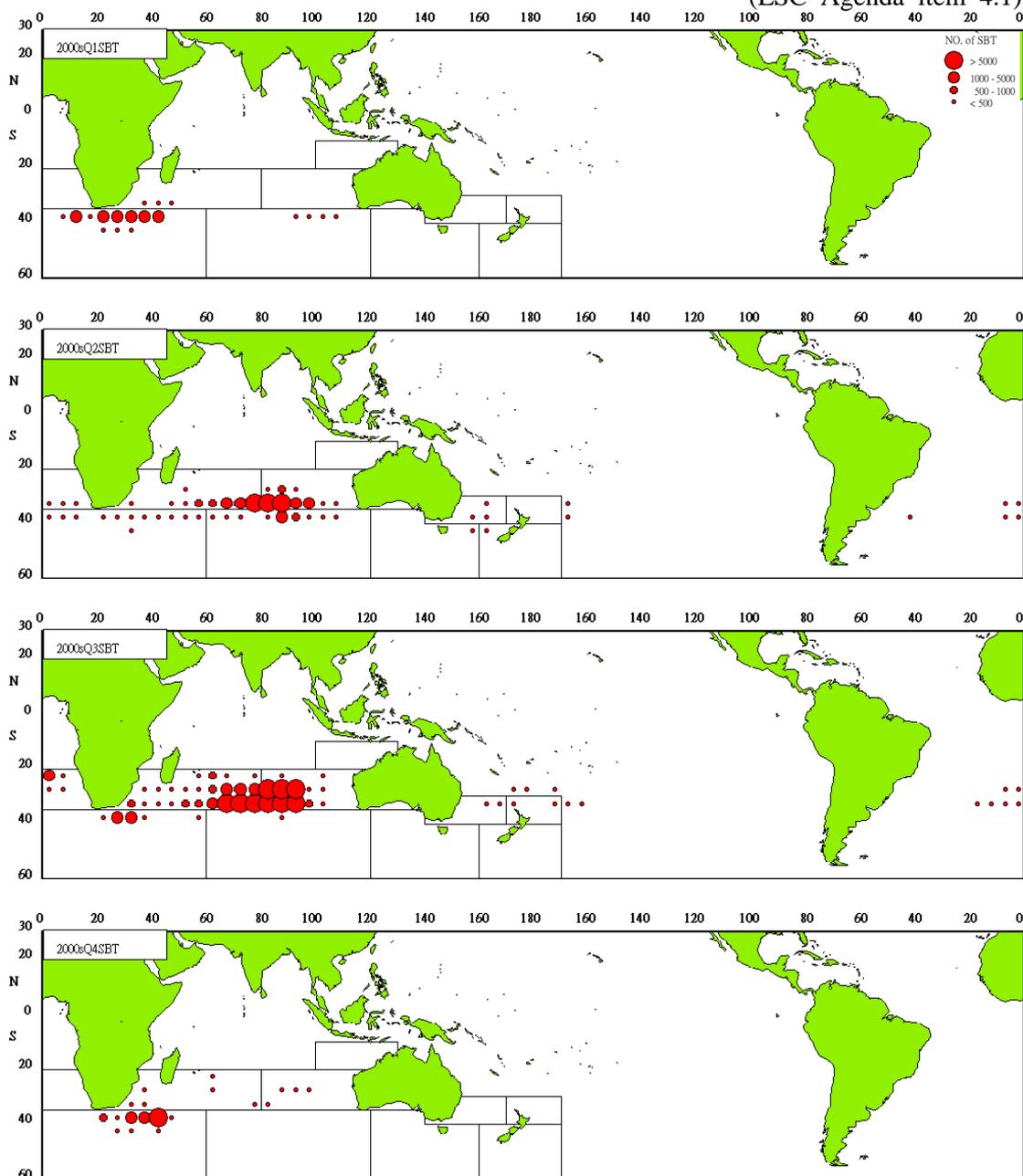


Fig.7 (1) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2000s

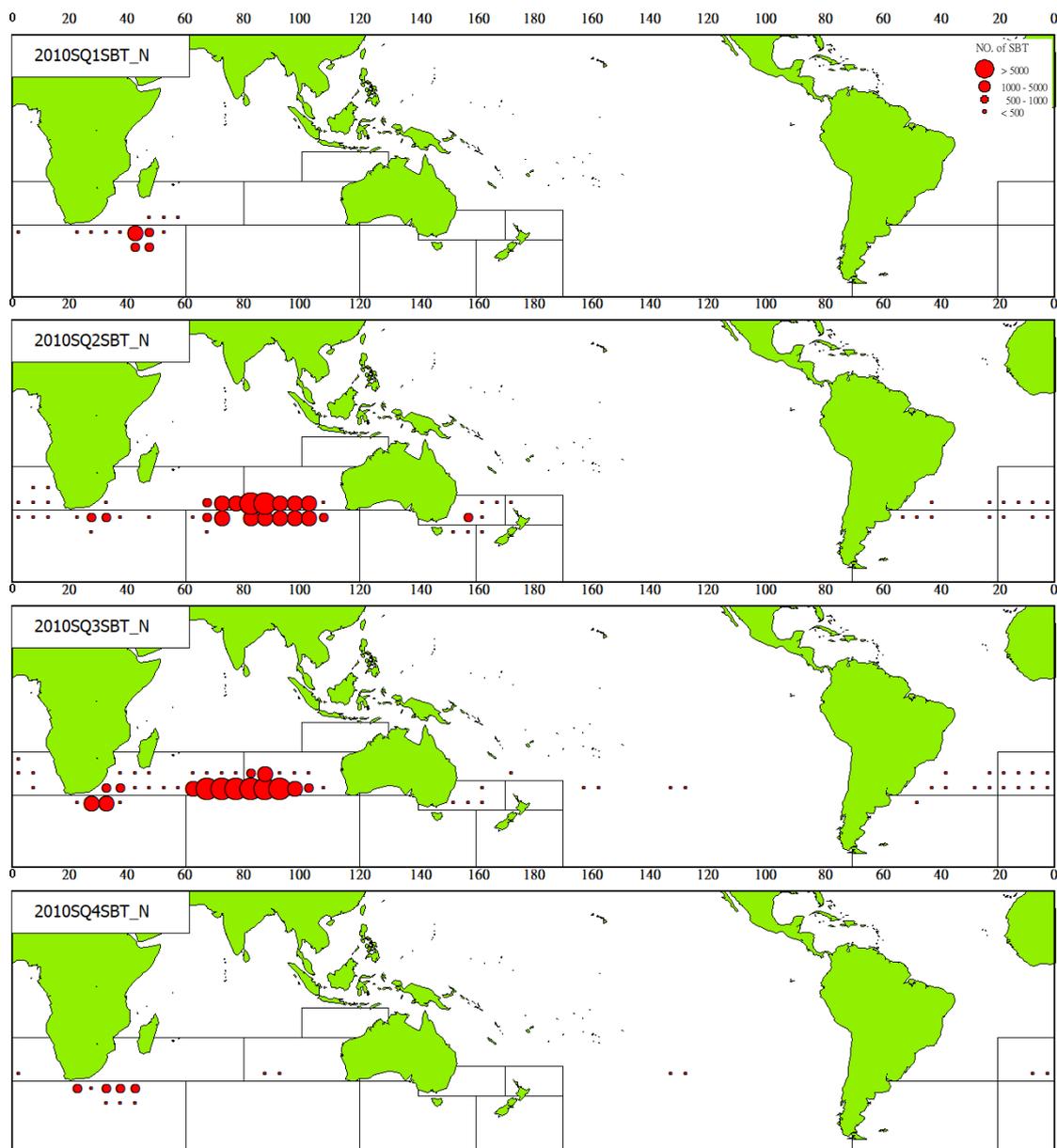


Fig.7 (2) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery during 2010-2016

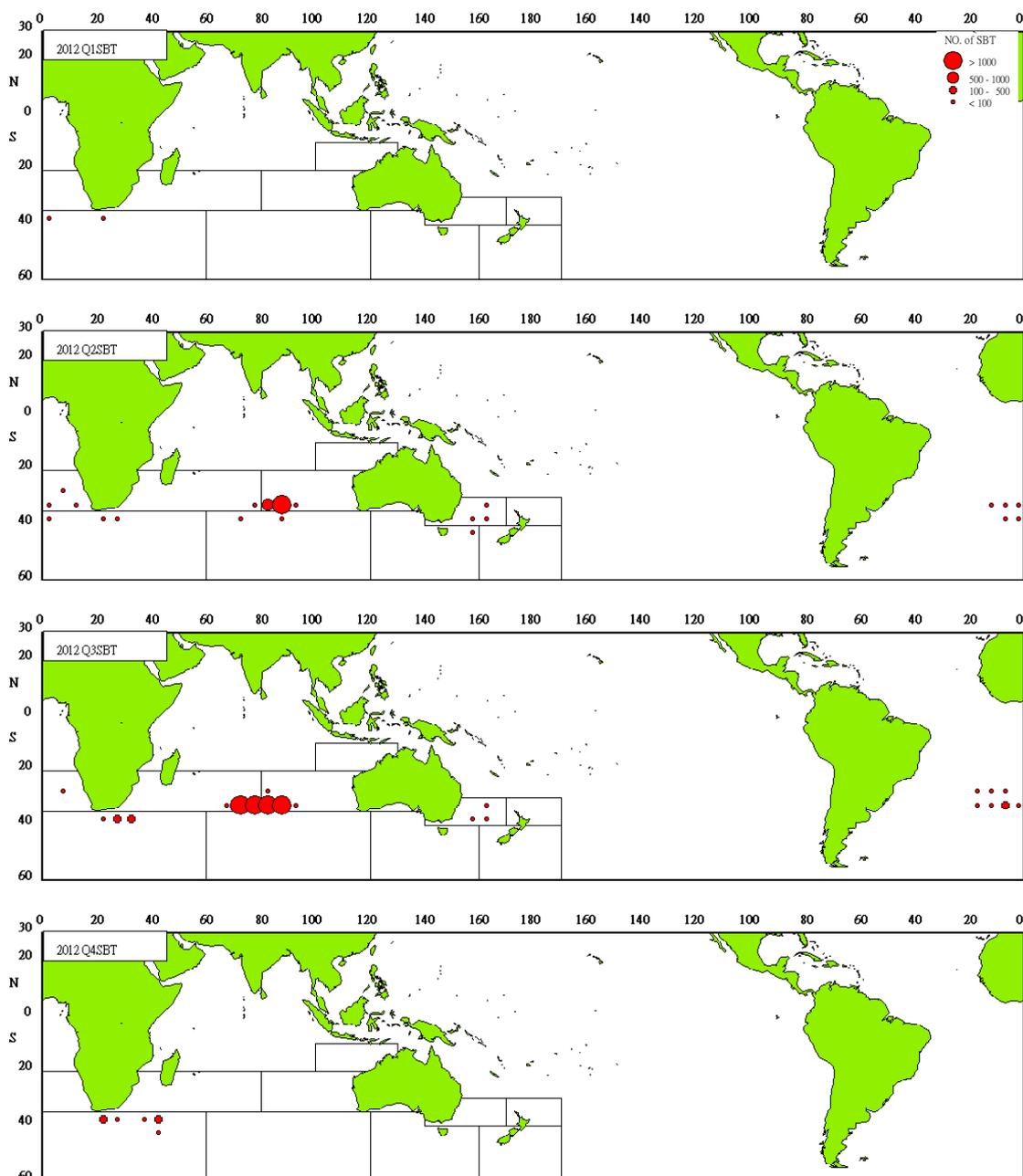


Fig.8 (1) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2012

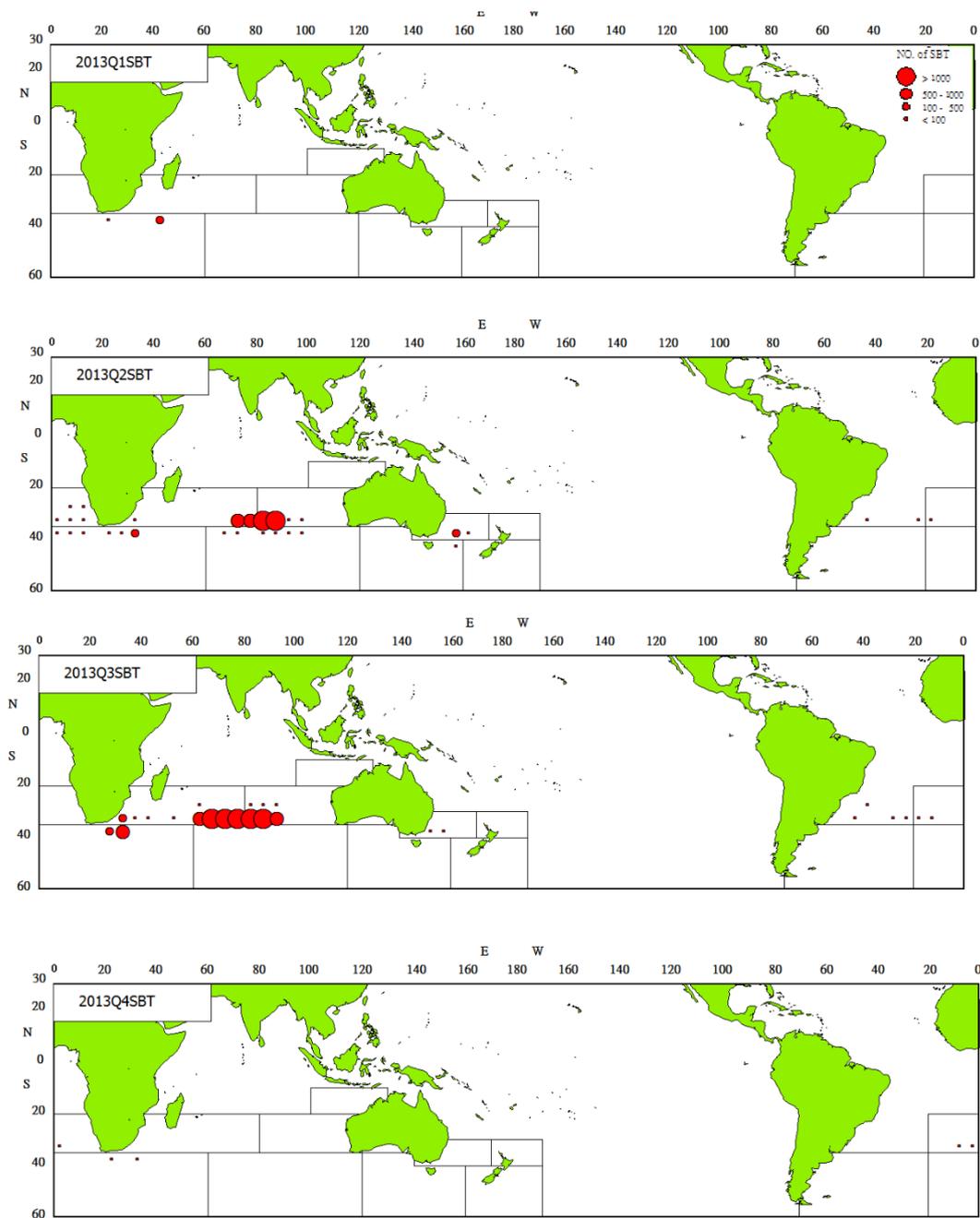


Fig.8 (2) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2013

CCSBT-ESC/1708/SBT Fisheries – Taiwan (Rev.1)
 (ESC Agenda item 4.1)

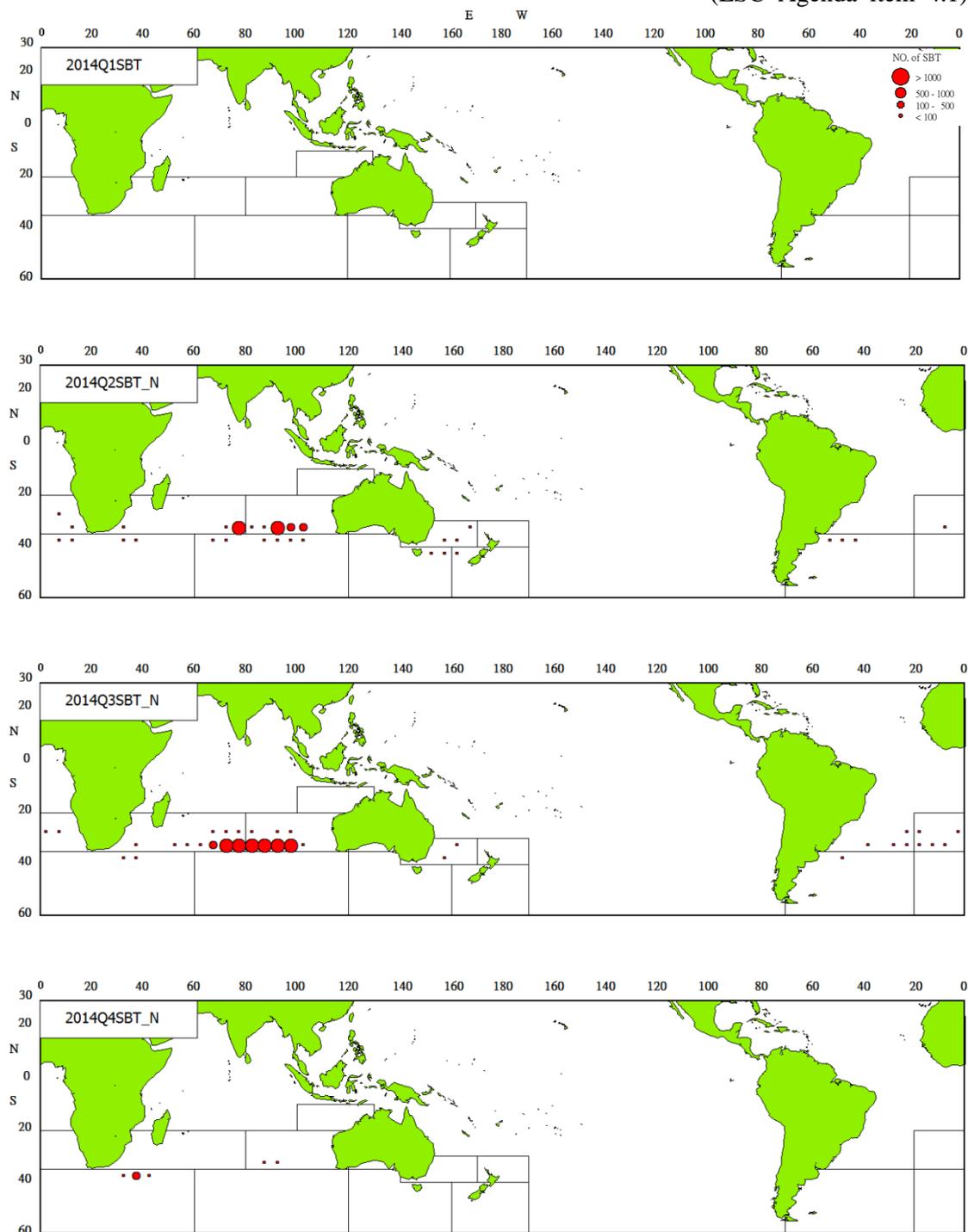


Fig.8 (3) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2014

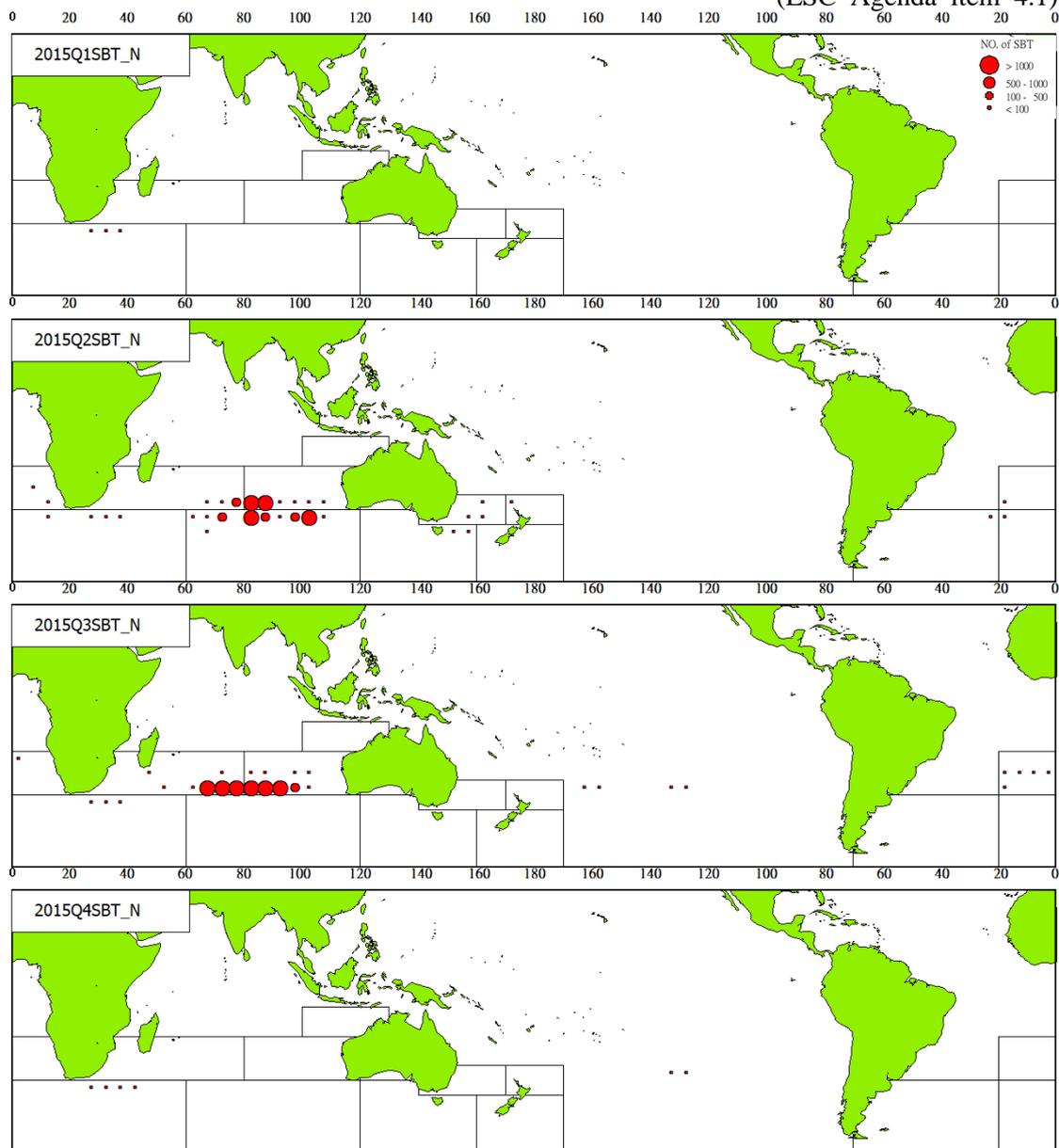


Fig.8 (4) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2015

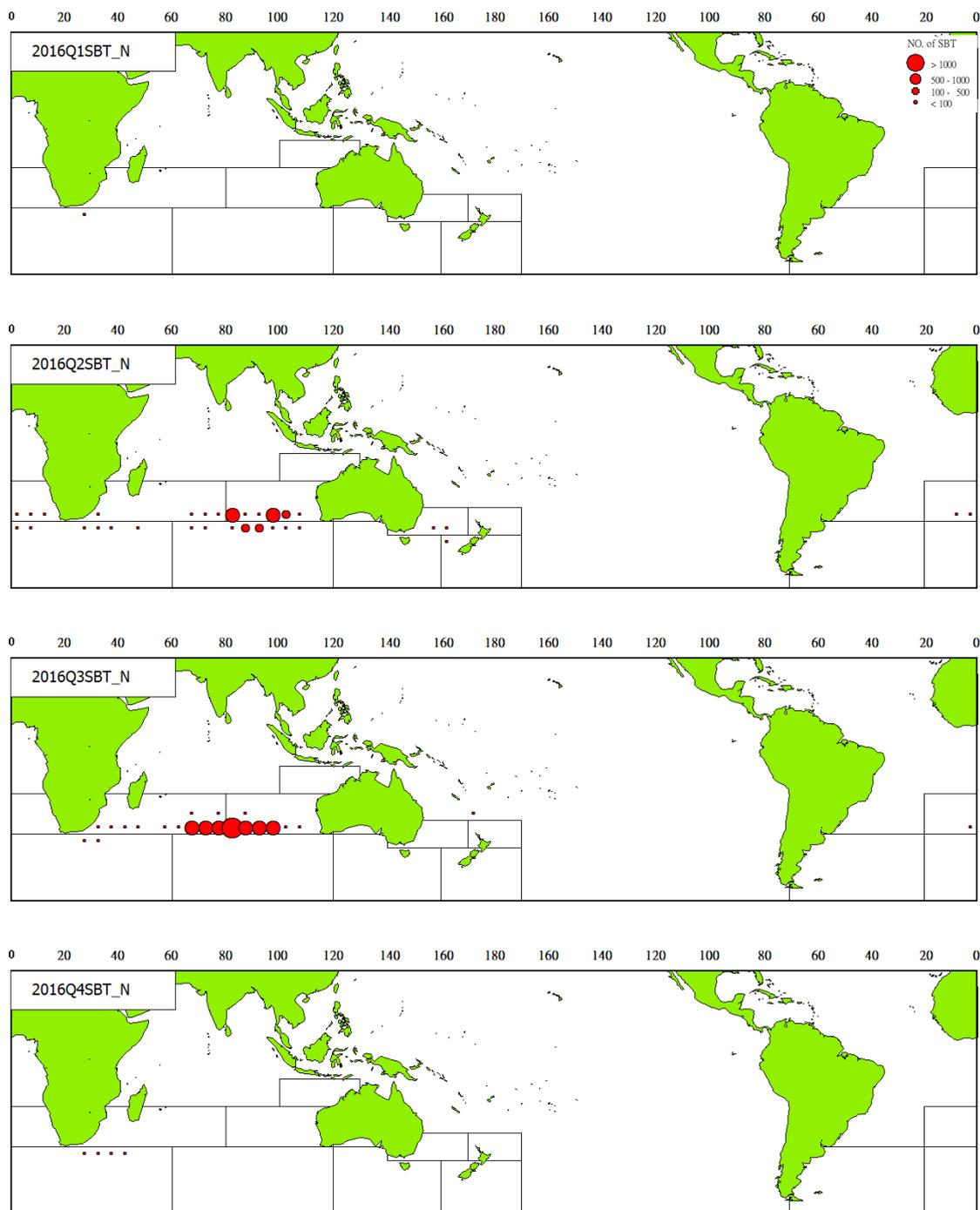


Fig.8 (5) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2016

Appendix 1

Scientific Observer Program

Observer Training

To collect scientific information of tuna longliners, the scientific observer program of large scale tuna longline fishery of Taiwan was launched in 2001. After trained, observers started being deployed on board and conducting the observation program of SBT in the following year.

To work in coordination with the Fisheries Agency (FA), the Overseas Fisheries Development Council (OFDC) is responsible for implementing the program and recruiting scientific observers. The Program also invited researchers on fishery sciences and senior observers to form a special panel for designing the observer training program, items of observation, biological and by-catch information to be collected for scientific researches and the format of data records.

The recruitment for observer is bachelor degree or senior high school graduated with experience on-board, and they are required the competence to live and work at sea. Candidate observers who have passed the oral examination will have to take a 4-week training program, and only those who pass the training program and medical check will be qualified and deployed on board as scientific observers.

Observer training program includes basic safety training for seafaring, operations of navigation devices, mini-log thermometer and VMS system, identification of tunas, tuna-like species, sea turtles, seabirds, sharks and marine mammals, sampling skill for muscle tissue, otolith, stomach content and gonad, and data collection for fishing activities, catches and locations. After 3-weeks training, they are required to undergo at sea training on a training ship for one week and have a test in identifying tuna and tuna-like species at local fish market.

The Program held 2 batches of observer training in 2016, inviting experts and scholars to provide follow-up trainings on observer safety during maritime navigation, species identification, and sampling. The Program also conducted observer experiences sharing events periodically, sharing at-sea observation practice, sampling

technique, and potential problems that observers might encounter. In 2015 and 2016, 58 and 75 employed observers have finished the program respectively.

Scientific Observer Program Design and Coverage

At the initial stage, for the purpose of encouraging industries to join the observer program, the observed vessels were offered reward catch quota after completing the observation cruise, if they fully cooperated with the observer's duties. However, this measure has been put an end since 2007. It is regarded as the obligation of industries to accept observer on board and the vessels were selected to carry observer by draw a lottery. Since 2008, upon completion of the observation missions, debriefers, served by senior observers, will examine observer's reports so as to enhance data accuracy.

Table 1 shows the summary of observed catch and effort by area and month during 2015-2016. The threat of Somalia piracy still exists in the tropical Indian Ocean. For the safety of observer, most of our observers deployed on fishing vessels which operate in the southern Indian Ocean, therefore, the observer coverage rate for SBT fishing vessels increased significantly. In 2015 calendar year, 13 observers were deployed on 13 fishing vessels authorized to target SBT seasonally and there were 1,520 fishing days and observed days were 1,343. There were 15 observers being deployed on 15 fishing vessels authorized in 2016 and there were 2,052 fishing days and observed days were 1,421. In 2015, the coverage rates accounted for 18.06% by vessels, 10.34% by hooks and 11.67% by catch. The coverage rates by vessels increased to 25.00% in 2016, by hooks and by catch have increased as 17.43% and 16.30% separately.

Observer Data Collected

The data recorded by observer on board includes 3 categories: vessel and gear attributes, set details and by-catch/incidental catch information (including sighting of marine mammals, sea turtles and sea birds).

The biological samples, including measurement of weight and length of all fishes during the observation time, and collection of otoliths, muscle tissues, stomach and

gonads of SBT, were carried out by observers on board. Table 2 shows the summary of biological samples by species collected by observers from 2015 and 2016. Total number of the length measured for SBT in 2015 and 2016 were 3,812 and 4,843 respectively. Number of otolith collected for SBT by observer were 145 in 2016. In 2015 and 2016, numbers of the length measured for per species were summarized by area and month as Table 3.

Tag Return Monitoring

The tags retrieved from SBT by Taiwanese fishing vessels are 779 in total among which 693 were released by the CCSBT and 86 tagged by CSIRO during 2002-2016. The details of tag recaptures for each year are shown in Table 4. The returned tags and the related information were sent to the CCSBT Secretariat.

Problems Experienced

Although the program was fully supported by boat owners and skippers of SBT observed vessels, there are still some difficulties that could not be resolved technically. For example: Sometimes the biological sampling device is damaged, but the homeport is far from the fishing ground, it will take more than 1 month to transport the supplies and equipment needed for sampling from Taiwan to fishing ground, and sometimes the supplies could not reach to observers on board in time. Besides, the samples collected by observers may be lost when they are transferred by transshipping vessels. In addition, it is also difficult to arrange interviews with skippers for collecting information on fishing activities since these SBT fishing vessels seldom return to Taiwan when they finished SBT fishing.

CCSBT-ESC/1708/SBT Fisheries – Taiwan (Rev.1)
(ESC Agenda item 4.1)

Table 1 Summary of observed catch and effort by area and by month

(a) 2015 (calendar year)

Area	Month	Numbers of vessels observed	Numbers of all vessels	Cover rate for the number of vessels	Number of hooks used by observed vessels	Number of hooks by all vessels	Cover rate for the number of hooks	Number of SBT observed	Number of SBT by all vessels	Cover rate for the number of SBT
Area2	Total	10	40	25%	629551	6291714	10.01%	2411	15049	16.02%
	5	2	10	20%	8070	162880	4.95%	0	379	-
	6	10	37	27.03%	251993	1795007	14.04%	796	6247	12.74%
	7	8	31	25.81%	254003	2058390	12.34%	1208	5394	22.40%
	8	2	18	11.11%	97320	1700420	5.72%	367	1753	20.94%
	9	2	14	14.29%	18165	575017	3.16%	40	1276	3.13%
Area8	Total	8	33	24.24%	314793	3699830	8.51%	347	7595	4.57%
	2	-	2	-	-	24702	-	-	0	-
	3	-	3	-	-	94494	-	-	0	-
	4	4	23	17.39%	103477	1163918	8.89%	38	1332	2.85%
	5	8	29	27.59%	187573	1847746	10.15%	222	4667	4.76%
	6	4	22	18.18%	23743	568970	4.17%	87	1596	5.45%
	Total	3	15	20%	170105	3146410	5.41%	26	895	2.91%
Area9	1	-	2	-	-	234565	-	-	288	-
	2	-	2	-	-	99336	-	-	138	-
	3	-	1	-	-	7600	-	-	0	-
	4	1	5	20%	12630	169442	7.45%	0	0	-
	5	-	8	-	-	291025	-	-	38	-
	6	-	9	-	-	420550	-	-	39	-
	7	-	7	-	-	256480	-	-	21	-
	8	-	7	-	-	433280	-	-	44	-
	9	-	4	-	-	391070	-	-	0	-
	10	1	4	25%	20385	388740	5.24%	0	0	-
	11	2	5	40%	61247	184260	33.24%	15	159	9.43%
	12	2	3	66.67%	75843	270062	28.08%	11	168	6.55%
Area14	Total	9	35	25.71%	822119	5634930	14.59%	1028	9124	11.27%
	3	2	6	33.33%	21246	113784	18.67%	0	0	-
	4	1	5	20%	2115	43000	4.92%	0	10	-
	5	5	15	33.33%	128752	636916	20.21%	5	8	62.50%
	6	7	22	31.82%	123610	805120	15.35%	80	1507	5.31%
	7	7	29	24.14%	222392	1963660	11.33%	590	4830	12.22%
	8	7	26	26.92%	277821	1718760	16.16%	338	2133	15.85%
	9	3	14	21.43%	46183	308830	14.95%	15	636	2.36%
	10	-	2	-	-	44860	-	-	0	-
	Grand Total		13	72	18.06%	1940612	18772884	10.32%	3812	32663

The areas which had observer deployed were appeared.

CCSBT-ESC/1708/SBT Fisheries – Taiwan (Rev.1)
(ESC Agenda item 4.1)

(b) 2016 (calendar year)

Area	Month	Numbers of vessels observed	Numbers of all vessels	Cover rate for the number of vessels	Number of hooks used by observed vessels	Number of hooks by all vessels	Cover rate for the number of hooks	Number of SBT observed	Number of SBT by all vessels	Cover rate for the number of SBT
Area2	Total	9	23	39.13%	1223972	4958989	24.68%	3271	16026	20.41%
	3	-	2	-	-	19780	-	-	0	-
	4	-	1	-	-	3200	-	-	0	-
	5	5	11	45.45%	133789	411950	32.48%	94	250	37.60%
	6	9	23	39.13%	300113	1429985	20.99%	670	4292	15.61%
	7	9	22	40.91%	392250	1622441	24.18%	1391	5911	23.53%
	8	7	15	46.67%	315627	1193330	26.45%	882	4356	20.25%
	9	4	6	66.67%	82193	278303	29.53%	234	1217	19.23%
	Area8	Total	6	20	30%	314391	2068661	15.20%	302	2311
4		5	15	33.33%	182176	1061046	17.17%	126	474	26.58%
5		6	19	31.58%	118415	880985	13.44%	136	1153	11.80%
6		1	9	11.11%	13800	126630	10.90%	40	684	5.85%
Area9	Total	5	25	20%	479228	4825965	9.93%	22	659	3.34%
	1	2	3	66.67%	107171	328830	32.59%	0	1	-
	2	1	3	33.33%	52590	188575	27.89%	0	0	-
	3	2	6	33.33%	52500	202675	25.90%	0	0	-
	4	4	7	57.14%	47924	482470	9.93%	0	0	-
	5	3	14	21.43%	140854	718220	19.61%	5	48	10.42%
	6	3	17	17.65%	66513	701525	9.48%	11	104	10.58%
	7	1	9	11.11%	11676	482460	2.42%	6	60	10%
	8	-	9	-	-	528560	-	-	88	-
	9	-	5	-	-	360800	-	-	15	-
	10	-	3	-	-	318500	-	-	0	-
	11	-	3	-	-	319350	-	-	222	-
12	-	2	-	-	194000	-	-	121	-	
Area14	Total	7	29	24.14%	745616	3996282	18.66%	1343	11208	11.98%
	3	1	4	25%	2085	49125	4.24%	0	0	-
	4	2	3	66.67%	15303	35790	42.76%	0	0	-
	5	1	10	10%	34725	247450	14.03%	1	3	33.33%
	6	7	18	38.89%	147292	880784	16.72%	7	805	0.87%
	7	6	19	31.58%	241570	1150413	21%	895	5112	17.51%
	8	7	21	33.33%	250939	1348180	18.61%	440	5268	8.35%
	9	3	9	33.33%	53702	236820	22.68%	0	20	-
	10	-	1	-	-	44420	-	-	0	-
	11	-	1	-	-	3300	-	-	0	-
	Grand Total		15	60	25.00%	2763207	15849897	17.43%	4938	30204

*The areas which had observer deployed were appeared.

Table 2 Number of biological samples collected by observers in 2015 and 2016

Year		2015	2016
SBT catch data recorded		3812	4938
SBT length measured		3812	4843
Otolith	SBT	213	145
Gonad	SBT	149	215
	Tunas	0	1
Head	SBT	72	48
Muscle	Albacore	105	12
	Marlin	1	2
	Sharks	51	105
	Butterfly kingfish	1	1
	Tunas	1	1
Vertebra	Sharks	77	106
	Albacore	0	0
	Marlin	1	12
	Butterfly kingfish	0	1
First dorsal fin spine	Albacore	128	19
Embryo	Sharks	1	1
Scales	Butterfly kingfish	0	1
	Albacore	960	95

CCSBT-ESC/1708/SBT Fisheries – Taiwan (Rev.1)
(ESC Agenda item 4.1)

Table 3 Number of the length measured for per species by area and by month

(a) 2015

Area	Area 2					Area 8			Area 9				Area 14						
	5	6	7	8	9	4	5	6	4	10	11	12	3	4	5	6	7	8	9
Albacore	93	2513	1779	492	67	971	2174	344	86	-	12	51	54	13	1947	1436	2016	2305	301
Bigeye tuna	8	95	55	24	7	28	104	5	1	2	21	29	2	-	209	208	216	420	86
Black marlin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Pomfrets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-
Blue shark	-	13	2	-	-	54	15	7	3	6	1	15	14	1	23	8	18	64	68
Butterfly kingfish	-	2	-	-	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-
BUM	-	-	-	1	-	-	1	-	-	-	-	-	-	-	2	-	-	-	-
Rudderfish	-	2	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1	7	-
Common dolphinfish	-	3	1	-	-	2	2	-	6	-	1	-	17	-	13	1	1	12	-
Opah	-	281	383	149	31	154	399	69	6	2	13	5	1	-	34	60	105	134	30
Escolar	4	72	90	47	11	13	12	18	-	61	227	358	1	-	74	78	184	203	17
Longfin mako	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Striped marlin	-	1	1	-	-	-	-	1	-	-	-	-	2	1	15	3	2	-	-
Oilfish	-	3	9	-	-	1	4	-	-	536	1082	1618	-	-	2	4	7	8	-
Southern bluefin tuna	-	796	1208	367	40	38	222	87	-	-	15	11	-	-	5	80	590	338	15
Shortfin mako	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-
Skipjack tuna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Shortfin mako	-	10	2	7	-	2	4	4	-	-	1	1	-	-	8	3	4	4	-
Longbill spearfish	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shortbill spearfish	-	4	3	-	1	1	3	-	-	-	-	-	-	-	5	6	4	16	-
Swordfish	-	20	10	5	1	6	5	6	-	1	-	1	-	-	17	25	51	56	2
Tunas nei	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wahoo	2	12	3	2	-	1	22	6	-	-	-	-	-	-	165	73	3	73	6
Yellowfin tuna	-	2	-	-	-	-	9	-	1	1	5	-	2	-	59	42	20	70	9

*The areas which had observer deployed were appeared.

CCSBT-ESC/1708/SBT Fisheries – Taiwan (Rev.1)
(ESC Agenda item 4.1)

(b) 2016

Area	Area 2					Area 8			Area 9							Area 14								
	Month	5	6	7	8	9	4	5	6	1	2	3	4	5	6	7	3	4	5	6	7	8	9	
Albacore	2926	5216	4390	2623	443	4019	2592	270	192	14	1	28	1106	1147	3	-	6	929	1915	2128	2116	151		
Bigeye tuna	29	149	183	77	33	9	19	-	80	2	5	8	30	35	-	-	16	168	325	161	255	11		
Black marlin	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1	-	
Pomfrets	-	-	4	-	-	-	5	-	-	-	-	-	2	11	-	-	-	-	-	-	1	-	-	
Blue shark	38	37	35	106	10	163	31	1	34	116	28	23	135	43	127	10	45	-	143	174	77	8		
Butterfly kingfish	14	14	9	2	-	79	15	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	
Blue marlin	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	
Rudderfish	-	-	-	-	-	-	-	-	-	-	-	-	1	5	-	-	-	1	3	-	4	-	-	
Common dolphinfish	17	22	3	2	-	9	15	-	-	-	-	2	1	-	-	1	-	14	-	-	1	1		
Silky shark	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	5	-	-	-	-	
Seerfishes nei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	2	-	
Opah	401	410	573	423	91	580	326	18	7	-	-	-	115	153	1	-	-	9	136	292	242	5		
Escolar	67	247	451	241	41	15	23	3	259	133	172	389	762	182	54	14	31	14	770	1156	1048	509		
Striped marlin	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	4	-	-	-	-	
Ocean sunfis	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Oilfish	-	2	9	9	2	-	-	-	1938	936	1076	1085	2893	723	297	-	-	1	217	376	183	4		
Southern bluefin tuna	94	670	1387	882	234	126	136	40	-	-	-	-	5	10	6	-	-	1	7	804	441	-		
Indo-Pacific sailfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	2	
Skipjack tuna	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	
Shortfin mako	1	5	15	6	-	1	-	-	-	-	-	3	3	3	-	-	1	-	6	3	3	1		
Shortbill spearfish	1	6	1	3	-	1	-	-	-	-	-	-	2	-	-	-	-	3	10	3	5	-		
Swordfish	12	27	37	20	3	8	4	-	2	-	-	12	14	5	5	-	21	7	108	57	34	2		
Tunas nei	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	
Wahoo	5	10	4	3	-	1	9	-	-	-	-	-	6	6	-	-	2	49	28	33	44	2		
Yellowfin tuna	-	3	3	2	-	-	-	-	12	-	-	8	15	11	-	-	3	55	67	57	57	3		

*The areas which had observer deployed were appeared.

Table 4 Number of SBT tag returned during 2002-2016

Year	Total		
		CCSBT	CSIRO
2002	18	2	16
2003	42	24	18
2004	133	112	21
2005	229	204	25
2006	259	253	6
2007	40	40	0
2008	5	5	0
2009	0	0	0
2010	27	27	0
2011	13	13	0
2012	5	5	0
2013	5	5	0
2014	1	1	0
2015	2	2	0
2016	0	0	0
Grand Total	779	693	86