

Review of Taiwan SBT Fishery of 2018/2019

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 equipped with super freezer for fishing tropical tuna, and started fishing SBT seasonally in early 1990s. Generally, the authorized SBT fishing fleet comes from tropical tuna fishing vessels, which shift southward and mainly operate in the central south Indian Ocean (Area 2 and 14) for SBT from March to September with some operating in the high seas area off South Africa (Area 14 and 9) for SBT from October to February of following year.

The annual catches of SBT were less than 250 tons in early 1980s, and the catches of SBT increased to a range of about 900 tons to 1,600 tons from 1990 to 2002 with the increase of fleet size and the expansion of fishing grounds,. 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 2018. In 2019, 72 fishing vessels were authorized to fish for SBT and the SBT catch was 1,230 tons for calendar year and quota year both.

2. Catch and Effort

Taiwanese SBT longline fishery mainly operates in Area 2, Area 14, Area 8 and Area 9 (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 engaged in SBT in 2011. The low catch in 2012 was due to better catch rate in tropical area, so most of fishing vessels remained in tropical areas to target bigeye tuna instead of fishing for SBT. The annual catches of SBT resumed in 2013 for returning of fishing vessels for SBT out of poor

revenue of harvesting tropical tuna.

Figure 1 shows the variation of annual catches in number between 2002 and 2019. 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 following two years (2011-2012) and resumed to the level of 26,000-35,000 from 2013 to 2019.

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 (2015-2019) 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 it was noted there were significant fishing efforts deployed in Area 9 for oilfish or Escolar (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.

4. Size composition

Before 2002, SBT fishing vessels were required to report their operation position, weights of SBT catches on weekly basis, and they were requested to report the length of individual SBT catch between 2002 to 2009. With the implementation of catch

documentation scheme (CDS) in 2010, the length and weight of all individual SBT catch are collected through CDS scheme.

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. However, the mode at 150 cm was observed in other areas with less number of catch comparing with that of the major Areas (Figure 3).

In recent 5 years (2015-2019), the size composition generally concentrated at the range of 106 cm to 126 cm among all areas (Figure 4) with modes at 120 cm and 126 cm in 2018 and 2019 respectively.

5. Fleet size and fishing efforts distributions

According to the weekly reports and trading documents, there were more than 100 fishing vessels engaging 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 authorizations are reviewed and renewed by FA of Taiwan annually.

The numbers of fishing vessels engaging in SBT fishery ranged from 30 to 100 from 2002 to 2019 (Table 5). From 2005 to 2008, the number of fishing vessels decreased significantly for some fishing vessels shifted to the waters off South Africa to target oilfish or Escolar. In 2009 and 2010, the number of fishing vessels increased for some tropical tuna fishing vessels shifted operations southward due to 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 for most fishing vessels remained in tropical area fishing for bigeye tuna. Owing to poor catch of tropical tuna in 2013, the fishing vessels returned to SBT fishing ground and the number of SBT longline fishing vessels increased substantially to 76 with a slight decrease to 71 and 72 in 2014 and 2015. In 2016, some fishing vessels remained in tropical area for targeting yellowfin tuna, so the number of SBT fishing vessels decreased to 60. On the contrary, the number of fishing vessel increased to 75 and 77 respectively in 2017 and 2018, due to the poor catch of tropical tuna. In 2019, the number of SBT fishing vessel decreased slightly to 72 than that of previous year.

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 the other 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 March 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. The fishing efforts deployed in Area 9 are mainly from the fishing vessels targeting oilfish or Escolar with SBT bycatch in the the fourth quarter and the first quarter of the following year.

6. Research and monitoring to improve estimates of attributable catch

The number of SBT discarded were 559 and 705 in 2018 and 2019 respectively, and these figures had been provided to the Commission as non-retained catches of Taiwanese SBT fishery.

Regarding the estimates of SBT discarded in 2018 and 2019, it can be referred to CCSBT-ESC/2008/31.

7. Development and implementation of scientific observer programs

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

8. 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 / number of hooks;

Calendar year	Hooks_N		SBT_N		SBT_W		CPUE	
	All Area	Area 2, 14、 8、 9	All Area	Area 2, 14、 8、 9	All Area	Area 2, 14、 8、 9	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	32,071	27,865	30,392	30,204	1,023	1,013	0.95	1.09
2017	40,858	38,197	32,864	32,809	1,171	1,168	0.8	0.86
2018	36,206	33,251	35,784	35,671	1,218	1,211	0.99	1.08
2019	37,274	35,212	34,615	34,560	1,230	1,227	0.93	0.98

* Including efforts deployed in the tropical areas for tropical tuna.

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
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	-
2017	Total	0	20789	0	0	0	0	0	2025	863	0	0	0	0	9132	55
	1	-	-	-	-	-	-	-	-	87	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	0	0	-	-	-	0	-
	3	-	0	-	-	-	-	-	0	0	0	-	-	-	0	0
	4	-	9	-	-	-	-	-	1094	30	-	-	-	-	0	18
	5	-	478	-	-	-	-	-	697	14	-	-	-	-	493	6
	6	-	5375	-	-	-	-	-	234	12	-	-	-	-	2358	1
	7	-	10770	-	-	-	-	-	-	72	-	-	-	-	2934	13
	8	-	4005	-	-	-	-	-	-	151	-	-	-	-	3176	5
	9	-	152	-	-	-	-	-	-	174	-	-	-	-	152	12
	10	-	-	-	-	-	-	-	-	67	-	0	-	-	18	0
	11	-	-	-	-	-	-	-	-	122	-	-	-	-	1	0
	12	-	-	-	-	-	-	-	-	134	-	-	-	-	0	-
2018	Total	0	16781	0	0	0	0	0	2888	521	10	12	0	0	15481	91
	1	-	-	-	-	-	-	-	-	188	-	-	-	-	0	0
	2	-	-	-	-	-	-	-	0	1	0	0	-	-	0	0
	3	-	2	-	-	-	-	-	551	2	0	0	-	-	0	0
	4	-	0	-	-	-	-	-	757	3	0	-	-	-	0	5
	5	-	430	-	-	-	-	-	781	65	10	-	-	-	27	4
	6	-	4600	-	-	-	-	-	799	76	0	0	-	-	3612	4
	7	-	7536	-	-	-	-	-	-	88	0	12	-	-	8496	37
	8	-	4013	-	-	-	-	-	-	26	-	0	-	-	2987	31
	9	-	200	-	-	-	-	-	-	72	-	-	-	-	259	10
	10	-	-	-	-	-	-	-	-	0	-	-	-	-	100	0
	11	-	-	-	-	-	-	-	-	0	-	-	-	-	0	-
	12	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
2019	Total	0	17511	0	0	0	0	0	3717	433	0	0	0	0	12899	55
	1	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
	2	-	0	-	-	-	-	-	-	0	-	-	-	-	0	-
	3	-	0	-	-	-	-	-	1390	5	-	-	-	-	0	0
	4	-	65	-	-	-	-	-	1777	4	-	-	-	-	0	0
	5	-	1219	-	-	-	-	-	486	55	-	-	-	-	61	1
	6	-	4737	-	-	-	-	-	64	57	-	-	-	-	2351	0
	7	-	10323	-	-	-	-	-	-	53	-	-	-	-	6928	13
	8	-	1150	-	-	-	-	-	-	139	-	-	-	-	3418	41
	9	-	17	-	-	-	-	-	-	92	-	-	-	-	139	0
	10	-	-	-	-	-	-	-	-	28	-	-	-	-	2	0
	11	-	-	-	-	-	-	-	-	0	-	-	-	-	0	0
	12	-	-	-	-	-	-	-	-	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
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	15242	2	151	250	0	5595	3149
	1	-	-	-	-	-	-	-	-	813	2	4	-	-	-	4
	2	-	-	-	-	-	-	-	-	626	-	31	-	-	-	3
	3	-	20	-	-	-	-	-	-	1460	-	8	-	-	49	-
	4	-	3	-	12	-	-	4	1061	2038	-	-	-	-	43	70
	5	-	412	-	136	-	59	-	881	2608	-	-	-	-	247	431
	6	-	1430	-	197	-	-	-	127	2092	-	-	3	-	995	690
	7	-	1622	-	170	49	-	-	-	1672	-	-	12	-	1520	796
	8	-	1193	-	-	24	-	-	-	1648	-	-	227	-	1897	601
	9	-	278	-	-	-	-	-	-	836	-	60	8	-	751	431
	10	-	-	-	-	-	-	-	-	617	-	38	-	-	87	123
	11	-	-	-	-	-	-	-	-	536	-	-	-	-	3	-
	12	-	-	-	-	-	-	-	-	296	-	10	-	-	3	-
2017	Total	0	6479	0	0	0	0	0	2877	17980	38	38	0	0	10862	2585
	1	-	-	-	-	-	-	-	-	55	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	313	15	-	-	-	11	-
	3	-	36	-	-	-	-	-	47	1940	23	-	-	-	119	16
	4	-	60	-	-	-	-	-	1496	3195	-	-	-	-	21	172
	5	-	651	-	-	-	-	-	1243	3392	-	-	-	-	722	509
	6	-	1998	-	-	-	-	-	91	1762	-	-	-	-	2537	486
	7	-	2485	-	-	-	-	-	-	1472	-	-	-	-	2907	434
	8	-	1110	-	-	-	-	-	-	1234	-	-	-	-	3342	290
	9	-	139	-	-	-	-	-	-	2041	-	-	-	-	628	381
	10	-	-	-	-	-	-	-	-	1076	-	38	-	-	430	284
	11	-	-	-	-	-	-	-	-	932	-	-	-	-	86	13
	12	-	-	-	-	-	-	-	-	568	-	-	-	-	59	-
2018	Total	0	4593	0	0	0	0	0	3992	11139	750	129	0	0	13527	2075
	1	-	-	-	-	-	-	-	-	181	-	-	-	-	40	8
	2	-	-	-	-	-	-	-	40	197	3	15	-	-	81	49
	3	-	10	-	-	-	-	-	807	1010	207	20	-	-	89	49
	4	-	36	-	-	-	-	-	1506	2361	238	-	-	-	109	146
	5	-	442	-	-	-	-	-	1327	2519	198	-	-	-	766	375
	6	-	1346	-	-	-	-	-	312	1922	93	7	-	-	2254	286
	7	-	1534	-	-	-	-	-	-	1214	11	79	-	-	3852	277
	8	-	985	-	-	-	-	-	-	580	-	8	-	-	3969	521
	9	-	240	-	-	-	-	-	-	567	-	-	-	-	1729	263
	10	-	-	-	-	-	-	-	-	174	-	-	-	-	602	101
	11	-	-	-	-	-	-	-	-	276	-	-	-	-	36	-
	12	-	-	-	-	-	-	-	-	138	-	-	-	-	-	-
2019	Total	0	5987	0	0	0	0	0	5152	12750	0	0	0	0	11321	2062
	1	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-
	2	-	10	-	-	-	-	-	-	19	-	-	-	-	27	-
	3	-	10	-	-	-	-	-	1548	1013	-	-	-	-	39	61
	4	-	394	-	-	-	-	-	2375	1997	-	-	-	-	92	378
	5	-	1378	-	-	-	-	-	1185	2448	-	-	-	-	719	136
	6	-	1600	-	-	-	-	-	44	1258	-	-	-	-	3092	331
	7	-	2214	-	-	-	-	-	-	1005	-	-	-	-	2777	436
	8	-	363	-	-	-	-	-	-	1557	-	-	-	-	2927	353
	9	-	18	-	-	-	-	-	-	1494	-	-	-	-	1107	285
	10	-	-	-	-	-	-	-	-	953	-	-	-	-	324	67
	11	-	-	-	-	-	-	-	-	653	-	-	-	-	126	15
	12	-	-	-	-	-	-	-	-	339	-	-	-	-	91	-

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
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	-	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	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	-
2017	Total	-	3.21	-	-	-	-	-	0.7	0.05	0	0	-	-	0.84	0.02
	1	-	-	-	-	-	-	-	-	1.58	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	0	0	-	-	-	0	-
	3	-	0	-	-	-	-	-	0	0	0	-	-	-	0	0
	4	-	0.15	-	-	-	-	-	0.73	0.01	-	-	-	-	0	0.1
	5	-	0.73	-	-	-	-	-	0.56	0	-	-	-	-	0.68	0.01
	6	-	2.69	-	-	-	-	-	2.57	0.01	-	-	-	-	0.93	0
	7	-	4.33	-	-	-	-	-	-	0.05	-	-	-	-	1.01	0.03
	8	-	3.61	-	-	-	-	-	-	0.12	-	-	-	-	0.95	0.02
	9	-	1.09	-	-	-	-	-	-	0.09	-	-	-	-	0.24	0.03
	10	-	-	-	-	-	-	-	-	0.06	-	0	-	-	0.04	0
	11	-	-	-	-	-	-	-	-	0.13	-	-	-	-	0.01	0
	12	-	-	-	-	-	-	-	-	0.24	-	-	-	-	0	-
2018	Total	-	3.65	-	-	-	-	-	0.72	0.05	0.01	0.09	-	-	1.14	0.04
	1	-	-	-	-	-	-	-	-	1.04	-	-	-	-	0	0
	2	-	-	-	-	-	-	-	0	0.01	0	0	-	-	0	0
	3	-	0.2	-	-	-	-	-	0.68	0	0	0	-	-	0	0
	4	-	0	-	-	-	-	-	0.5	0	0	-	-	-	0	0.03
	5	-	0.97	-	-	-	-	-	0.59	0.03	0.05	-	-	-	0.04	0.01
	6	-	3.42	-	-	-	-	-	2.56	0.04	0	0	-	-	1.6	0.01
	7	-	4.91	-	-	-	-	-	-	0.07	0	0.15	-	-	2.21	0.13
	8	-	4.07	-	-	-	-	-	-	0.04	-	0	-	-	0.75	0.06
	9	-	0.83	-	-	-	-	-	-	0.13	-	-	-	-	0.15	0.04
	10	-	-	-	-	-	-	-	-	0	-	-	-	-	0.17	0
	11	-	-	-	-	-	-	-	-	0	-	-	-	-	0	-
	12	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
2019	Total	-	2.92	-	-	-	-	-	0.72	0.03	-	-	-	-	1.14	0.03
	1	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
	2	-	0	-	-	-	-	-	-	0	-	-	-	-	0	-
	3	-	0	-	-	-	-	-	0.9	0	-	-	-	-	0	0
	4	-	0.16	-	-	-	-	-	0.75	0	-	-	-	-	0	0
	5	-	0.88	-	-	-	-	-	0.41	0.02	-	-	-	-	0.08	0.01
	6	-	2.96	-	-	-	-	-	1.45	0.05	-	-	-	-	0.76	0
	7	-	4.66	-	-	-	-	-	-	0.05	-	-	-	-	2.49	0.03
	8	-	3.17	-	-	-	-	-	-	0.09	-	-	-	-	1.17	0.12
	9	-	0.94	-	-	-	-	-	-	0.06	-	-	-	-	0.13	0
	10	-	-	-	-	-	-	-	-	0.03	-	-	-	-	0.01	0
	11	-	-	-	-	-	-	-	-	0	-	-	-	-	0	0
	12	-	-	-	-	-	-	-	-	0	-	-	-	-	0	-

Table 5 Number of fishing vessel engaged in SBT fishery during 2002-2019

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
2017	43	32	75
2018	46	31	77
2019	44	28	72

* There was one vessel shipwrecked.

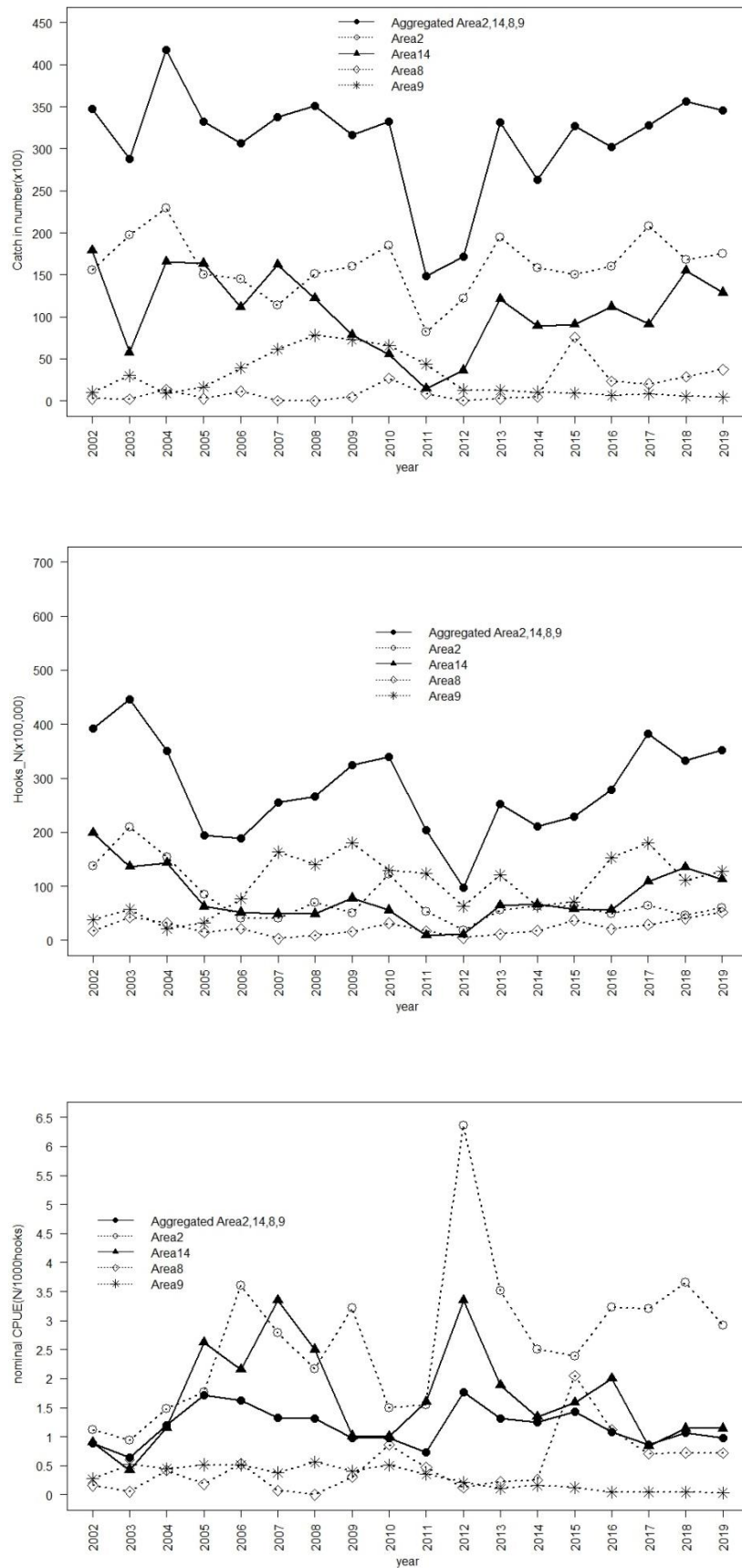


Fig. 1 Annual SBT catches in number, fishing effort and nominal CPUE of Taiwanese SBT longline fishery in main fishing grounds

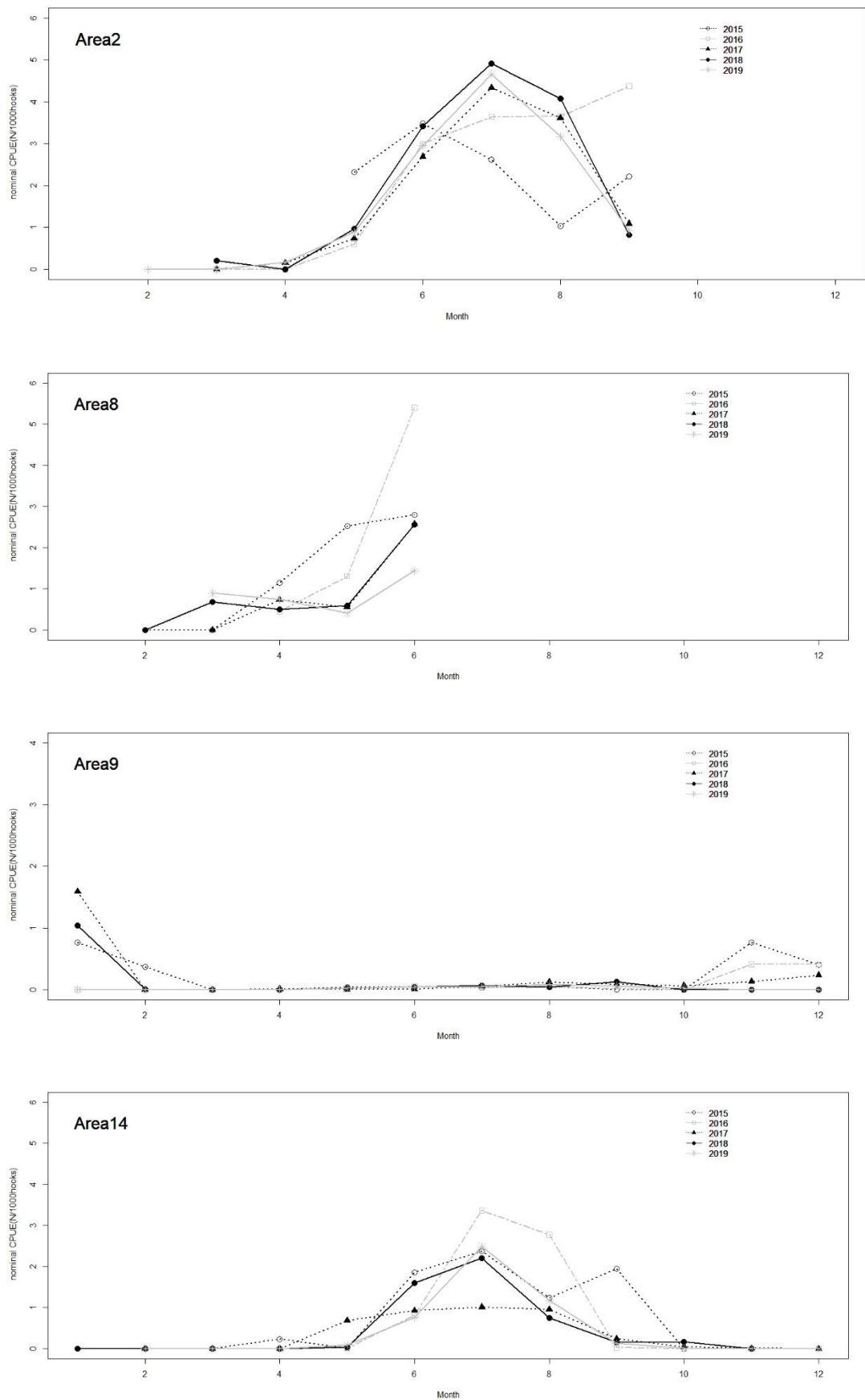


Fig. 2 Annual nominal CPUE by area, by month and by year of Taiwanese SBT longline fishery in main fishing grounds

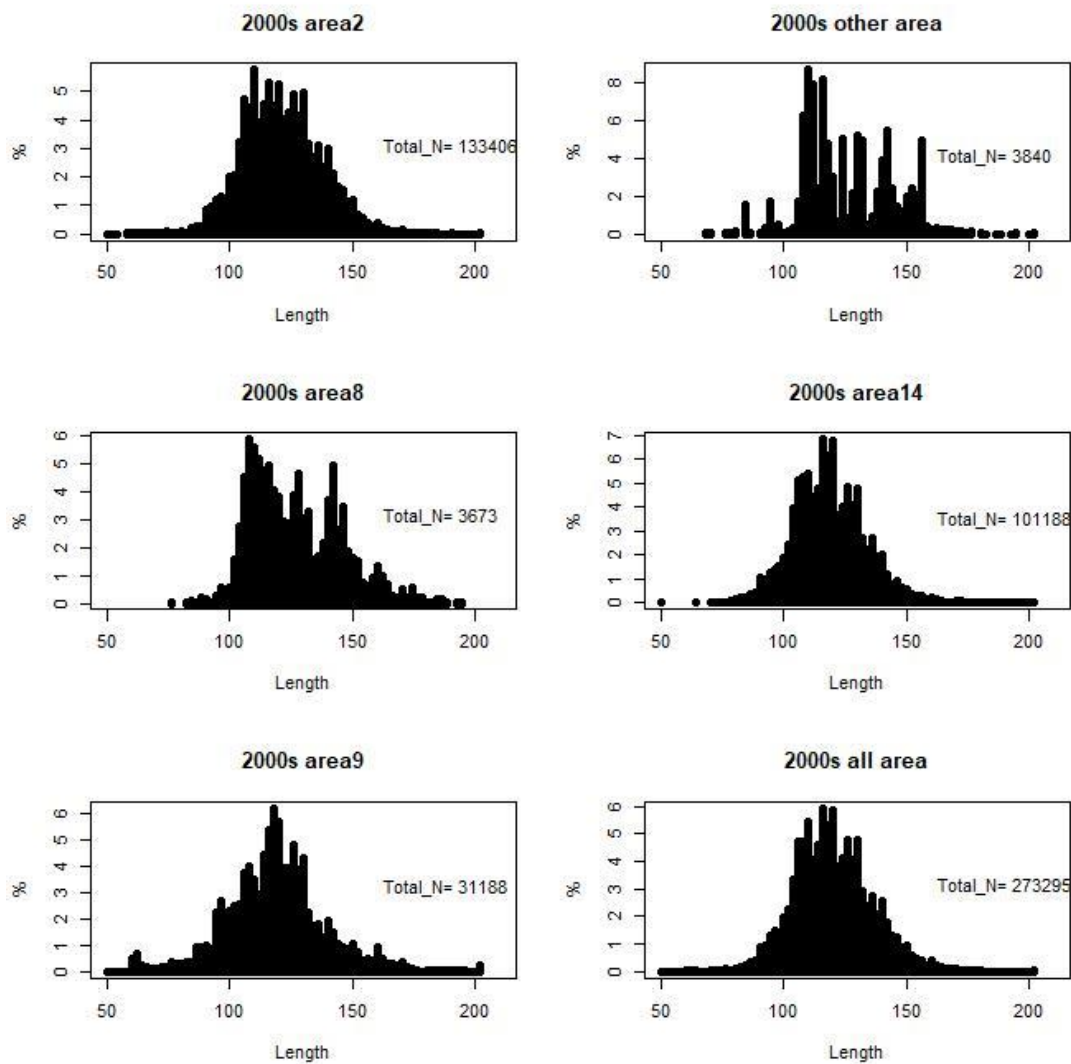


Fig.3 (1) SBT size frequency by area of Taiwanese SBT longline fishery in 2000s

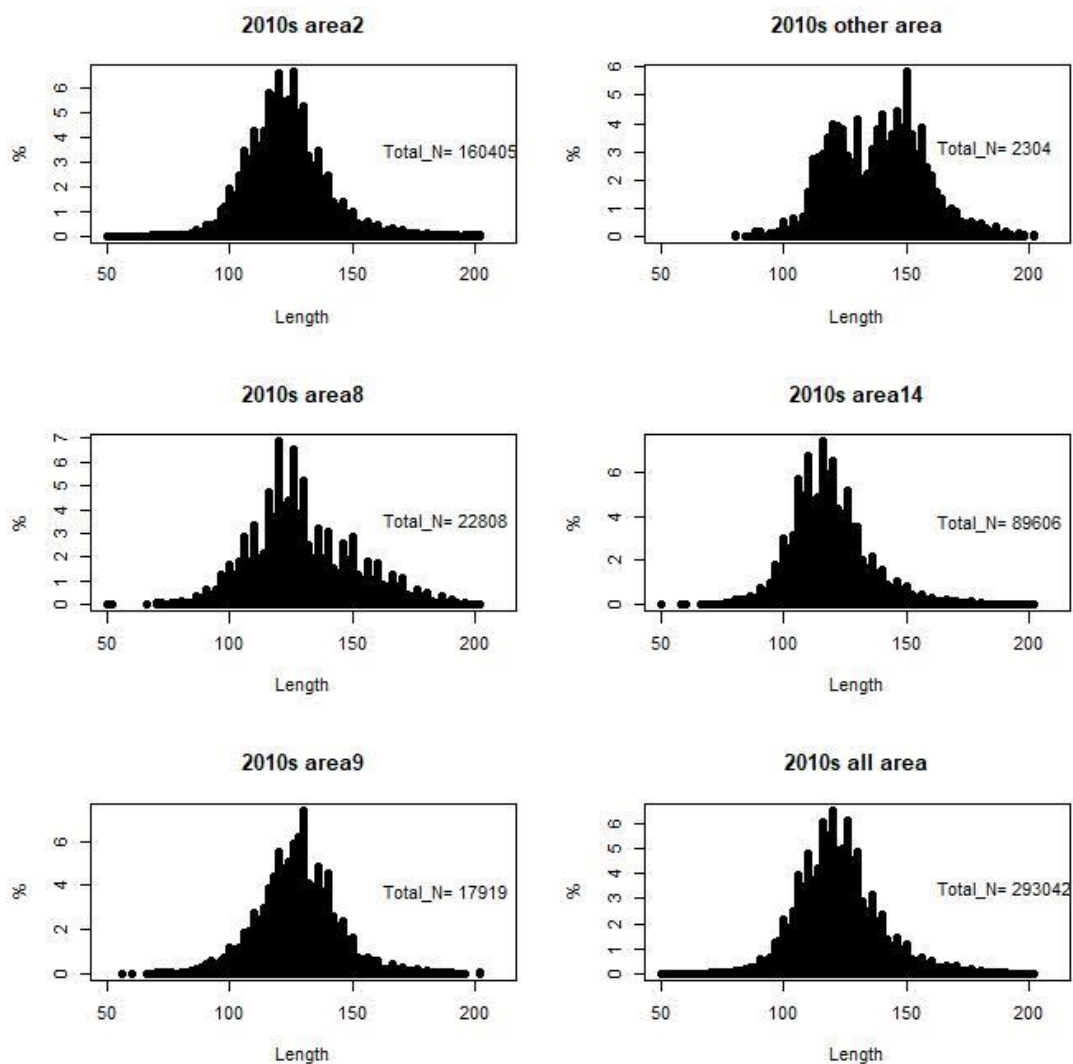


Fig.3 (2) SBT size frequency by area of Taiwanese SBT longline fishery during 2010-2019

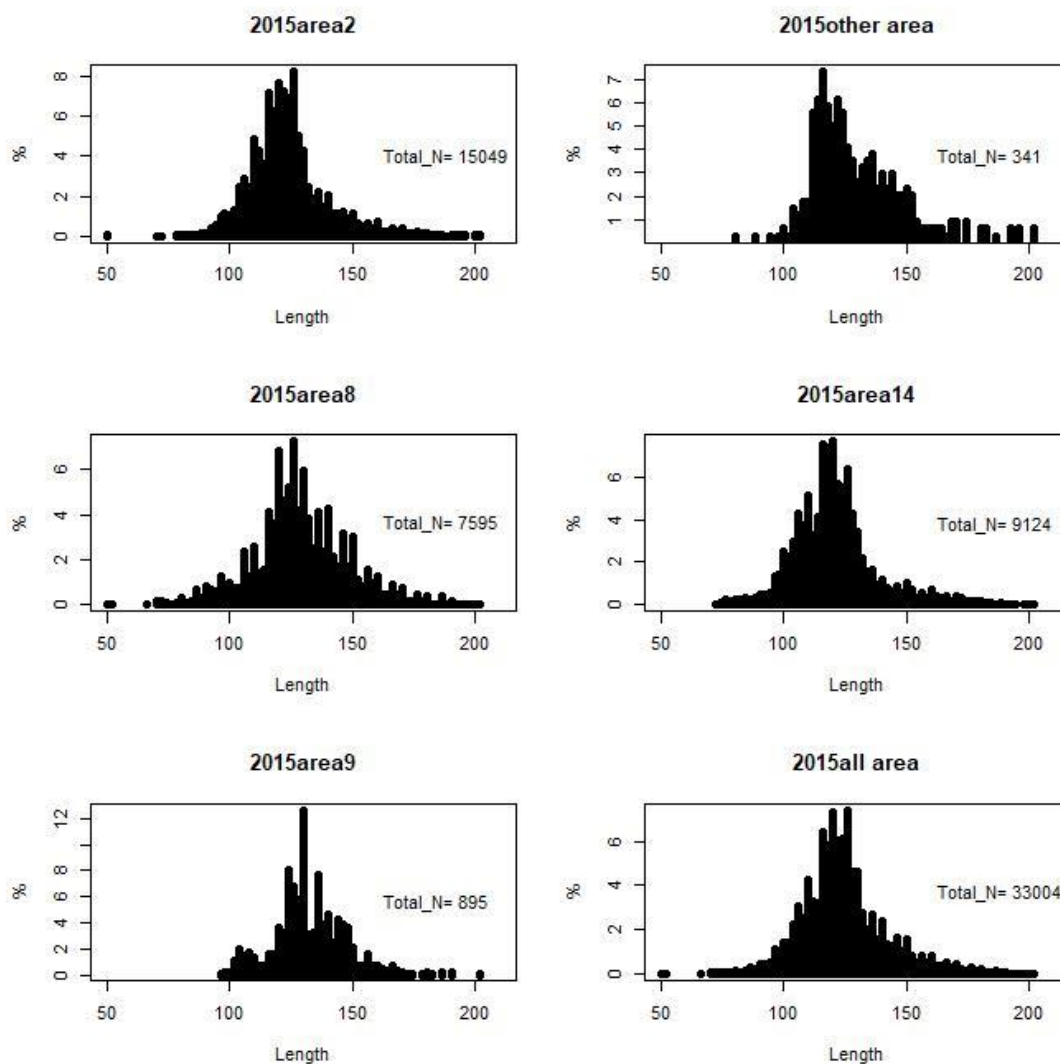


Fig.4 (1) SBT size frequency by area of Taiwanese SBT longline fishery in 2015

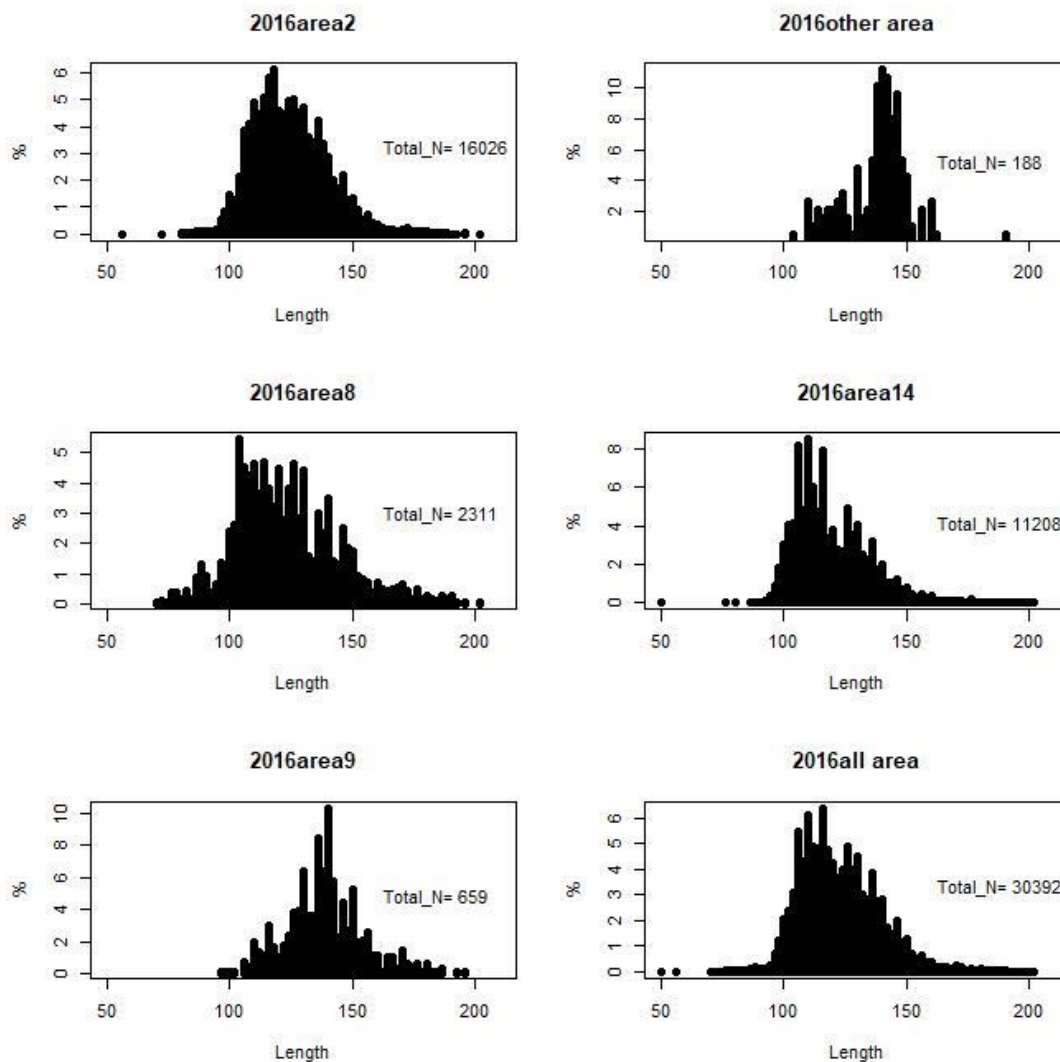


Fig.4 (2) SBT size frequency by area of Taiwanese SBT longline fishery in 2016

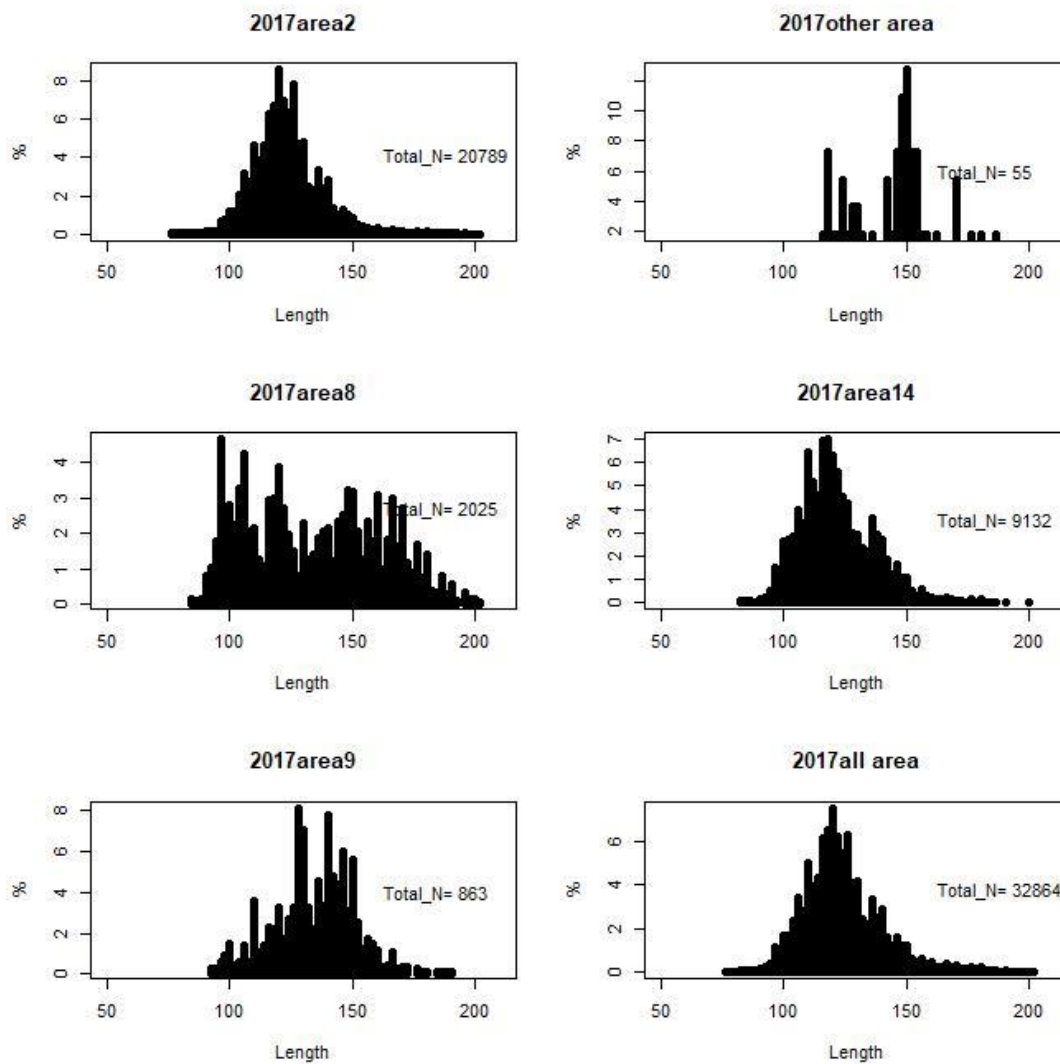


Fig.4 (3) SBT size frequency by area of Taiwanese SBT longline fishery in 2017

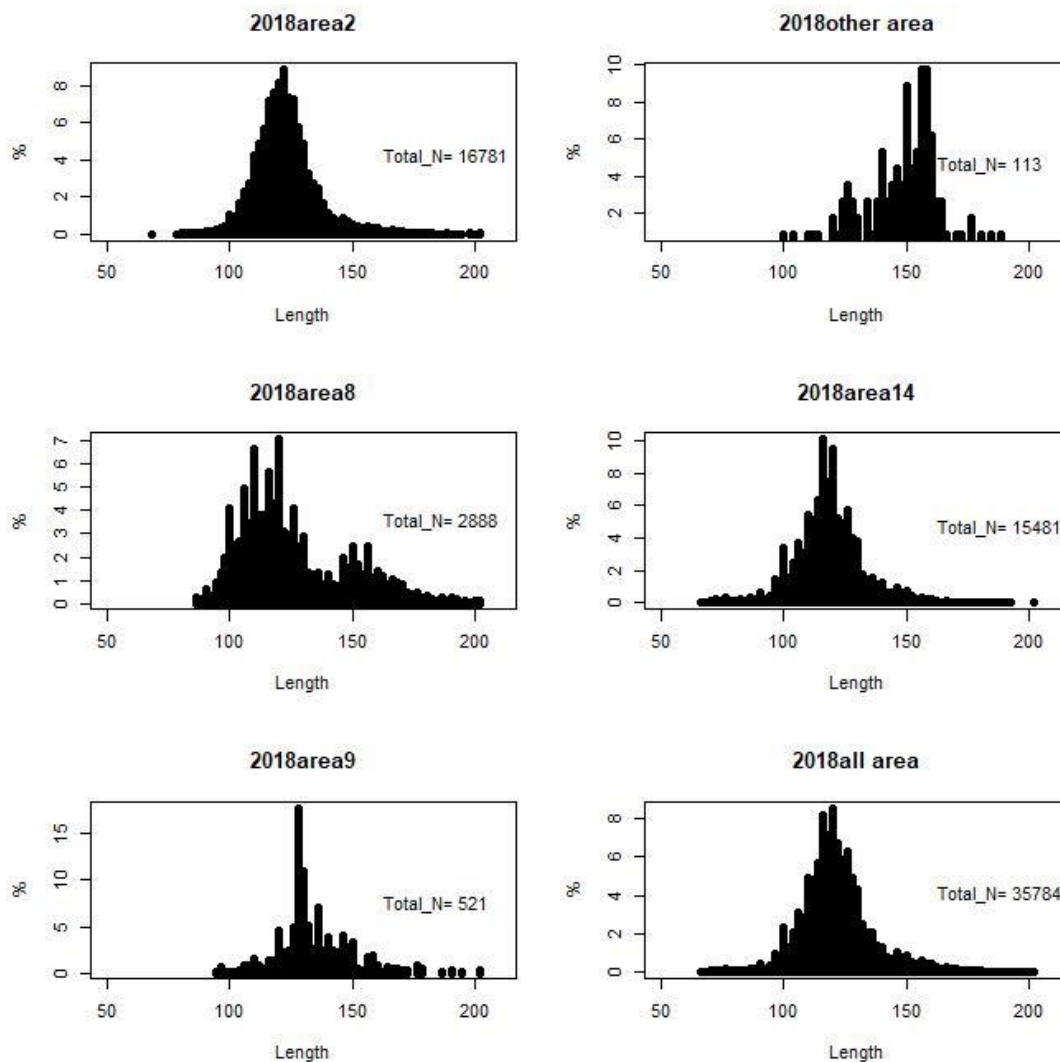


Fig.4 (4) SBT size frequency by area of Taiwanese SBT longline fishery in 2018

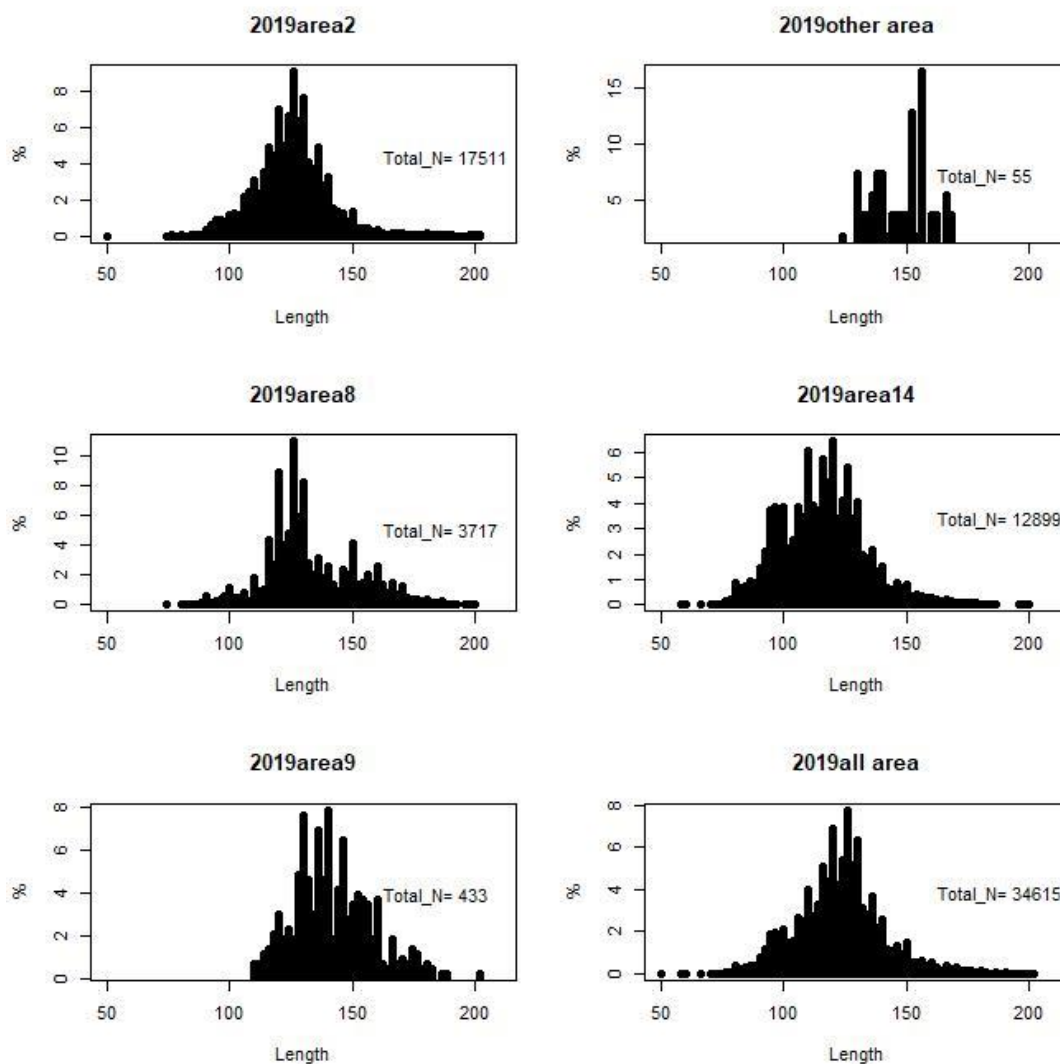


Fig.4 (5) SBT size frequency by area of Taiwanese SBT longline fishery in 2019

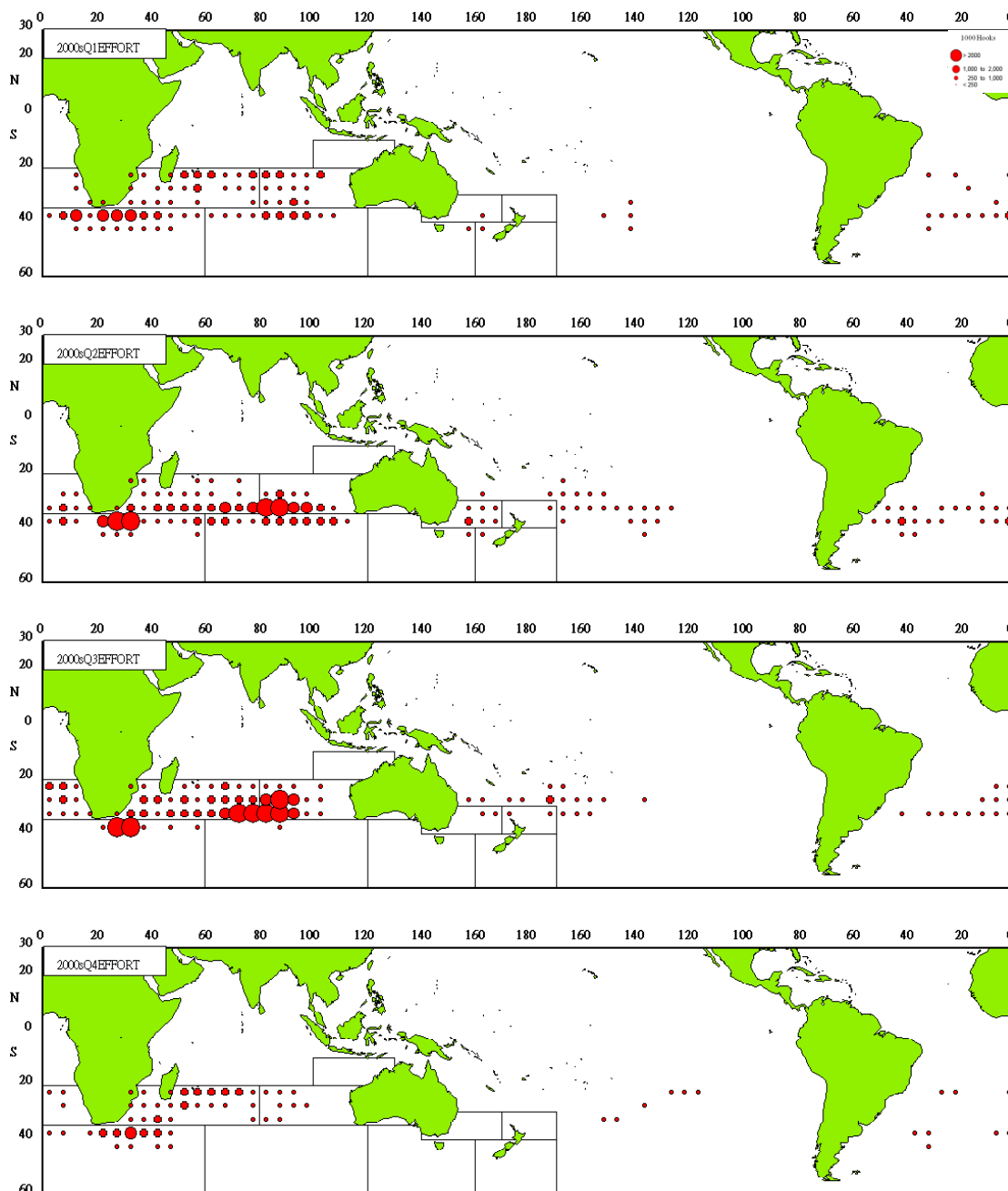


Fig.5 (1) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2000s

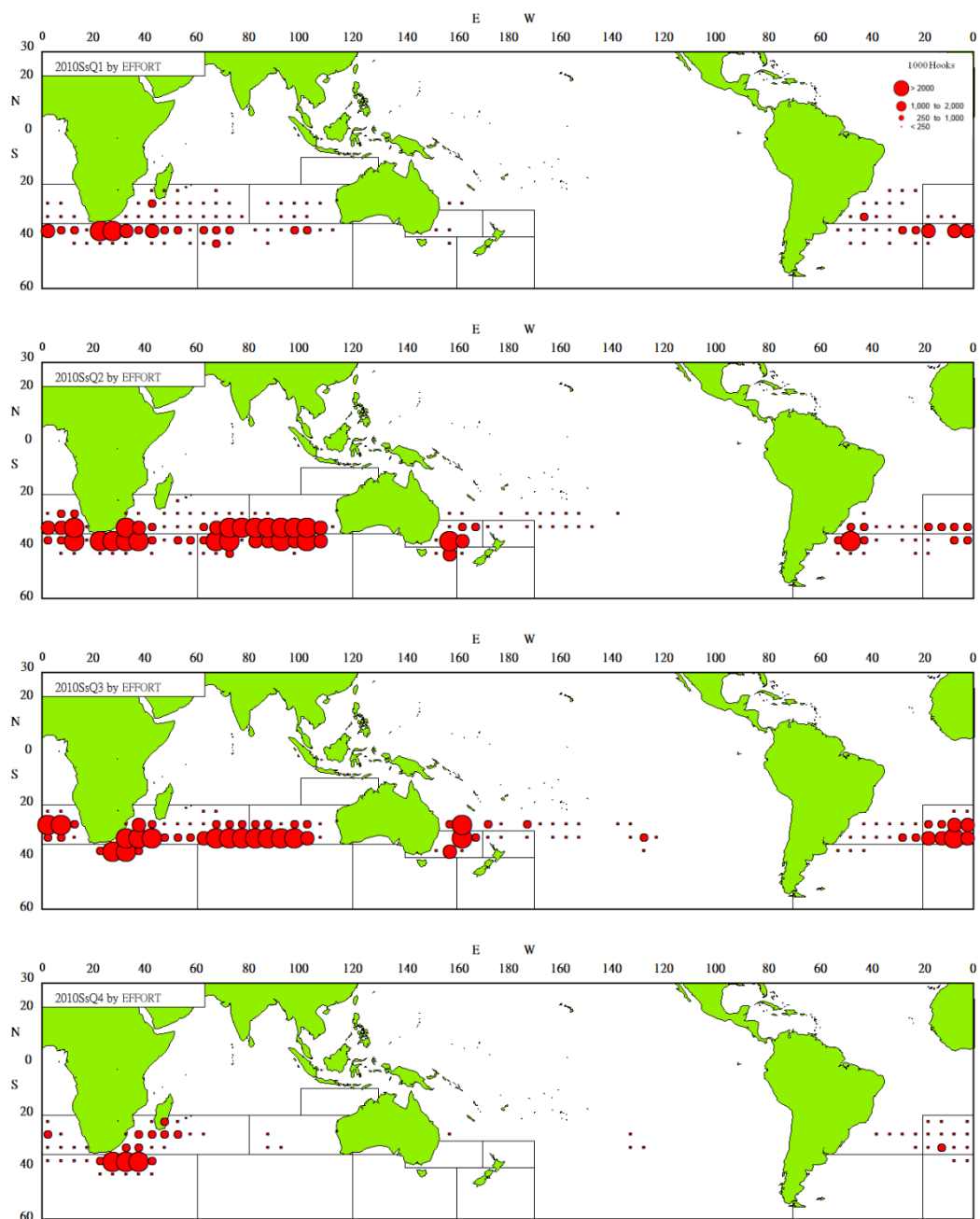


Fig.5 (2) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery during 2010-2019

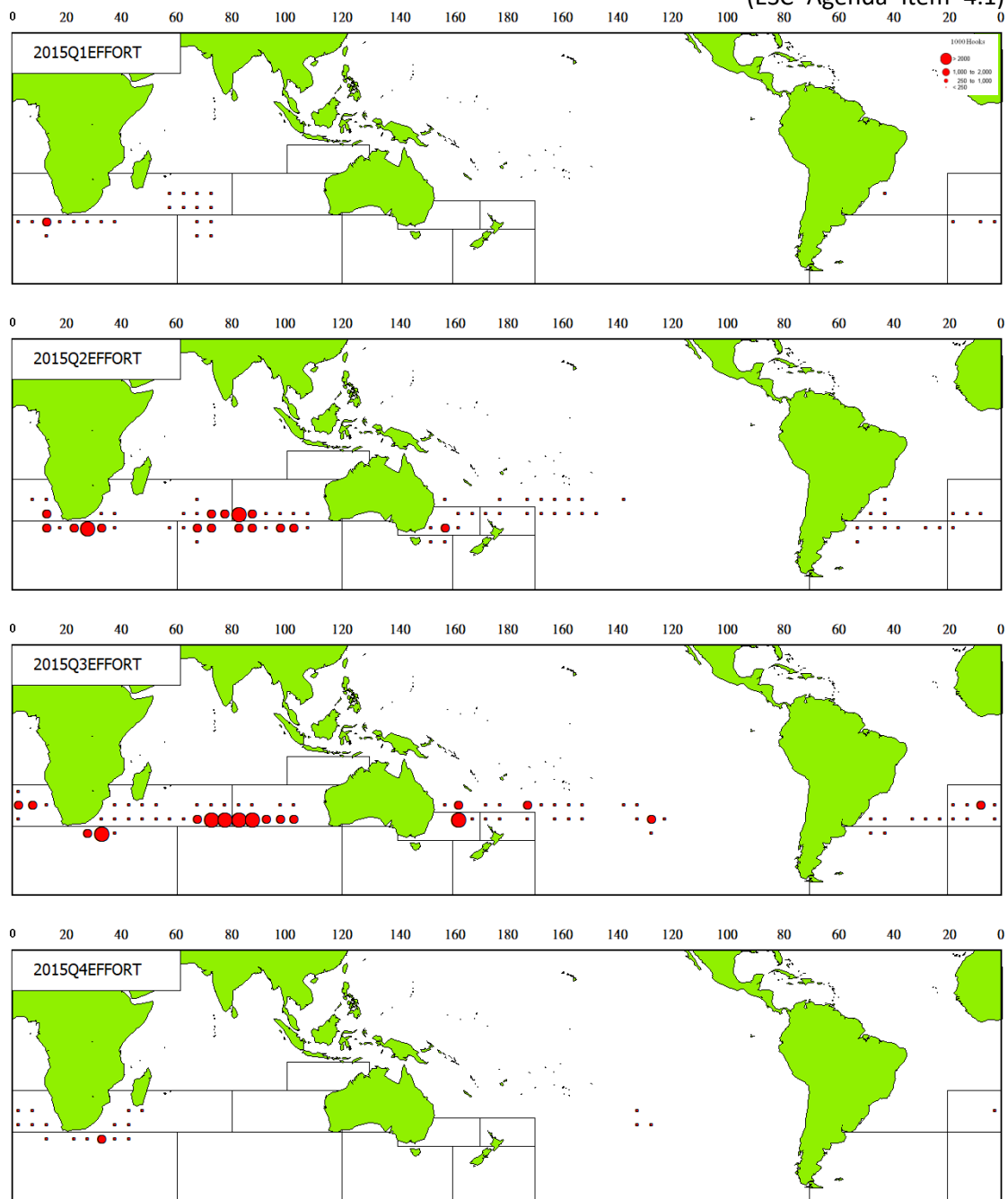


Fig.6 (1) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2015

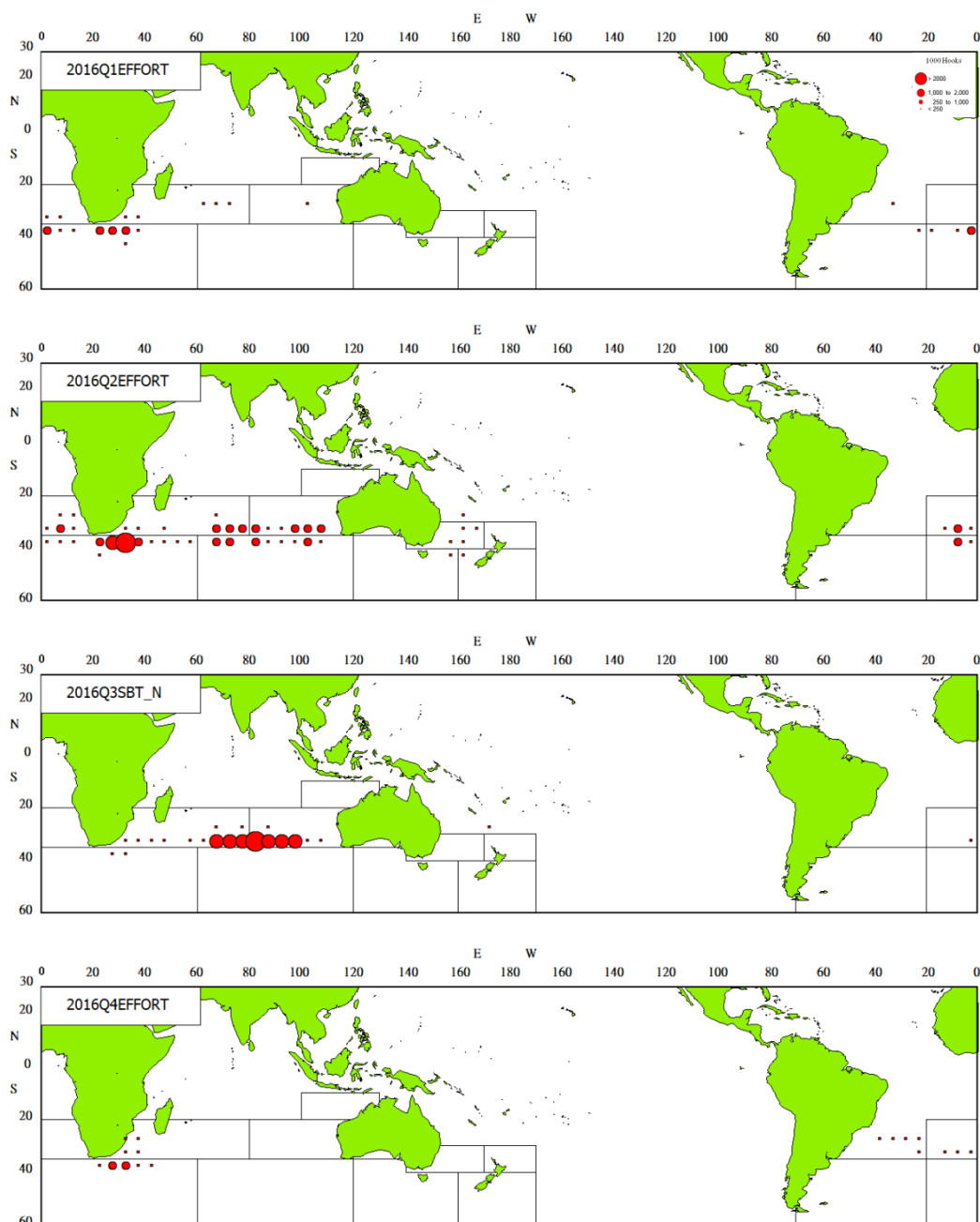


Fig.6 (2) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2016

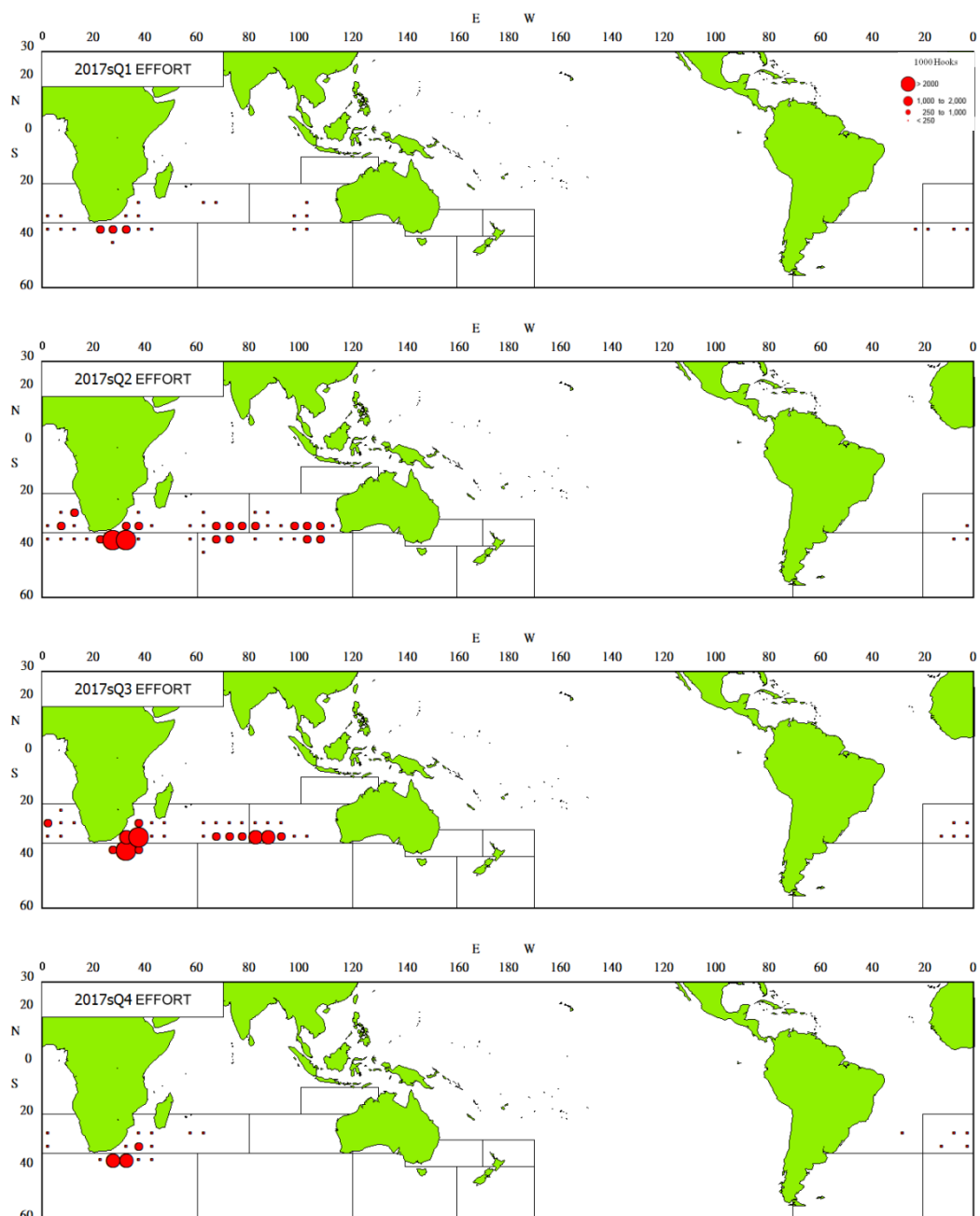


Fig.6 (3) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2017

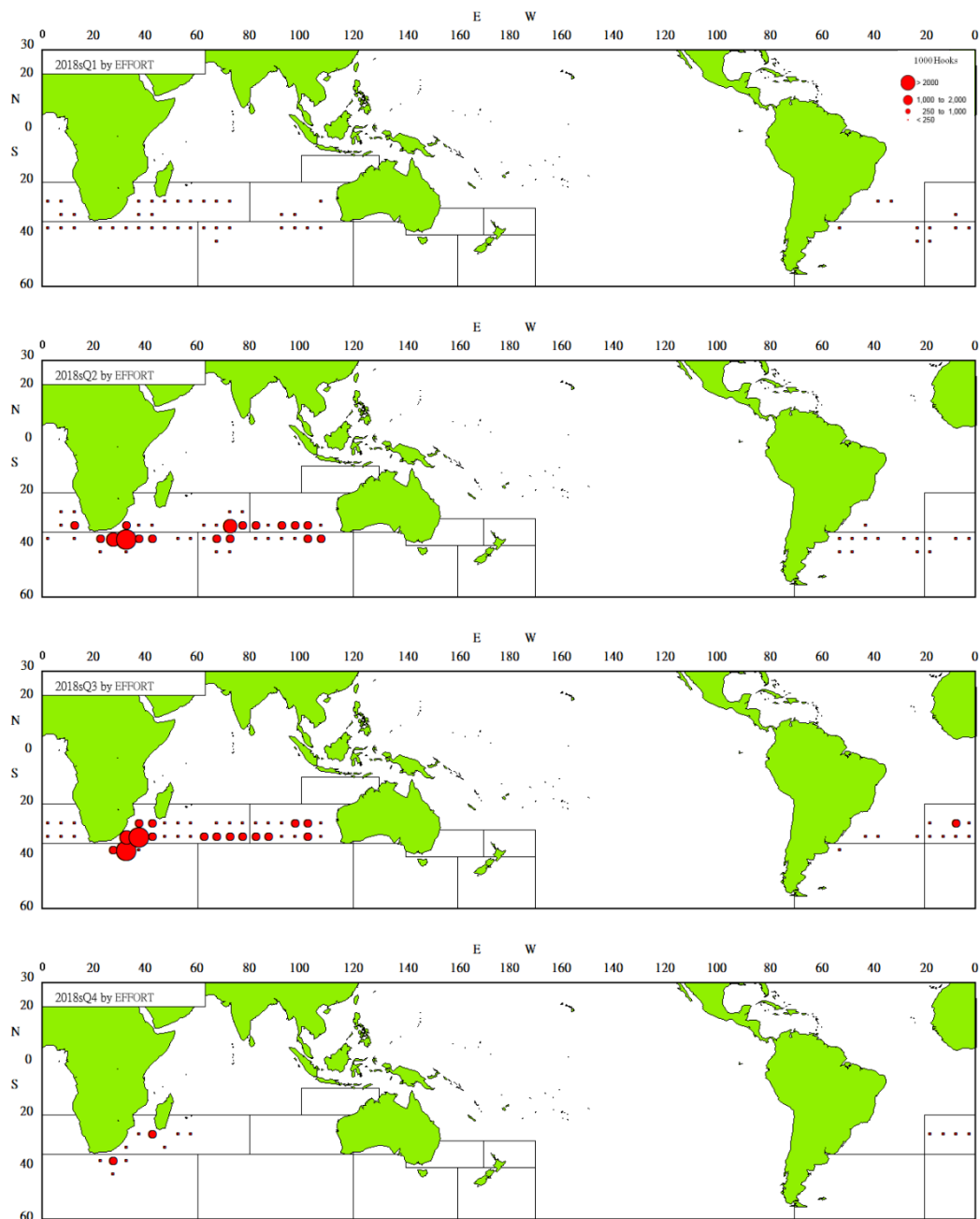


Fig.6 (4) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2018

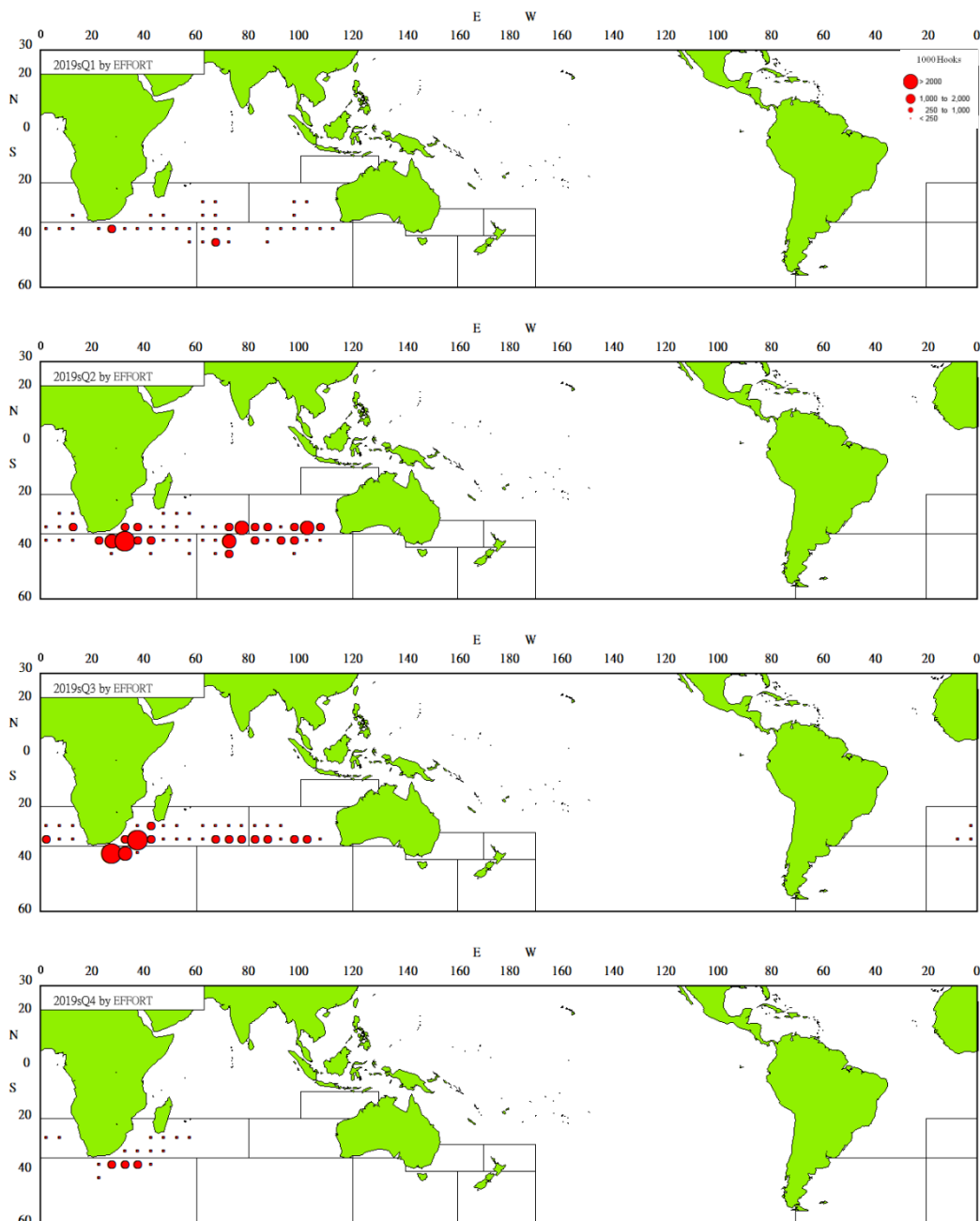


Fig.6 (5) Fishing efforts distributions by quarter of Taiwanese SBT longline fishery in 2019

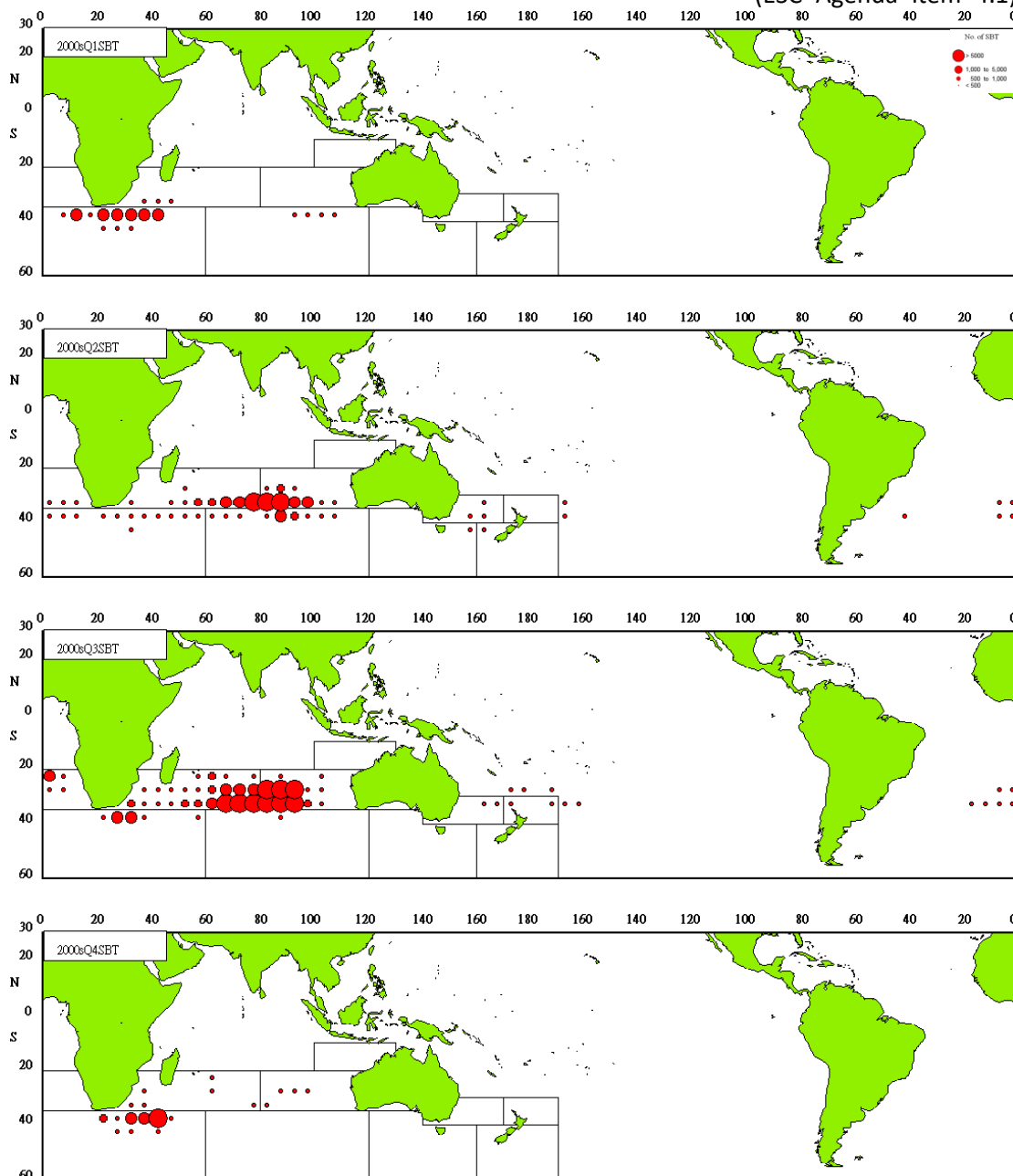


Fig.7 (1) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2000s

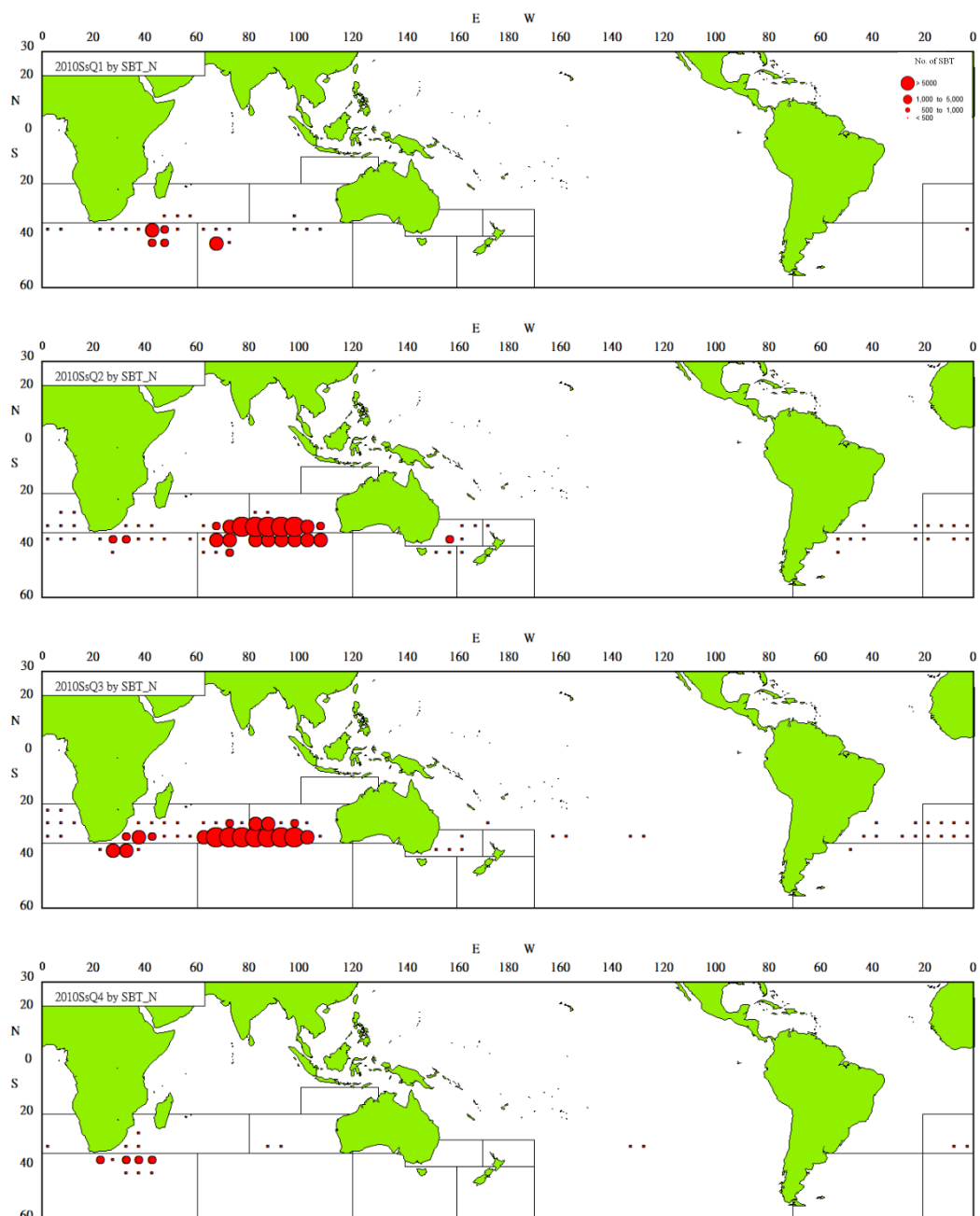


Fig.7 (2) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery during 2010-2019

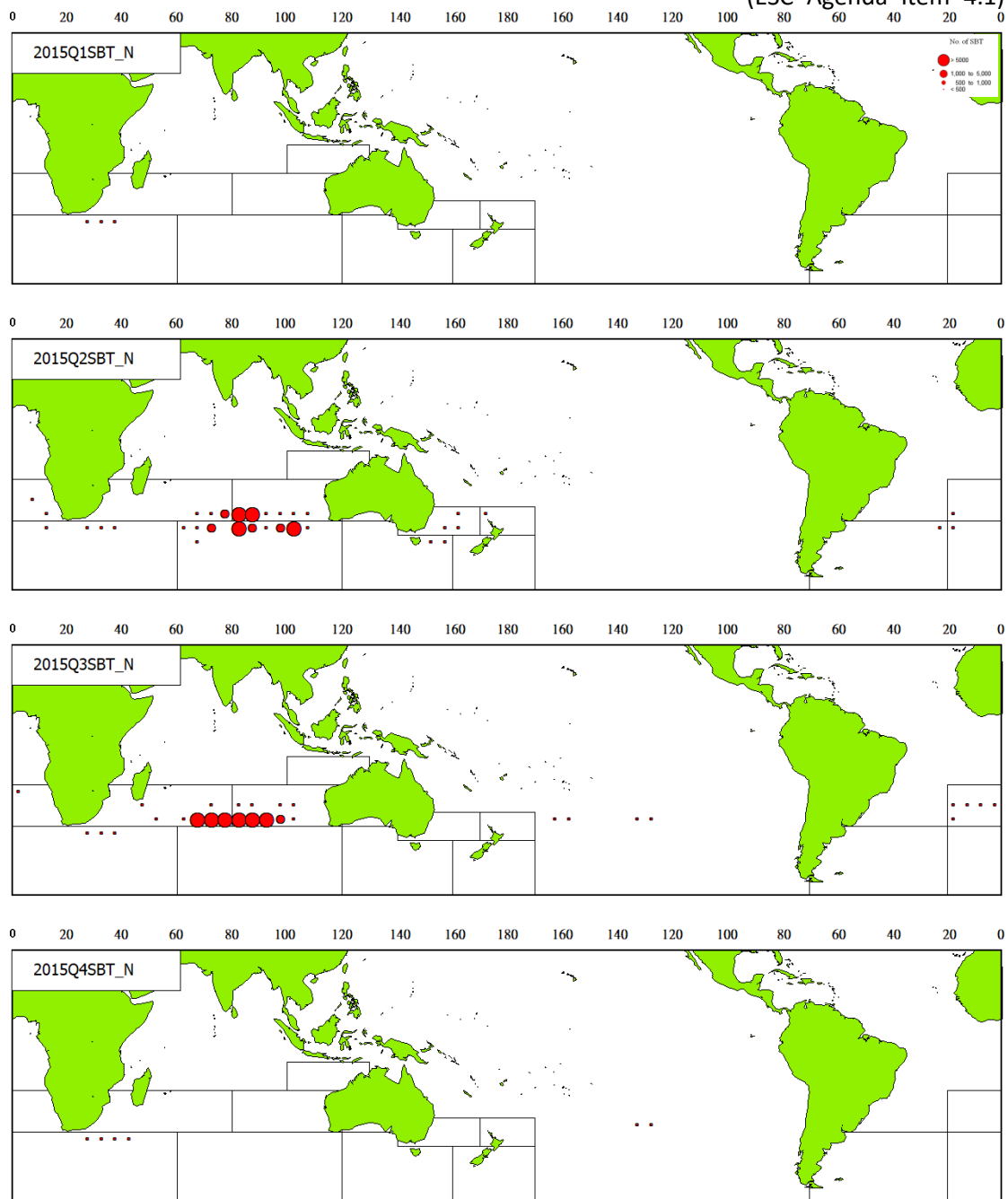


Fig.8 (1) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2015

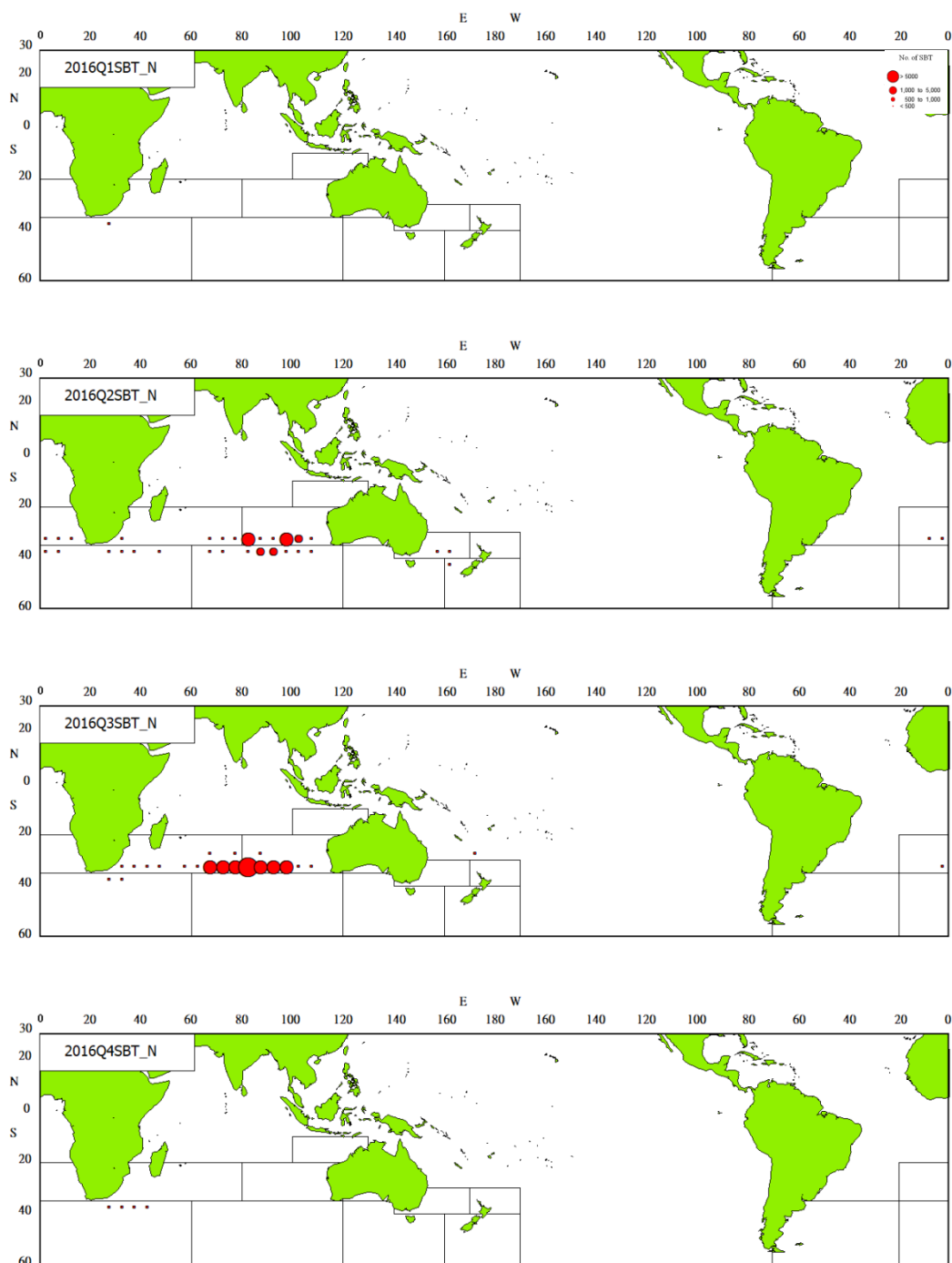


Fig.8 (2) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2016

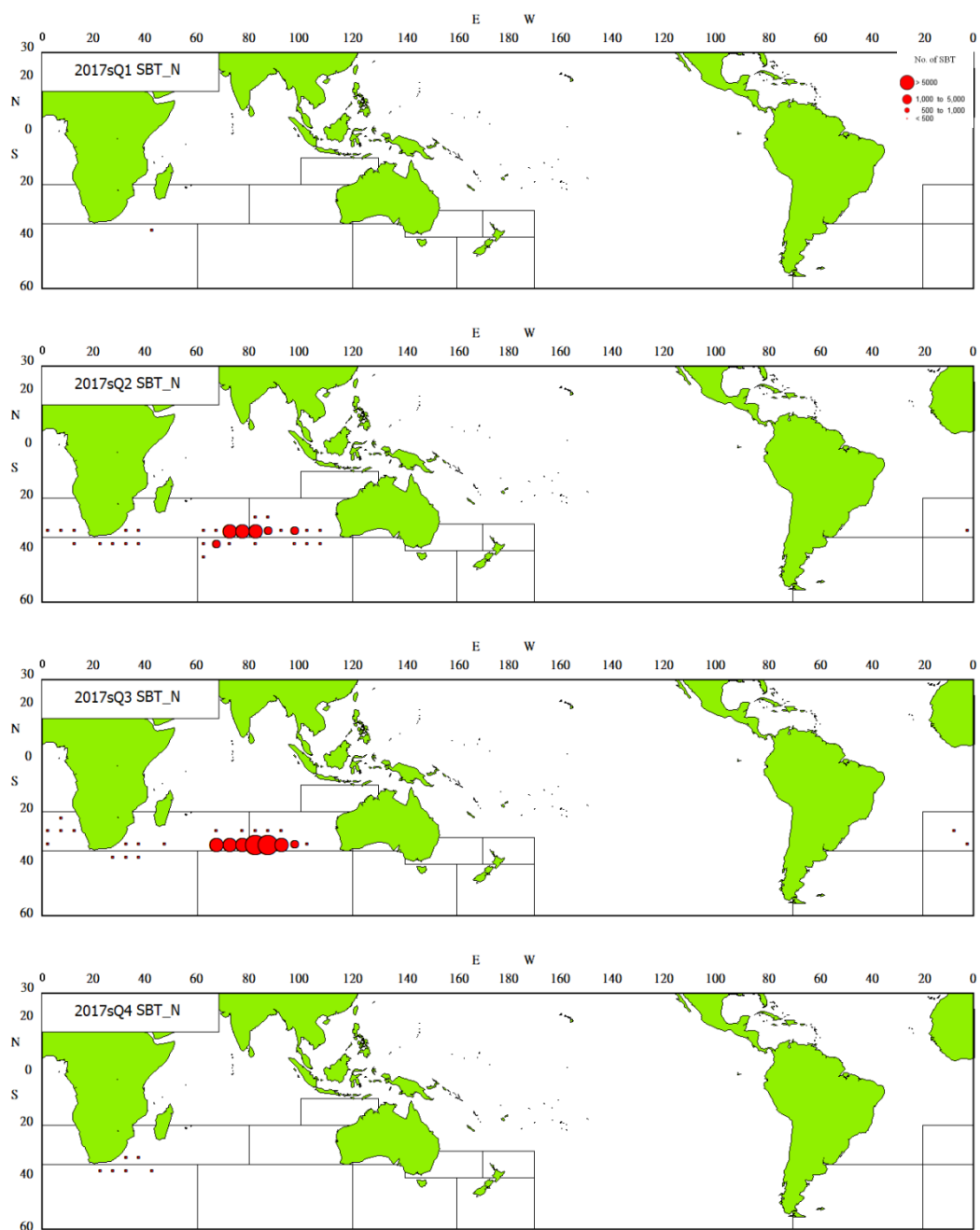


Fig.8 (3) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2017

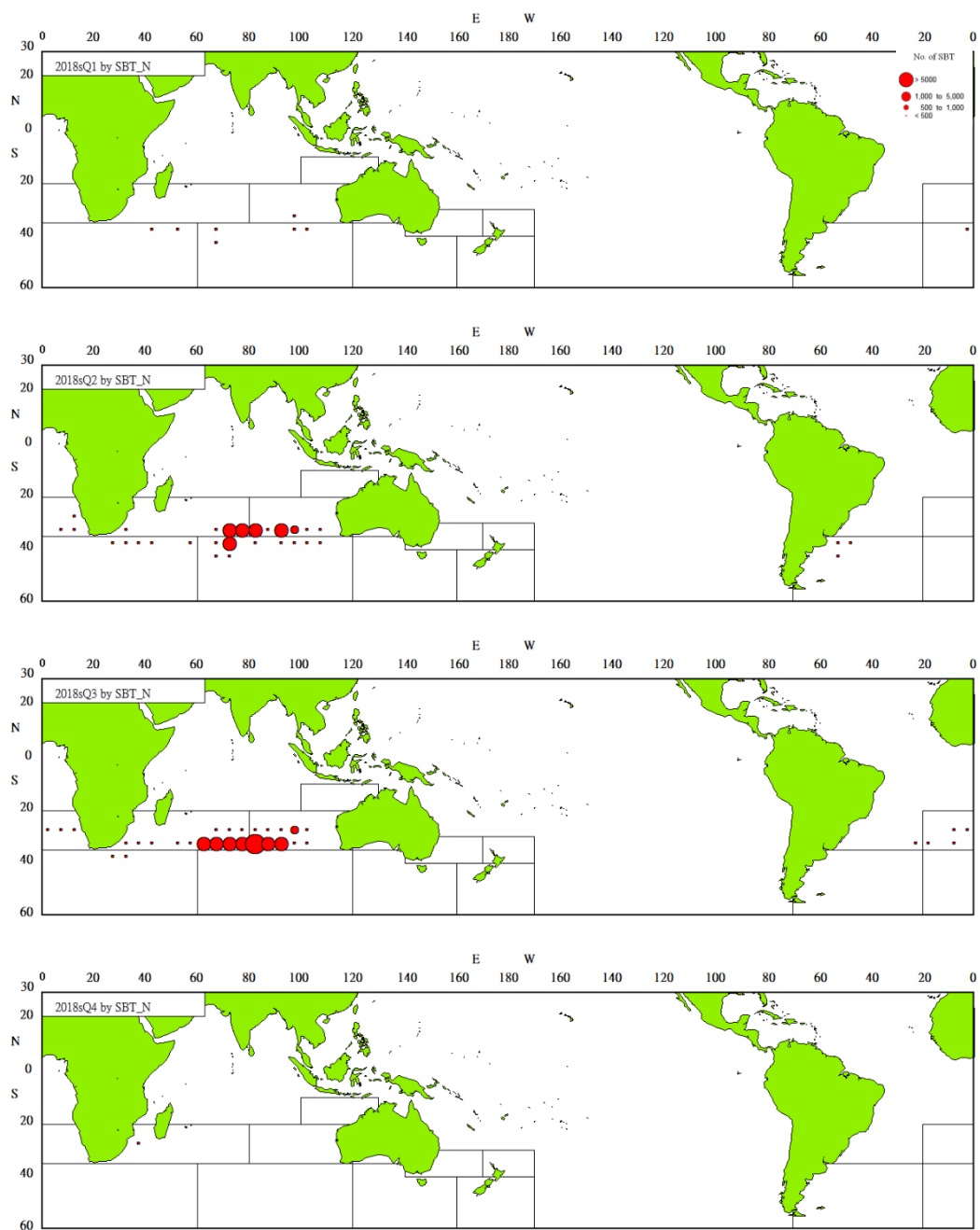


Fig.8 (4) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2018

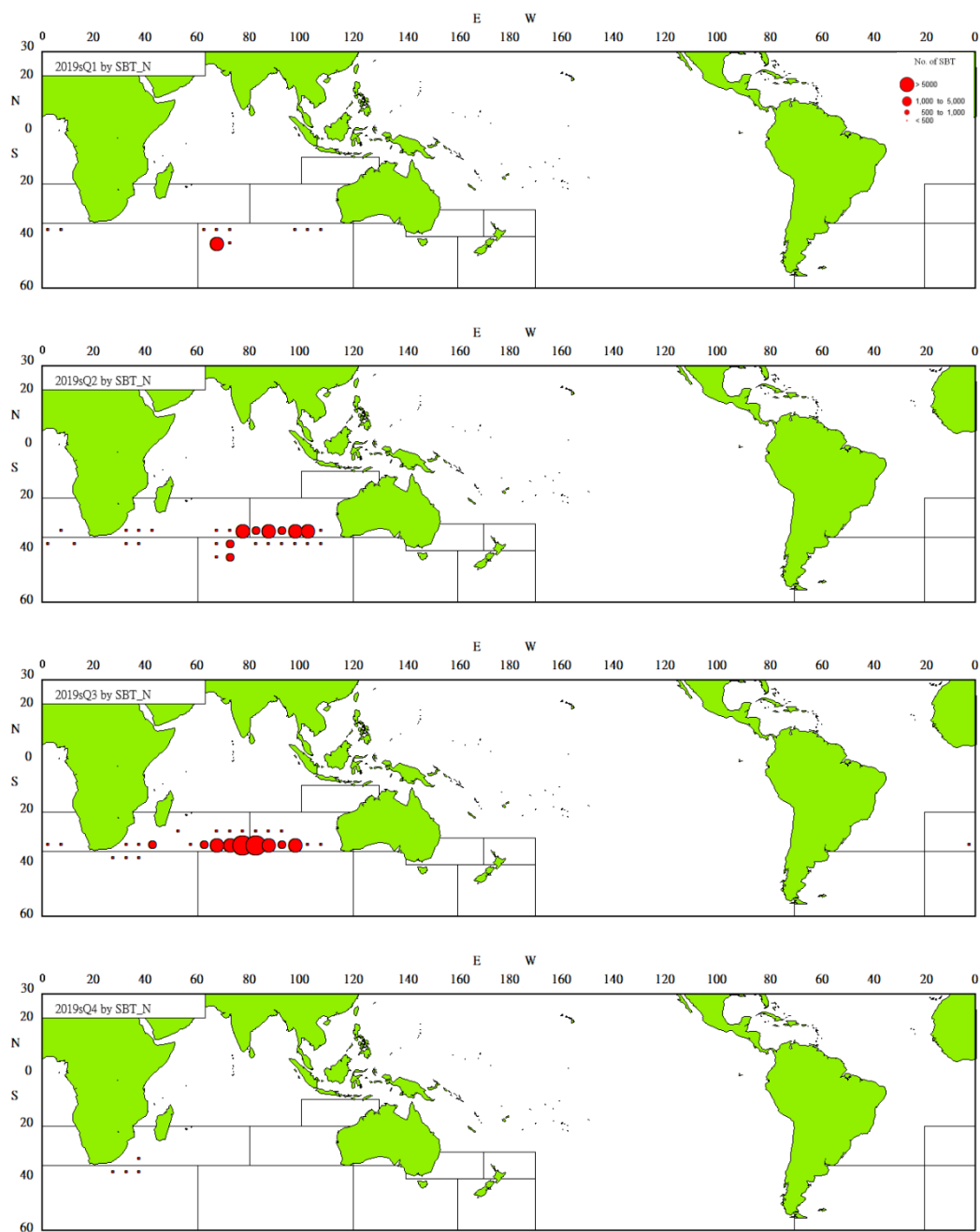


Fig.8 (5) SBT catch (in number) distributions by quarter of Taiwanese SBT longline fishery in 2019

Annex 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 2002. 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 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 research and the format of data records.

The qualifications of recruitment for observer is senior high school graduation, with experience on-board preferred. They are also 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 and VMS system, identification of catch 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, and basically understanding of Conservation and Management Measures and Resolutions of the RFMOs. 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 3 and 2 batches of observer training respectively in 2018 and 2019, 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 2018 and 2019, 103 and 105 employed observers had conducted the observations 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.

The threat of Somalia piracy still exists in the tropical Indian Ocean. The same as recent years, most of our observers deployed on fishing vessels which operate in the southern Indian Ocean for the safety of observers, therefore, the observer coverage rate for SBT fishing vessels maintaining stability. In 2018 calendar year, 12 observers were deployed on 12 of the 46 fishing vessels authorized to target SBT seasonally, and 4 were deployed on 4 of the 31 fishing vessels authorized to bycatch SBT. There were 2,712 fishing days with 1,994 days observed. Sixteen observers were deployed on 16 of the 44 fishing vessels authorized to target SBT, and 2 were deployed on 2 of the 28 fishing vessels authorized to bycatch SBT in 2019 with 2,747 days observed out of 3,018 fishing days. In 2018, the coverage rate of observation was 20.78% by vessels, 12.80% by hooks and 10.78% by catch. The coverage rate was accounted for 25.00% by vessels in 2019, 15.15% by hooks, and 14.02% by catch. In order to conducting effectively monitoring, it is necessary for FA to considering expanding the observer program and budget to reduce the affluence of fishing vessels changing which may involve the coverage rates.

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 collected by observers from 2018 and 2019. The length measurements of SBT in 2018 and 2019 were 3,854 and 4,857 respectively, and the number of otolith of SBT collected was 110 in 2019. The length measurements by species were summarized in 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 2002-2019. The details of tag recaptures for each year are shown in Table 4. The returned tags and the related information had been delivered 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/2008/SBT Fisheries-Taiwan
(ESC Agenda Item 4.1)

Table 1 Summary of observed catch and effort by area and by month
(a) 2018 (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	7	29	24.14%	659566	4593181	14.36%	2364	16781	14.09%
	3	-	2	-	-	9920	-	-	2	-
	4	2	5	40%	14542	35516	40.94%	-	-	-
	5	4	13	30.77%	91084	442186	20.60%	116	430	26.98%
	6	5	19	26.32%	195057	1345765	14.49%	556	4600	12.09%
	7	6	27	22.22%	210365	1534223	13.71%	580	7536	7.70%
	8	6	14	42.86%	148518	985080	15.08%	1112	4013	27.71%
	9	-	6	-	-	240491	-	-	200	-
Area8	Total	10	26	38.46%	608364	3992004	15.24%	497	2888	17.21%
	2	-	1	-	-	40200	-	-	-	-
	3	4	14	28.57%	92987	806692	11.53%	135	551	24.50%
	4	8	24	33.33%	235797	1506444	15.65%	61	757	8.06%
	5	10	26	38.46%	217757	1326774	16.41%	124	781	15.88%
	6	3	10	30%	61823	311894	19.82%	177	799	22.15%
Area9	Total	7	30	23.33%	313385	1763603	17.77%	29	521	5.57%
	1	-	1	-	-	63900	-	-	188	-
	2	-	1	-	-	3800	-	-	1	-
	3	1	3	33.33%	43725	199033	21.97%	1	2	50%
	4	6	10	60%	84054	430974	19.50%	2	3	66.67%
	5	4	13	30.77%	76882	374766	20.51%	9	65	13.85%
	6	3	14	21.43%	73444	321180	22.87%	10	76	13.16%
	7	2	10	20%	35280	210600	16.75%	7	88	7.95%
	8	-	5	-	-	56750	-	-	26	-
	9	-	3	-	-	102600	-	-	72	-
Area14	Total	11	53	20.75%	912651	7130318	12.80%	958	15481	6.19%
	1	-	1	-	-	9600	-	-	-	-
	2	-	1	-	-	3150	-	-	-	-
	3	-	1	-	-	18900	-	-	-	-
	4	2	8	25%	7238	65025	11.13%	-	-	-
	5	8	15	53.33%	148494	661289	22.46%	17	27	62.96%
	6	7	31	22.58%	209610	1635700	12.81%	371	3612	10.27%
	7	8	43	18.60%	268822	2197515	12.23%	388	8496	4.57%
	8	7	38	18.42%	250345	1789290	13.99%	182	2987	6.09%
	9	3	11	27.27%	28142	490104	5.74%	-	259	-
	10	-	5	-	-	259745	-	-	100	-
Area15	Total	1	6	16.67%	8412	2074190	0.41%	6	91	6.59%
	4	1	3	33.33%	2148	145800	1.47%	3	5	60%
	5	1	4	25%	4284	374940	1.14%	2	4	50%
	8	1	6	16.67%	1980	520840	0.38%	1	31	3.23%
Grand Total		16	77	20.78%	2502378	19553296	12.80%	7708	71473	10.78%

* The areas which with observer deployed.

CCSBT-ESC/2008/SBT Fisheries-Taiwan
(ESC Agenda Item 4.1)

(b) 2019 (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	15	34	44.12%	1553961	5988463	25.95%	3852	17511	22%
	2	1	1	100%	7854	10500	74.80%	-	-	-
	3	1	2	50%	6324	9900	63.88%	-	-	-
	4	5	8	62.50%	113158	393745	28.74%	12	65	18.46%
	5	9	21	42.86%	379337	1378395	27.52%	346	1219	28.38%
	6	15	33	45.45%	442122	1600370	27.63%	1162	4737	24.53%
	7	13	28	46.43%	535180	2214453	24.17%	2202	10323	21.33%
	8	6	13	46.15%	69986	362740	19.29%	130	1150	11.30%
	9	-	1	-	-	18360	-	-	17	-
Area8	Total	12	30	40%	817054	4926875	16.58%	595	3717	16.01%
	3	8	24	33.33%	256830	1475365	17.41%	339	1390	24.39%
	4	12	29	41.38%	373544	2257934	16.54%	232	1777	13.06%
	5	8	27	29.63%	184840	1149184	16.08%	20	486	4.12%
	6	1	5	20%	1840	44392	4.14%	4	64	6.25%
Area9	Total	3	28	10.71%	55724	2030910	2.74%	9	433	2.08%
	3	-	2	-	-	37800	-	-	5	-
	4	-	4	-	-	123400	-	-	4	-
	5	1	10	10%	2125	231446	0.92%	1	55	1.82%
	6	-	10	-	-	177862	-	-	57	-
	7	-	5	-	-	146650	-	-	53	-
	8	2	13	15.38%	37024	530528	6.98%	3	139	2.16%
	9	2	9	22.22%	16575	330974	5.01%	5	92	5.43%
	10	-	4	-	-	152400	-	-	28	-
	11	-	2	-	-	202350	-	-	-	-
	12	-	2	-	-	97500	-	-	-	-
	Area14	Total	11	50	22%	579210	6887132	8.41%	390	12899
2		-	2	-	-	9400	-	-	-	-
3		-	1	-	-	12180	-	-	-	-
4		-	1	-	-	3780	-	-	-	-
5		4	18	22.22%	44614	427958	10.42%	-	61	-
6		7	33	21.21%	242533	1953445	12.42%	179	2351	7.61%
7		5	34	14.71%	140155	1518876	9.23%	69	6928	1%
8		8	29	27.59%	118920	1804283	6.59%	142	3418	4.15%
9		1	17	5.88%	32988	818140	4.03%	-	139	-
10		-	7	-	-	203670	-	-	2	-
11		-	2	-	-	99600	-	-	-	-
12		-	3	-	-	35800	-	-	-	-
Grand Total		18	72	25.00%	3005949	19833380	15.15%	4846	34560	14.02%

* The areas with observer deployed.

Table 2 Number of biological samples collected by observers in 2018 and 2019

Year		2018	2019
SBT catch data recorded		3854	4857
SBT length measured		3852	4854
Otolith	SBT	106	110
Gonad	SBT	134	257
Muscle	Sharks	11	2
Vertebra	Sharks	93	1
caudal peduncle	Mahi mahi	51	136

Table 3 Number of the length measurements per species by area and by month
(a) 2018

Area	Area 2					Area 8				Area9					Area 14					Area15			
	4	5	6	7	8	3	4	5	6	3	4	5	6	7	4	5	6	7	8	9	4	5	8
Albacore	491	1414	3637	3323	1052	2397	3849	4507	1471	1789	1729	103	102	6	67	1708	3247	2848	2095	353	63	117	29
Bigeye tuna	3	22	60	118	25	26	67	51	30	11	7	15	20	3	-	194	164	127	175	16	2	3	-
Black marlin	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blue marlin	-	-	1	1	-	-	1	1	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-
Pomfrets	1	5	29	17	24	3	9	2	-	-	1	5	-	-	2	3	7	9	23	-	-	-	-
Blue shark	2	16	12	65	23	97	158	56	6	-	49	1	7	3	3	32	27	62	58	8	-	-	1
Butterfly kingfish	16	31	7	4	6	1	34	12	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-
Rudderfish	-	-	2	2	2	-	2	3	3	-	-	1	-	-	-	1	4	2	-	-	-	-	-
Common dolphinfish	-	5	5	2	-	3	35	70	-	22	34	-	-	1	3	72	11	2	14	2	-	-	-
Silky shark	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Opah	51	164	316	348	268	150	443	475	113	81	134	1	10	1	4	173	275	158	272	62	-	-	-
Escolar	1	38	167	137	66	29	71	73	38	7	144	537	647	249	3	165	213	1059	918	51	2	1	1
Striped marlin	-	1	-	1	-	-	2	-	-	-	-	-	-	-	-	10	1	1	2	-	-	-	-
Ocean sunfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Oilfish	-	1	3	2	7	2	2	3	2	-	217	1462	1777	980	-	60	114	1353	1090	7	3	-	-
Rainbow runner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Southern bluefin tuna	2	114	556	581	1112	135	61	124	175	1	2	9	10	7	-	17	370	388	182	-	3	2	1
Indo-Pacific sailfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-
Skipjack tuna	-	-	-	-	-	-	2	2	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-
Shortfin mako	-	1	8	5	5	7	3	3	-	3	1	4	4	3	-	4	6	8	4	-	-	-	-
Shortbill spearfish	-	1	4	7	-	-	2	2	-	1	3	-	-	-	-	16	6	3	2	-	-	-	-
Swordfish	6	12	28	16	8	1	11	11	6	1	6	4	7	4	-	8	12	12	7	-	-	-	-
Wahoo	-	5	2	18	2	-	21	29	-	1	3	2	-	-	3	96	49	17	26	8	-	-	-
Yellowfin tuna	-	18	1	4	-	-	38	14	1	5	14	7	7	1	1	111	57	24	68	1	-	2	-

CCSBT-ESC/2008/SBT Fisheries-Taiwan
(ESC Agenda Item 4.1)

(b) 2019

Area	Area 2							Area 8				Area 9			Area 14				
	2	3	4	5	6	7	8	3	4	5	6	5	8	9	5	6	7	8	9
Albacore	13	31	3416	7039	4922	5982	468	4632	7599	3778	51	20	10	4	642	3793	1440	934	13
Bigeye tuna	-	-	9	27	71	126	6	5	29	28	-	1	3	2	15	77	80	63	3
Black marlin	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-
Pomfrets	-	-	-	3	6	10	6	28	44	26	-	-	-	-	2	61	3	-	-
Blue shark	2	1	42	52	27	59	29	184	79	21	1	-	4	2	2	14	8	27	3
Butterfly kingfish	-	-	33	74	30	13	-	63	87	1	-	-	-	-	-	2	2	-	-
Blue marlin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Rudderfish	-	-	-	-	2	8	-	-	1	1	-	-	-	-	4	5	-	3	-
Common dolphinfish	1	2	-	7	4	4	-	1	109	35	-	-	-	-	13	11	6	1	-
Kawakawa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8	1	-	-
Opah	-	4	246	695	445	821	120	578	753	263	3	4	1	1	27	176	84	85	2
Escolar	-	-	1	53	212	393	8	8	55	91	-	-	413	156	63	317	210	546	398
Striped marlin	-	-	-	-	-	2	-	-	1	2	-	-	-	-	1	2	-	-	-
Ocean sunfish	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Oilfish	-	-	1	11	10	44	22	6	2	10	-	-	660	180	7	9	58	355	504
Pelagic fishes nei	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	1	-	5	-
Southern bluefin tuna	-	-	12	346	1162	2210	130	339	232	20	4	1	3	5	-	179	69	142	-
Skipjack tuna	-	-	-	-	1	1	-	-	-	1	-	-	-	-	5	2	-	4	-
Shortfin mako	-	-	2	2	13	17	2	9	8	8	-	1	6	-	1	5	5	5	2
Longbill spearfish	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shortbill spearfish	-	-	1	9	4	3	-	1	8	3	-	-	-	-	3	2	1	1	-
Swordfish	-	-	8	37	36	50	8	5	18	19	-	-	-	1	9	21	11	15	9
Tunas nei	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Wahoo	2	1	-	4	13	13	3	-	4	29	-	1	-	-	22	19	7	13	-
Yellowfin tuna	-	-	-	3	7	30	8	1	4	4	-	4	-	-	24	40	19	45	2

Table 4 Number of SBT tag returned during 2002-2019

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
2017	0	0	0
2018	0	0	0
2019	0	0	0
Grand Total	779	693	86