

## **Review of Taiwan SBT Fishery of 2009/2010**

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### **1. INTRODUCTION**

Southern Bluefin Tuna (*Thunnus maccoyii*, SBT) was by-catch of Taiwanese tuna longline fishery targeting albacore in the past, but after the fishing vessels equipped with deep-frozen freezers, some fishing vessels operating in the Indian Ocean started targeting SBT seasonally since 1990s. The annual catches of SBT were less than 250 MT in early 1980s (Table 1); after then with the increase of fishing fleet size and the expansion of fishing grounds, the catches of SBT increased thereafter.

From 1989 onwards, the annual catches of SBT were over 1,000 MT, of which the catches of drift net accounted for about 25% of the total catches in 1989 and 1990. The catches of SBT kept stable between 800 and 1,600 MT from 1991 to 2001. Since 2002 Taiwan has become the member of the Extend Commission of CCSBT and commences to restrain its annual catch of SBT to its national allocation of 1,140 MT. The annual catches of SBT fluctuated between 841 MT and 1,298 MT from 2002 to 2009.

In 2010, the annual catch of SBT was 1,140 MT for quota year and 1,208 MT for calendar year. Taiwan's SBT quota for the 2010 and 2011 quota year was set 1,718 MT. Therefore, the remainder quota of Taiwan is 578 MT in 2011 fishing season. Table 1 shows the annual catches of SBT by gear from 1972 to 2010.

### **2. CATCH AND EFFORT**

There are 3 types of data collected to compile the catch and effort data for SBT, namely, (1) weekly reports (SB data), (2) logbooks (LG data) and (3) commercial trading information including statistical/catch documents of trade information scheme/catch documentation scheme and certified weight reports provided by the Organization for the Promotion of Responsible Tuna Fisheries (OPRT) (OT data).

In addition to the requirement of logbook, the masters of fishing vessels authorized to fish for SBT are required to send their weekly catch reports of SBT with individual weight, length and location, to Fisheries Agency of Taiwan since 2002. However, the weekly report has only the catch information of SBT without other tuna and tuna-like information. The trading information on SBT product has also been collected through the subscription of certified weight reports of Shin Nippon Kentai Kaisha from 1994 to 2003, and through OPRT since 2004. The weekly reports of fishing vessels have been crosschecked with the logbook and trading information.

Considering the catch record of weekly report and CDS was measured at sea, the high waves in southern Indian Ocean may affect the precision of measurement. In accordance with our regulation, fishers shall submit the invoice to Fisheries Agency after sale. According to the record we received, for 2010 fishing season, the whole weight of landing was 1,104 tons for quota year and 1,208 tons for calendar year. The annual catch of SBT by gear from 1972 to 2010 is shown in Table 1. The catch distribution of those vessels seasonally targeting SBT from 2007 to 2010 is mapped in Figure 1 and the catch distribution for by-catch vessels is mapped in Figure 2.

### **3. NOMINAL CPUE**

The catch of SBT was relatively low compared with the catches of other tuna and tuna-like species for Taiwanese deep-sea tuna longline fishery and there was no separate 'SBT' item on logsheet issued to fishers before 1994. Because the catch information on SBT collected through logbook system is insufficient to reflect the fishing pattern, the weekly report data system has become the major source of catch and effort information since 1996. However, since the weekly report system was designed for monitoring the SBT catch so as to manage the quota allocation rather than to replace the logbook system on catch and effort data collection, the fishing effort information was collected incompletely, and this could lead to over-estimation of CPUE of Taiwanese vessels authorized to fish for SBT. Since 2002, the catch and effort information was requested to be recorded in the weekly report and improvement of logbook recovery, the CPUE over-estimation has been improved.

For estimation of CPUE, the nominal CPUE series were derived from the LG data of active vessels authorized to seasonally target SBT operating in the southern area of 20°S. Based on the catch distribution of SBT and the fishing season of Taiwanese fishing vessels, the fishing ground could be roughly divided into two areas: one is around the waters of the southern central Indian Ocean (Area1, in the area of 20°S-40°S and 50°-110°E), and the other is around the southeastern waters off South Africa (Area 2, in the area of 20°S-45°S and 20°E-50°E) (Figure 3). Figure 4 shows the nominal CPUE trend of Taiwanese fishing vessels operating in these two areas during 2002-2010. The CPUEs (number of SBT caught per 1000 hooks) during 2002-2010 appeared to be varied from 0.86 to 3.51 and from 0.4 to 1.02 for Area 1 and 2, respectively. CPUEs in Area 1 were apparently higher than those in Area 2. The CPUE of 2010 is preliminarily estimated and may be revised in the coming year.

#### **4. SIZE COMPOSITION**

The measurement scheme of catch length has been applied to Taiwanese deep-sea longline fishery statistical system. Fishers are requested to measure the fork length of the first 30 specimens from daily catch, and fill the length data in logbook. Besides, fishers have to report SBT catch positions and weights on weekly basis to Fisheries Agency since 1996, and they are also requested to report the individual length of SBT caught since 2002. Figure 5 shows the distributions of length frequency of SBT caught in Area 1 and 2 during 2005-2010. Although the distributions mainly concentrate at the range of 100 cm to 140 cm for both areas, the length frequency in Area 2 distributed with a wider range than that in Area 1. The length frequency data of 2010 is preliminary and may be revised in the coming year.

#### **5. FLEET SIZE AND DISTRIBUTION**

According to the record of weekly report and trading information, there were more than 100 vessels fishing for SBT during 1998-2001. Since 2002, vessels fishing for SBT including seasonal target and by-catch shall be authorized in advance of fishing season every year, and individual quota allocation system to each vessel has also been established. The number of active vessels fishing for SBT was 30-100 from

2002 to 2010 shown as Table 2. During 2005-2009, the number of vessels fishing for SBT significantly decreased. The major reason was that partial vessels shifted to target oil fish around the waters off South Africa. In 2010, due to increasing threat of Somalia piracy, partial vessels operating in northern Indian Ocean were permitted to move to southern Indian Ocean to target temperate tuna and tuna-like species. This resulted in an increase of number of vessels fishing for SBT from 67 in 2009 to 82 in 2010 fishing season.

Taiwanese fishing vessels seasonally targeting SBT mainly operated in the waters of 20°S - 40°S in the Indian Ocean and the areas adjacent to the Atlantic Ocean. There were two major fishing grounds in general: one is in the southern central Indian Ocean around 50°E-105°E, 20°S-40°S, and the other one locates in the southeastern waters off Africa around 20°E-50°E, 25°S-45°S. Seasonally, SBT was caught in the southern and central Indian Ocean from April to September, and in the southern and western Indian Ocean extending to the eastern boundary of the Atlantic Ocean from October to February of the following year.

## **6. SCIENTIFIC OBSERVATION PROGRAM**

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

## **7. OTHER RELEVANT INFORMATION**

The collaboration between Taiwan and Australia on SBT archival tagging program was initiated in 2004. The observers deployed on SBT fishing vessels carried out the SBT tagging program for 4 years (2004-2007). There were 37, 48, 25 and 75 archival tags successfully settled in 2004, 2005, 2006, and 2007 respectively. The program ended in 2007.

Table 1. Annual SBT catches by gear for Taiwanese fishing vessels during 1972-2010  
calendar year

Unit: MT

Year	Longliner	Drift Net	Total
1972	70		70
1973	90		90
1974	100		100
1975	15		15
1976	15		15
1977	5		5
1978	80		80
1979	53		53
1980	64		64
1981	92		92
1982	171	11	182
1983	149	12	161
1984	244	0	244
1985	174	67	241
1986	433	81	514
1987	623	87	710
1988	622	234	856
1989	1,076	319	1,395
1990	872	305	1,177
1991	1,353	107	1,460
1992	1,219	3	1,222
1993	958		958
1994	1,020		1,020
1995	1,431		1,431
1996	1,467		1,467
1997	872		872
1998	1,446		1,446
1999	1,513		1,513
2000	1,448		1,448
2001	1,580		1,580
2002	1,137		1,137
2003	1,128		1,128
2004	1,298		1,298
2005	941		941
2006	846		846
2007	841		841
2008	913		913
2009 <sup>1</sup>	921		921
2010 <sup>2</sup>	1208*		1208*

<sup>1</sup> Catch by quota year in 2009 ( from 2009/4/1 to 2010/3/31): 949 MT

<sup>2</sup> Catch by quota year in 2010 ( from 2010/4/1 to 2011/3/31): 1,140\* MT

\*landed weight

Table 2. The number of active vessels fishing for SBT during 2002-2010.

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

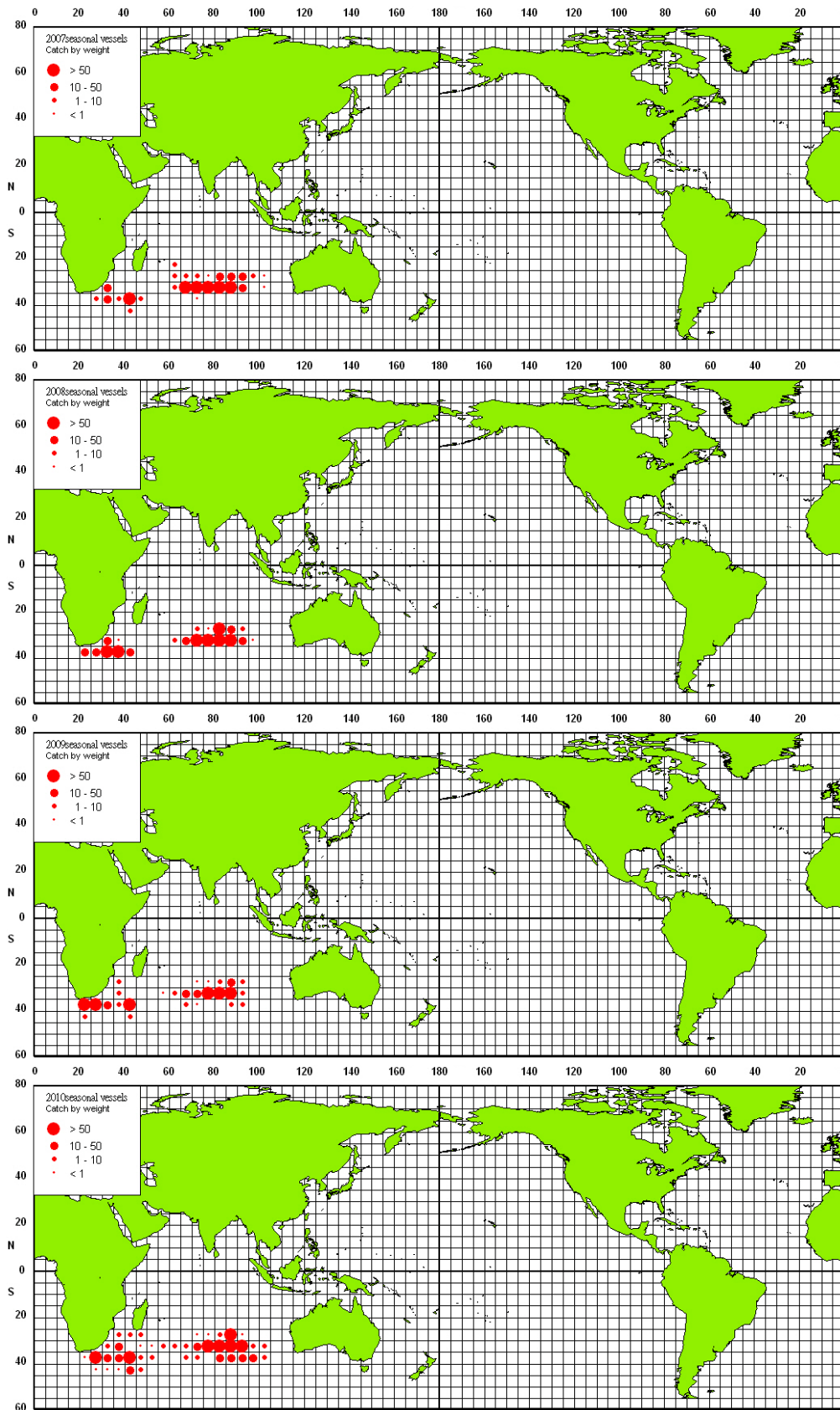


Fig. 1 The SBT catch distribution of Taiwanese fishing vessels seasonally targeting SBT during 2007-2010

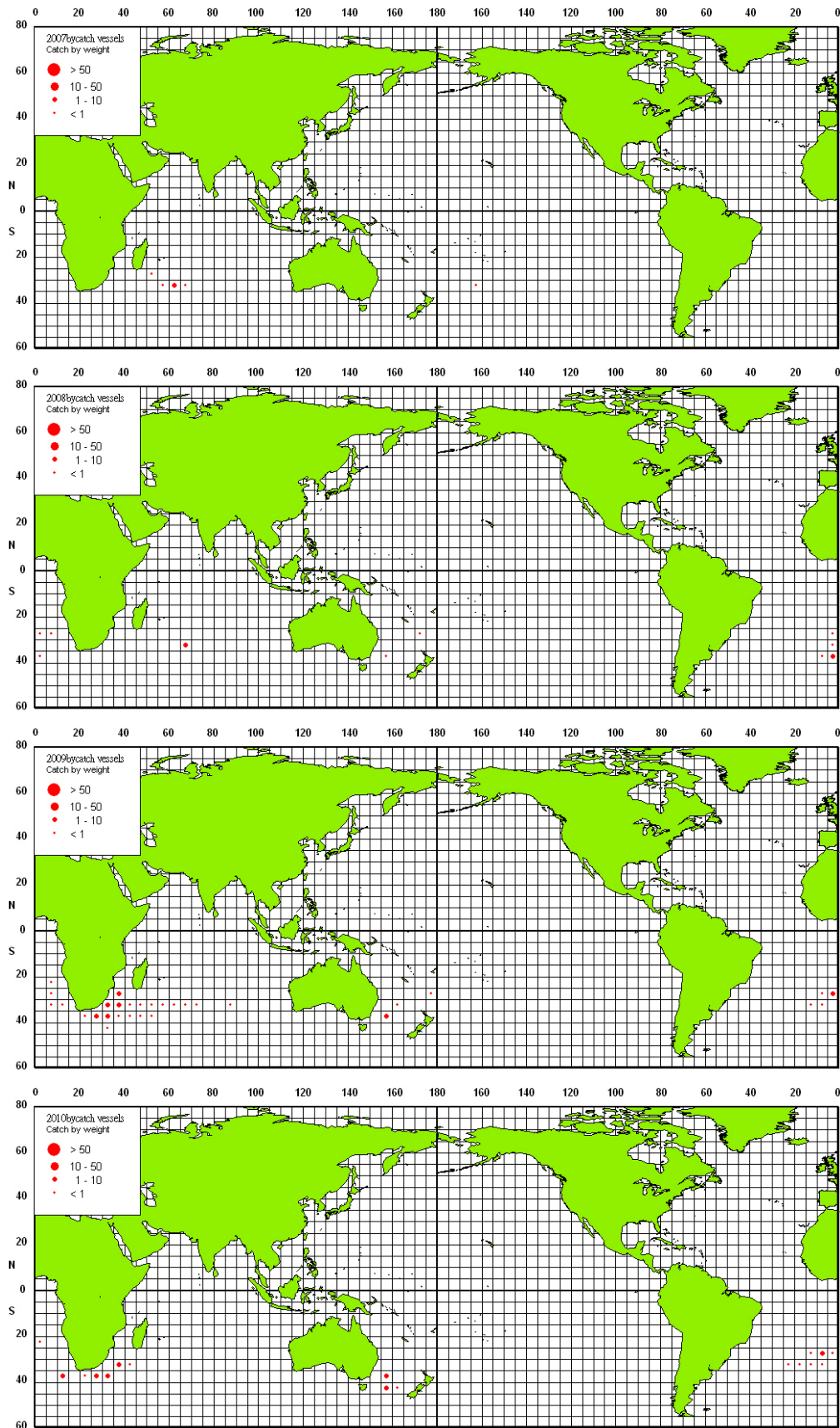


Fig. 2 The SBT by-catch distribution of Taiwanese fishing vessels during 2007-2010



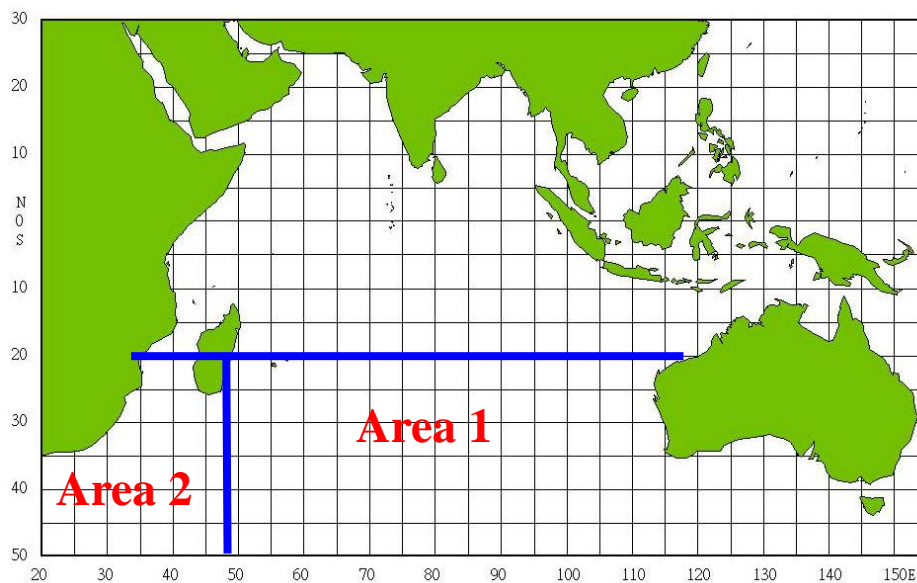


Fig 3. Fishing grounds of Taiwanese seasonally targeting SBT vessels

*Nominal CPUE of SBT seasonal vessels operating in different Area*

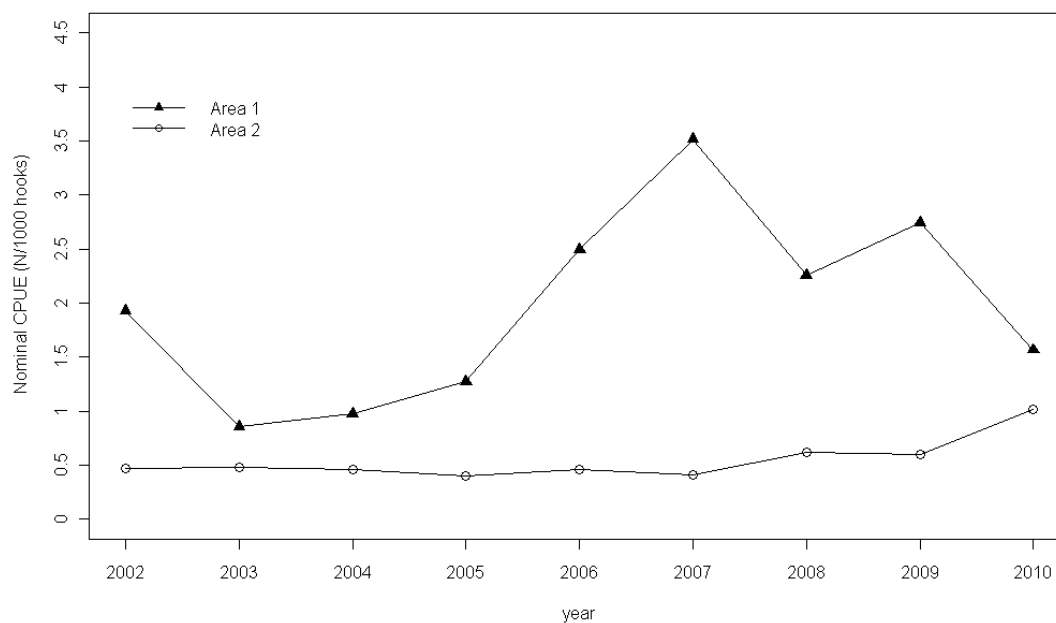
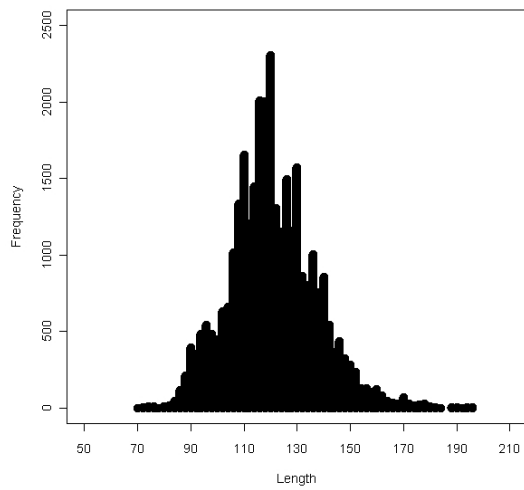
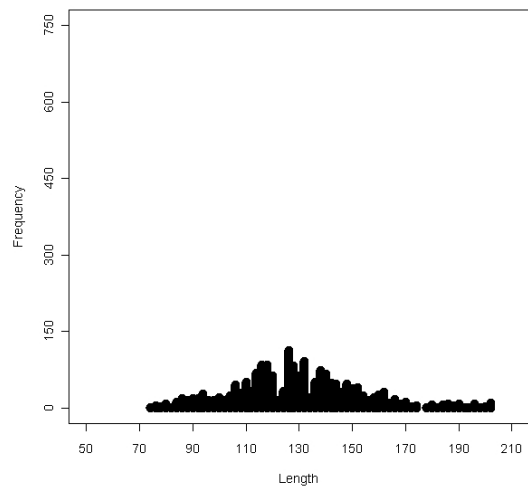


Fig 4. The nominal CPUE series of Taiwanese seasonally targeting SBT vessels operated in Area1 and Area2 during 2002-2010 (data of 2010 is preliminary).

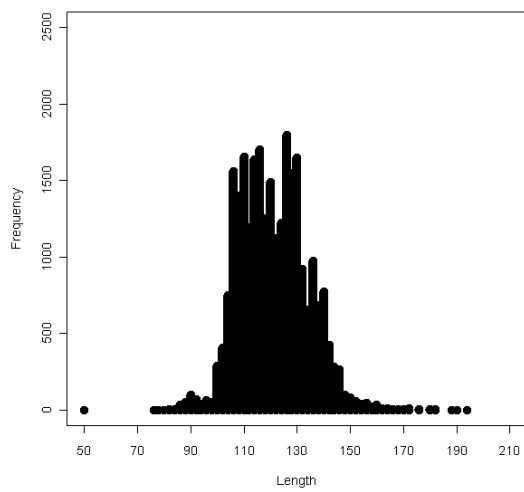
*FL-length frequency distributions of Area 1 in 2005*



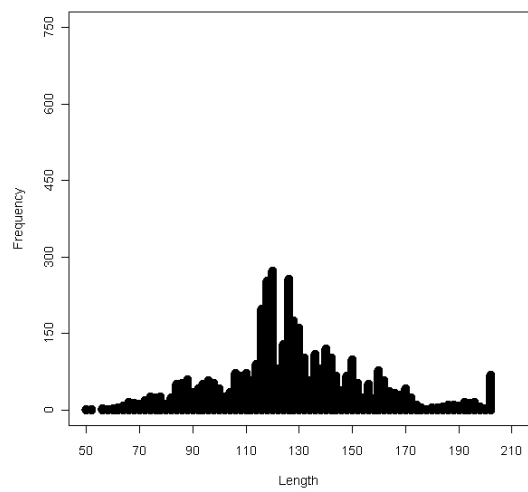
*FL-length frequency distributions of Area 2 in 2005*



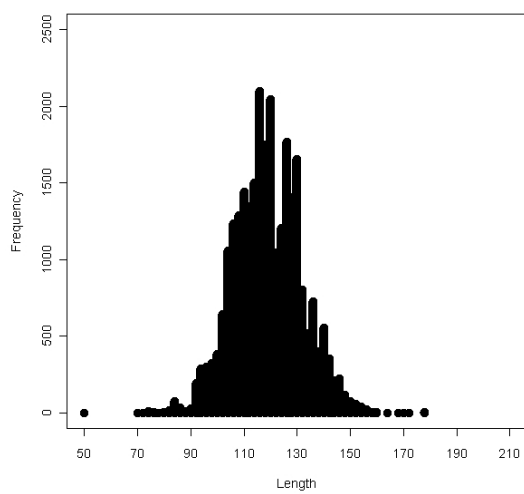
*FL-length frequency distributions of Area 1 in 2006*



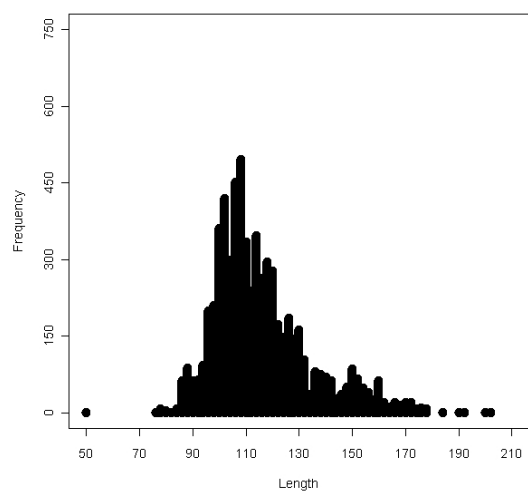
*FL-length frequency distributions of Area 2 in 2006*



*FL-length frequency distributions of Area 1 in 2007*



*FL-length frequency distributions of Area 2 in 2007*



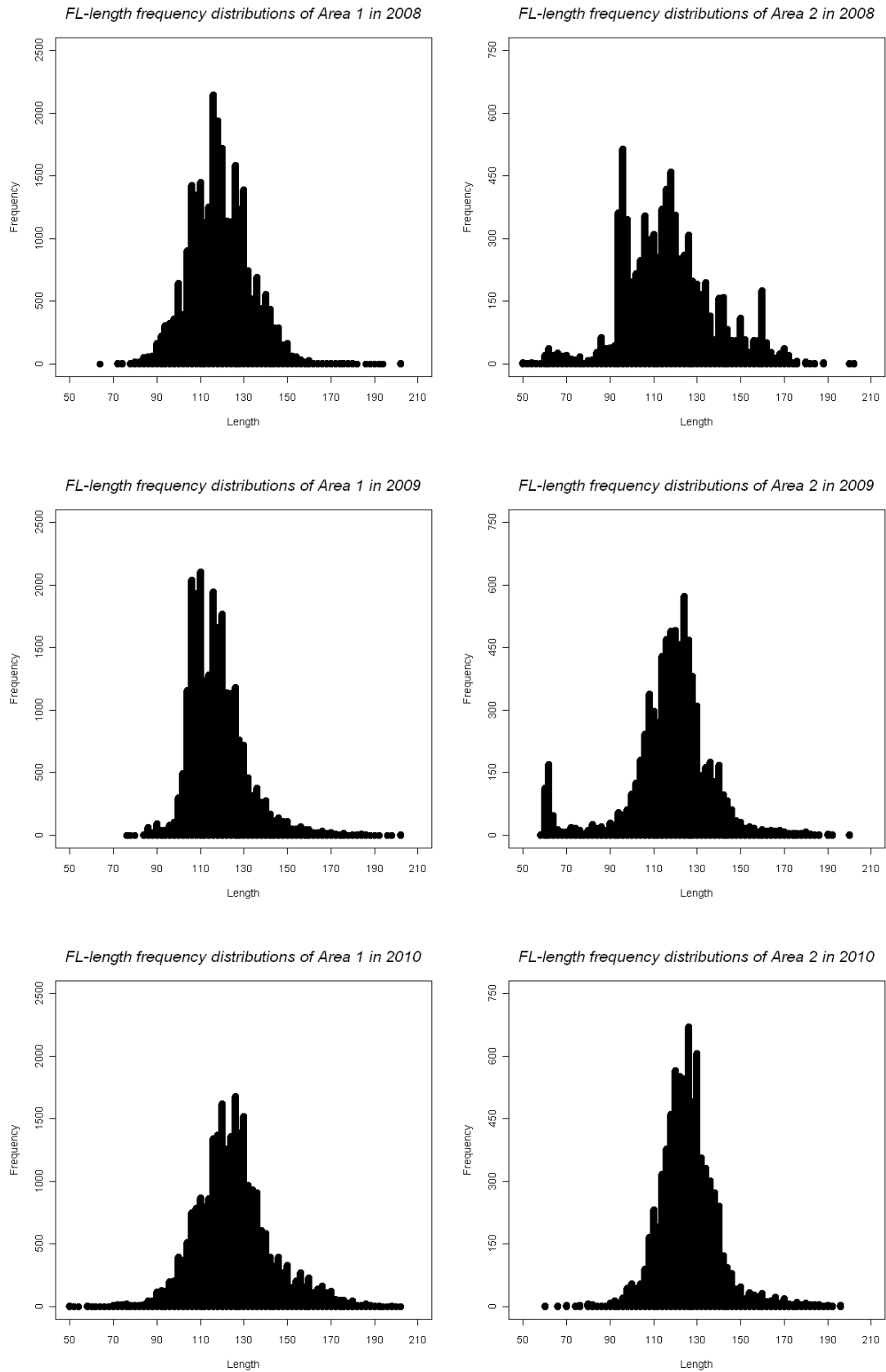


Figure 5. The FL-length frequency distributions of SBT caught by Taiwanese longline fishery in Area1 and Area2 during 2005-2010 (data of 2010 is preliminary).

## Appendix 1

### Scientific observer program

#### **Observer Training**

To collect scientific information of tuna longliners, the scientific observer program of deep-sea tuna fisheries of Taiwan was launched in 2001. However, observers deployed on vessels seasonally targeting SBT commenced in 2002.

Fisheries Agency (FA) is responsible for implementing the program and recruiting scientific observers. FA also invited researchers on fishery sciences and senior observers (with 2-year's experience) 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 qualification for observers is college graduated or senior high school graduated with at least 5-year 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 3-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 the training program, 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.

## **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. Since 2008, observers have been requested to accept a debriefing after completing the trip.

In 2008, due to high fuel price, for saving cost, fishing vessels reduced to enter ports and meet transshipping vessels, it was difficult to deploy observer on board, so that only 2 observers were placed on 2 seasonally targeting SBT vessels. In 2010, 7 observers were deployed on 11 fishing vessels seasonally targeting SBT. There were 964 fishing days and 2,383,058 hooks observed by observers. The observer coverage rate by vessels was about 16.67%, 11.95% by hooks and 8.35% by catch in 2010. Table 1 shows the summary results for scientific observer program from 2002-2010.

## **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 samplings include measuring length and weight, recording the first 60 fish, and collecting otoliths, muscle tissues, stomach content and gonads of SBT. Figure 1 shows SBT catch distributions of observed vessels during 2005-2010.

In 2010, 2,605 SBT catch data were recorded, 2,308 SBT lengths were measured, and 219 SBT otoliths and 179 SBT muscle were sampled. Table2 shows the results of SBT biological data collected by observers from 2002 to 2010.

## **Tag Return Monitoring**

There was no tagged SBT recaptured during the presence of observer on board during 2008-2010. The tags returned by Taiwanese fishing vessels are 753 in total among which 667 were released by the CCSBT and 86 tagged by CSIRO during 2002-2010. The details of tag recaptures for each year are shown in Table 3. 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. Since the homeport is far from the fishing ground, it will take more than 1 month to transport the supplies and equipments needed for sampling from Taiwan to fishing ground, and sometimes the supplies could not reach to observers on board in time. Besides, samples collected by observers were sometimes missing 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 finalized SBT fishing.

Table 1. Summary of results for scientific observer programs during 2002-2010.

Year	Observers Deployed	Observed Trips	Sea Days	Set Observed	Observed Vessels (%)	Observed Effort (%)	Observed catch (%)
2002	1	1	202	126	4.76	6.57	1.44%
2003	2	2	177	133	2.63	2.43	0.86%
2004	3	5	263	165	3.8	4.17	3.10%
2005	4	4	681	444	8.16	11.57	9.62%
2006	3	3	296	253	9.09	10.46	6.08%
2007	4	4	441	394	14.81	14.84	13.72%
2008	2	2	252	227	5.71	6.65	3.63%
2009	5	6	531	457	18.18	15.01	12.75%
2010	7	11	964	927	16.67	11.95	8.35%

\*Data from 2009 was for quota year.

Table 2. Biological samples collected by observers during 2002-2010.

Year	SBT catch data recorded (No. of fish)	SBT length measured (No. of fish)	Number of otolith collection	Stomach content (No. of fish)	Number of Muscle collection
2002	498	338	-	-	-
2003	226	174	102	-	-
2004	1295	1290	316	93	-
2005	3200	2217	210	257	-
2006	1863	1484	56	57	-
2007	4632	4043	197	189	-
2008	1219	1049	73	45	-
2009	4045	3958	155	-	159
2010	2605	2308	219	101	179

Table 3. Number of SBT tag returned by Taiwanese fishing vessels during 2002-2010.

Year	CCSBT	CSIRO	Total
2002	2	16	18
2003	24	18	42
2004	112	21	133
2005	204	25	229
2006	253	6	259
2007	40	0	40
2008	5	0	5
2009	0	0	0
2010	27	0	27
Sum	667	86	753

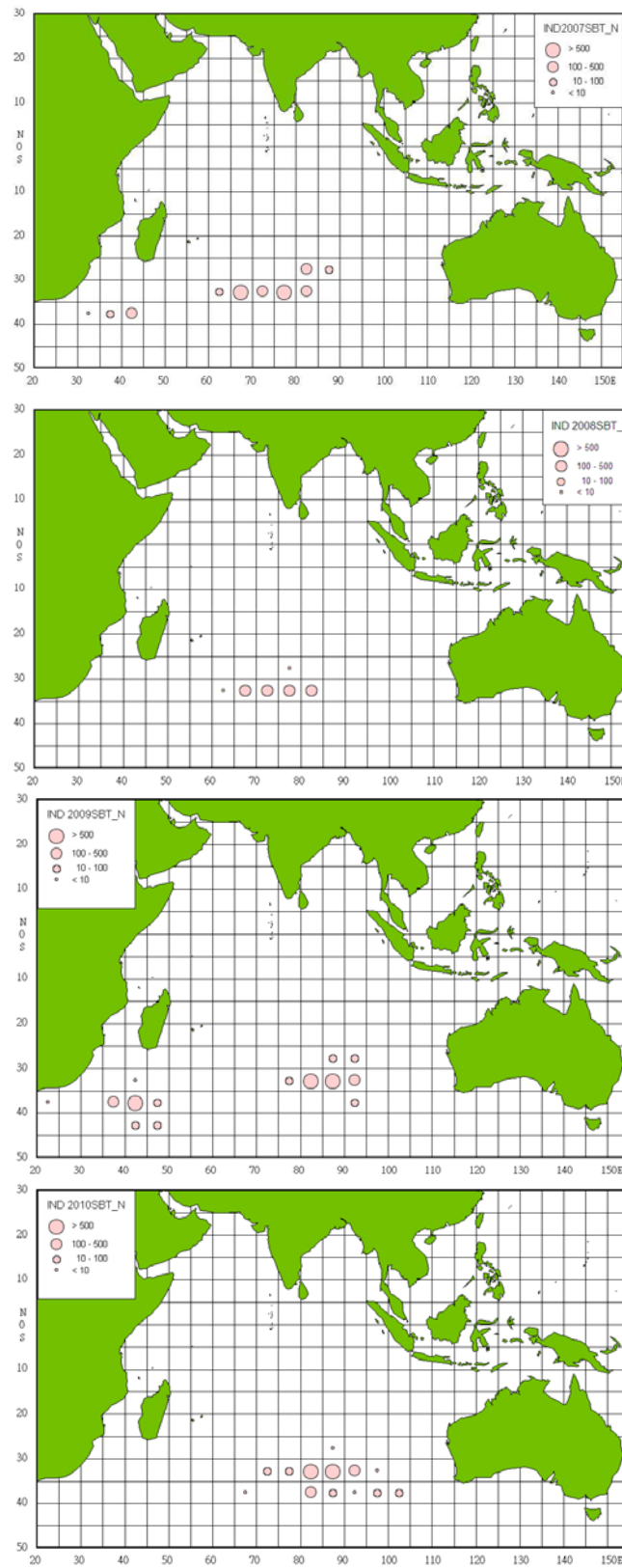


Figure 1 The SBT catch distributions of observed vessels during 2007-2010.