Report of Japanese scientific observer activities for southern bluefin tuna fishery in 2009/2010

ミナミマグロ漁業における日本の科学オブザーバの活動報告：2009/2010 年

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要約

2009 年度に水産庁は商業延縄漁船 7 隻へ科学オブザーバを派遣し調査を実施した。オブザーバの乗船中に 4 海区で 2 隻、8 海区で 3 隻、9 海区で 3 隻がそれぞれ操業を行った。調査カバー率は、隻数で 7.4%、使用釣鈎数で 7.0%、ミナミマグロ漁獲尾数で 4.6%であった。オブザーバが実際に観察した時間を考慮すると、観察釣鈎数は全操業の 4.8%と推定された。4,8,9 海区においてオブザーバが記録した漁獲体長と、同海域で RTMP により報告された漁獲体長には部分的に差が見られた。オブザーバは乗船中にミナミマグロから耳石（279 個体分）、胃内容物（253 個体分）、および筋肉（321 個体分）の生物標本を採集し、通常標識 18 個体分を回収した。2009 年度のオブザーバ派遣に要した費用は総額 1,688 万円（197,469 米ドル）であった。

Summary

In 2009/2010, Japanese scientific observers were sent to seven longline vessels for the observer program of southern bluefin tuna (SBT). These scientific observers were employed by the Fisheries Agency of Japan. Two vessels with observer operated in area 4, three vessels operated in area 8, and three vessels operated in area 9. Observer coverage against all of Japanese SBT longline fishing was 7.4% in the number of vessels, 7.0% in the number of hooks used, and 4.6% in the number of SBT caught (coverage of hook and SBT were calculated for Apr. 2009 -Jan. 2010 in area 4-9). Taking into account of the duration of observed during hauling, the number of hooks observed was estimated as 4.8% against all hauling durations by all SBT vessels. Partly, there were some differences in the length frequency distributions between vessels with observers and all vessels in area 4, 8, and 9. Observers collected the otolith (from 279 individuals), stomach (from 253 individuals), and muscle (from 321 individuals) as the scientific sample of SBT, and retrieved the 28 conventional tags (from 18 individuals). The total costs of the observer program in 2009/2010 were 16,877,683 yen (US$197,469).

1. 科学オブザーバの訓練　Training of the scientific observers

2009 年度には、ミナミマグロ操業を行う商業延縄船へ派遣する前に 7 名のオブザーバを訓練した。うち 4 名は過去にミナミマグロ科学オブザーバを多く経験した者である。全てのオブザーバは 2 日間、調査方法、記録方法、および安全確保について研修を受けた。研修では、テキストに基づく講習に加え、実物の魚を用いて生物サンプル採取方法の実習を行なった。日本帰国後にはオブザーバ活動の報告が行われ、次年度以降のオブザーバ活動の改善につなげた。

In 2009, Japan trained 7 observers on scientific activities before send to Japanese commercial longline vessels. Four observers of them had much experience of scientific observer for Southern Bluefin Tuna (SBT) fisheries. They brushed up their knowledge and skills on research method, recording procedure and safety by 2 days training program. This program included the practical training with the actual tuna to collect the biological samples. After the return from the commercial longline vessels, every observer reported their observer activity. Their experiences and information were used for the improvement of next year's observer program.

2. 科学オブザーバ計画の設計と範囲　Design and coverage of the program

2009 年に RTMP において主要漁期にミナミマグロ操業を行った 95 隻の遠洋まぐろ延縄漁船のうち、ランダムに選定した 7 隻に科学オブザーバを派遣した（全体の約 7.4%）。2006 年以降のミナミマグロ漁業は、漁期規制の撤廃、IQ 制の導入、燃油の高騰、魚価の低迷等の影響により、各船の操業計画は流動的となっている(CCSBT-ESC/1009/BGD1)。そのため 2009 年度には操業隻数の少ない 5 海区および 7 海区へのオブザーバの配置が出来なかった。ミナミマグロ主要漁場で得られた操業観察データは 4 海区の 52 操業（2 隻）、8 海区の 122 操業（3 隻）、および 9 海区の 114 操業（3 隻）、合計 288 操業である（Table 1）。

Scientific observers were sent to seven vessels which were chosen at random from all Japanese vessels operated during 2009 fishing season in the CCSBT statistical Area 4-9 (95 vessels). Since 2006, annual operational pattern and schedule of Japanese longline vessels has been possibly affected by the introduction of individual quota (IQ) system, abolish of seasonal area closure, drastic/ temporal increase of fuel price, and market price slump of SBT (CCSBT-ESC/1009/BGD1). Because of these factors, annual fishing schedules of Japanese longline vessels became unpredictable, thus there were difficulties to deploy the observers to minor fishing area (e.g. area 5 and 7 in 2009). Total numbers of operation observed in area 4, 8 and 9 were 288 (52 operations in area 4, 122 operations in area 8, and 114 operations in area 9).

3. 収集したオブザーバデータ　Collected data by the scientific observers

海域ごと、月ごとの隻数、努力量（釣鈎数）および漁獲尾数、全体に占めるカバー率を Table 1 に示す。比較には、CCSBT へ提出したデータ（努力量、漁獲尾数）、および RTMP データ（操業隻

数）を用いた。推算されたカバー率は、隻数で 7.4%（4 海区で 10.5%、8 海区で 6.7%、9 海区で 7.7%）、使用釣鈎数で 7.0%（4 海区で 15.9%、8 海区で 6.0%、9 海区で 7.8%）、ミナミマグロ漁獲尾数で 4.6%（4 海区で 5.6%、8 海区で 3.8%、9 海区で 5.9%）であった。なお、釣鈎数と漁獲尾数のカバー率の総計は 2009 年 4 月～2010 年 1 月の 4～9 海区で集計している

オブザーバは、食事の休憩や天候等の要因により操業を観察しない場合がある。2009 年には、オブザーバの乗船期間中の全操業 336 回のうち、320 回の操業（95.2%）で実際に調査が行われた。これらの調査を実施した操業では、総揚縄時間 4346 時間のうち 3141 時間（72.3%）で実際に観察が行われた（Table 2）。よって、オブザーバが実際に観察した鈎数の割合は、平均 4.8%（7.0%×95.2%×72.3%）と推定された。なお、オブザーバが調査を行った 320 回の操業のうち、ミナミマグロ主要漁場（4～9 海区）での操業は 279 回（87.2%）、他の魚種が対象の操業（12 および 15 海区）は 41 回（12.8%）だった。

体長を測定した種別個体数を海域･月別に Table 3 に示す。全体では 18,947 個体の体長を測定し、このうちミナミマグロは 2,163 個体であった。ミナミマグロ以外の魚で測定個体数の多かったのは、ビンナガ 7,046 個体、ガストロ 1,149 個体、キハダ 968 個体であった。オブザーバは乗船中に耳石、胃、筋肉などの生物標本を収集した（Table 4）。ミナミマグロからは 279 個体から耳石を、253 個体から胃内容物を、321 個体から筋肉を採集した。また、ミナミマグロ 2,058 個体、合計 8,670 個体について性別を判定した。

Table 1 summarizes the catch-and-effort data reported from scientific observers and longline fishermen. The data reported from the fishermen was based on the RTMP or logbook; the number of catch-and-effort was based on the data which was submitted to CCSBT and the number of the operated vessels was based on the RTMP. On the basis of these data sets, we calculated observer coverage. Total numbers of hooks and SBT for the calculation of the coverage were aggregated between April 2009 and January 2010 in area 4-9. The coverage rates were 7.4% in the number of vessels (10.5% in area 4, 6.7% in area 8, and 7.7% in area 9), 7.0% in the number of hooks used (15.9% in area 4, 6.0% in area 8, and 7.8% in area 9) and 4.6% in the number of SBT caught (5.6% in area 4, 3.8% in area 8, and 5.9% in area 9). Scientific observer did not observe whole of the hauling operation because of rest for meal, rough weather condition and the other reasons. Table 2 summarizes the actual observed time rate while the observers were on board. In 2009, the observers monitored 320 / 336 operations (95.2%), and actually observed 3141 / 4346 hours (72.3%) of those operations. Thus, the coverage of effort which was actually observed by the observers was estimated as 4.8% (7.0% of 95.2% of 72.3%) on average. The operations observed in the major fishing ground of SBT (area 4-9) were 279 (87.2%), and in the fishing ground for the other tunas (area 12 and 15) were 41 (12.8%).

Table 3 summarizes the number of individuals whose length was measured by the observers by area and month. Total number of measurements was 18,947, including 2,163 SBT. Other dominant fish species which were measured were Albacore (n=7,046), Butterfly tuna (n=1,149), Yellowfin tuna (n=968). Biological samples were also collected (Table 4) such as otoliths from 279 SBT, stomachs from 253 SBT, and muscle tissues from 321 SBT. Observer identified sex of 8,670 individuals, including 2,058 SBT.

4. 体長組成データの分析 Analysis of length frequency data

観察されたミナミマグロの体長組成を海域ごとに Fig.1 に示す。各海域の全操業船によるデータは、オブザーバ調査が実施された時期（4 海区は 6-8 月、8 海区は 8-12 月、9 海区は 6-10 月）について抽出した。オブザーバが観察した体長分布と、全操業船から報告された体長分布とでは、類似していたが､詳細に見ると 9 海区の 100-120cm 前後の小型魚の体長組成には差があった｡この差は、一部の日本延縄漁船が小型魚を船に取り込まずに放流したことに起因する可能性が高い。なお、放流魚は CCSBT の枠組みにおいて各国のクオータには含まれないことに留意されたい。日本のクオータにより漁獲された全てのミナミマグロは、漁業者により漁獲時に体重と体長が測定され水産庁へ報告されている。これらの報告漁獲量は日本の港での水揚げの際に政府職員により検査されていることにも留意されたい。

Fig. 1 shows the comparison of the SBT length frequencies between the observer data and RTMP. The time periods and area for the comparison were June-August in area 4, August-December in area 8 and June-October in area 9, which corresponded to the observed periods and area by the scientific observer. The length frequency distributions of the observer data and RTMP data were similar to each other, but seeing in detail, there was a discrepancy around 100-120 cm FL in area 9. The reasons for this difference would be the release of small fishes conducted by some fishermen. Meanwhile, it should be noted that released SBT is not included in the national quota within the CCSBT. Furthermore, it should be noted that all SBT caught under the Japanese national quota are measured in weight and length at the time of catch and inspected by governmental officials at the timed of landing at a port in Japan.

5. 標識魚の再捕 Tag recaptures by the observed vessels

調査を通じて回収したミナミマグロ標識（通常標識）は、5 隻から 18 個体分（CCSBT タグ 14 個体分（24 本)、CSIRO タグ 3 個体分（3 本)、豪州の NSW 州にて遊魚により放流されたタグが 1 個体分（1 本)）であった。

Scientific observer collected 28 conventional tags from 18 recaptured SBT on 5 vessels. The recaptured conventional tags included 3 “CSIRO” tags (from 3 SBT), 24 “CCSBT” tags (from 14 SBT), and 1 “NSW” tag (from 1 SBT).

6. 科学オブザーバ事業の問題点 Problem of the scientific observer program

科学オブザーバ事業は、1992 年から 10 年以上にわたってほぼ一貫した方法で実施している。問題点は、この事業には多額の経費が必要なことである。2009 年度も 2007-2008 年度と同様に予算上の制約によりオブザーバ派遣人数は 7 名に留まっている。

日本の延縄漁船はコスト削減のために洋上補給し、ほとんど寄港しないため、一部のオブザーバは対象調査船への配乗時に補給船を利用した洋上転船を行った。しかし、洋上転船は補給船の運航スケジュールとの調整が必要な上､天候によっては大きな危険を伴う等の問題点が指摘されている。オブザーバの質については、経験豊富な元漁船員が多いこと、講習会及び報告会を行っていることにより良好である。しかし、過去には調査内容の理解が不十分なオブザーバが若干見られたことから、問題が見られたオブザーバを再雇用しないほか、講習会の充実、乗船中における調査内容の確認、連絡体制の確立等を図っている。

オブザーバ 7 名の雇用日数は、延べ 594 日であり、漁船への乗船実日数は 80％の 475 日であった（Table 5)。2009 年に科学オブザーバ調査に要した費用は、オブザーバへの報酬費約 832 万円（97 千ＵＳ＄)、オブザーバの派遣旅費約 597 万円（70 千ＵＳ＄)、保険・資機材他 259 万円(30 千ＵＳ＄)、総額約 1,688 万円（197 千ＵＳ＄）であった。日本はこれらの必要経費をみなみまぐろオブザーバ関連事業として支出し、責任ある漁業国としての義務を果たすよう努めている（Table 6)。

Japanese observer program has been performed systematically in consistent method since 1992. This program is very cost-intensive. In 2009, total number of observers was forced to seven by budgetary restrictions as same as in 2007-2008.

Japanese commercial longline vessels rarely come into port because of cost-cutting; thus, some observers were forced to transfer from supply vessels to fishing vessels on high seas. Transfer on high seas is risky, and magnitude of risk is depending on the weather conditions. All data and samples which are collected by the observers have good quality because most of observers are retired fisherman who has the experience of SBT fisheries. This quality was kept by not rehiring of the problematic observer and by enhancing of the training program.

Total periods of employment and cruise of 7 observers were 594 days and 475 days, respectively (Table 5). Total expenses which were spent for Japanese observer program in 2009 were 16,877,683 yen (US$ 197,469); 8,316,000 yen for the observer’s salary, 5,974,073 yen for the overseas travel expenses for observers, 292,810 yen for the insurance premium for observers, and 2,294,800 yen for the research materials. Japanese government expended these budgets in fulfilling the responsibilities as the responsible fishing nation.

Reference

Itoh, T. 2010 Change in operation pattern of Japanese SBT longliners in 2009 resulting from the introduction of the individual quota system in 2006. CCSBT-ESC/1009/BGD1 (Originally CCSBT-OMMP/1006/09)

Table 1 Observed effort and catch of SBT in Japanese longline observer program 2009.

Data of all vessels are based on catch-and-effort data which was submitted to CCSBT, but the data of number of vessels are based on RTMP data.

Area	Month	Number of vessels observed	Number of all vessels	Rate of observed vessel	Number of hooks observed	Number of hooks by all vessels	Rate of observed hooks	Number of SBT observed	Number of SBT by all vessels	Rate of observed SBT
Area4	Apr.		8	0.0%		148,400	0.0%		827	0.0%
	May		14	0.0%		683,770	0.0%		3269	0.0%
	Jun.	1	5	20.0%	91,800	152,040	60.4%	5	1565	0.3%
	July	2	3	66.7%	71,600	106,660	67.1%	395	1954	20.2%
	Aug.	1	1	100.0%	13,600	9,500	143.2%	25	33	75.8%
	Sep.		1	0.0%		14,000	0.0%		4	0.0%
Area5	July		1	0.0%		27,700	0.0%		0	
	Aug.		1	0.0%		38,200	0.0%		2	0.0%
Area7	Apr.		13	0.0%		630,366	0.0%		3260	0.0%
	May		9	0.0%		222,030	0.0%		1210	0.0%
Area8	July		10	0.0%		107,640	0.0%		304	0.0%
	Aug.	1	37	2.7%	81,400	3,208,506	2.5%	96	7,176	1.3%
	Sep.	2	35	5.7%	131,320	812,347	16.2%	250	2,129	11.7%
	Oct.	1	15	6.7%	47,300	543,476	8.7%	71	1,451	4.9%
	Nov.	1	16	6.3%	84,836	1,215,149	7.0%	87	2,629	3.3%
	Dec.	1	15	6.7%	72,707	965,365	7.5%	106	1,977	5.4%
	Jan./2010		5	0.0%		168,931	0.0%		321	0.0%
Area9	Apr.		4	0.0%		151,274	0.0%		404	0.0%
	May		17	0.0%		567,993	0.0%		2,875	0.0%
	Jun.	1	19	5.3%	29,700	1,211,353	2.5%	48	3,455	1.4%
	July	2	31	6.5%	110,658	1,250,078	8.9%	370	7,561	4.9%
	Aug.	2	18	11.1%	48,840	640,340	7.6%	38	2,609	1.5%
	Sep.	1	5	20.0%	78,595	95,999	81.9%	198	435	45.5%
	Oct.	2	4	50.0%	50,435	150,622	33.5%	432	1,051	41.1%
	Dec.		1	0.0%		3,500	0.0%		1	0.0%
Area4	Total	2	19	10.5%	177,000	1,114,370	15.9%	425	7,652	5.6%
Area5	Total		1	0.0%		65,900	0.0%		2	0.0%
Area7	Total		13	0.0%		852,396	0.0%		4,470	0.0%
Area8	Total	3	45	6.7%	417,563	7,021,414	5.9%	610	15,987	3.8%
Area9	Total	3	39	7.7%	318,228	4,071,159	7.8%	1,086	18,391	5.9%
Total		7	95	7.4%	912,791	13,125,239	7.0%	2,121	46,502	4.6%

Total number of hook and SBT were the aggregated number in Area 4-9 from April 2009 to January 2010.

In August area4, one operation with observer was not reported under RTMP because SBT was not caught at that operation.

Table 2 Actual observation on deck in times and rate during observers were on board in the 2009 Japanese longline observer program.

	Operated	Observed	Rate
Number of operation	336	320	95.2%
Time (hour) of operations[1]	4,346	3,141	72.3%

1: Total hours of line hauling of operation in which observed (i.e. 320 operations).

Table 3 Number of individuals its length measured in the 2009 Japanese longline observer program.

		Area 4			Area 8					Area 9					Area 12		Area 15	総計
		Jun.	July	Aug.	Aug.	Sep.	Oct.	Nov.	Dec.	Jun.	July	Aug.	Sep.	Oct.	Aug.	Sep.	Aug.	Total
ミナミマグロ	Southern bluefin tuna	8	400	25	96	258	71	87	106	49	399	38	198	428				2163
キハダ	Yellowfin tuna	8									164	49	11	33	480	192	31	968
メバチ	Bigeye tuna	152	25	3							135	67	61	25	42	33	44	587
ビンナガ	Albacore	2023	766	123	37	39	1				835	565	675	245	500	132	1105	7046
バショウカジキ	Sailfish														13	4		17
フウライカジキ	Shortbill spearfish	1									2				2			5
マカジキ	Striped marlin	7	1												1			9
メカジキ	Swordfish	39	18	5							8	10	13	8	5	2	3	111
クロカジキ	Blue marlin														11	2		13
シロカジキ	Black marlin											1			4			5
ガストロ	Butterfly tuna				178	204	44	161	132	211	216			3				1149
カツオ	Skipjack	15	2								4	5	2		19	1		48
サメ類	Sharks	144	372	48	116	253	38	1046	225	309	1062	609	579	168	17	4	239	5229
その他魚類	Other fish	116	86	31	69	89	5	50	46	23	142	212	366	189	53	26	18	1521
海亀類	Sea turtles												1		0			1
海鳥類	Sea birds	4	2		4	17	3	6	2	1	9	10	11	6				75
総計	Total	2517	1672	235	500	860	162	1350	511	593	2976	1566	1917	1105	1147	396	1440	18947

Table 4 Number of individuals investigated.

Each observers identified species and sex, and took biological samples in the 2009 Japanese longline observer program.

		Number of biological samples			Sex		
		Otolith	Stomach	Muscle	Male	Female	Total catch number
ミナミマグロ	Southern bluefin tuna（Total）	279	253	321	1146	912	2342
	～89cm	7	5	4	13	3	27
	90～99cm	8	11	9	27	15	56
	100～109cm	17	18	16	175	124	317
	110～119cm	15	25	25	316	250	589
	120～129cm	28	26	37	193	151	360
	130～139cm	31	16	28	83	112	203
	140～149cm	38	27	52	81	84	172
	150～159cm	46	33	44	57	63	124
	160～169cm	45	44	54	104	71	177
	170～179cm	29	35	39	76	31	108
	180～189cm	13	13	13	19	8	27
	190cm～	1	0	0	2	0	2
	No data	1	0	0	0	0	180
キハダ	Yellowfin tuna	4	86	22	66	98	986
メバチ	Bigeye tuna	19	110	27	216	221	593
ビンナガ	Albacore	0	12	6	12	14	7177
バショウカジキ	Sailfish	0	0	0	0	0	17
フウライカジキ	Shortbill spearfish	0	0	0	1	1	5
マカジキ	Striped marlin	0	0	0	5	3	9
メカジキ	Swordfish	0	14	4	31	28	114
クロカジキ	Blue marlin	0	0	0	0	0	15
シロカジキ	Black marlin	0	0	0	0	1	5
ガストロ	Butterfly tuna	0	87	0	88	1013	1174
カツオ	Skipjack	0	0	0	0	0	50
サメ類	Sharks	0	9	64	1939	2640	6178
その他魚類	Other fish	0	126	2	80	155	2404
海亀類	Sea turtles	0	0	0	0	0	2
海鳥類	Sea birds	0	0	0	0	0	112

Table 5 Employment and cruise period of the scientific observers from 2001 to 2009.

		Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
雇用日数	Number of days employed	(A)	1,199	1,135	1,482	1,441	1593	1408	686	465	594
乗船日数	Number of days on board the longline vessels	(B)	858	642	1,135	861	1181	1257	616	418	475
乗船率	Rate of on board	(B/A)	72%	57%	77%	60%	74%	89%	90%	90%	80%

Table 6 Expenses which were spent for Japanese observer program from 2001 to 2009.

		2001	2002	2003	2004	2005	2006	2007	2008	2009
報 酬	Observer's salary	17,109	18,365	21,286	20,170	22,302	20,570	9,618	6,520	8,316
旅 費	Overseas travel expenses for observers	14,259	12,571	15,878	16,350	16,157	12,580	7,694	5,498	5,974
保 険	Insurance premium for observers	519	672	778	720	852	700	314	240	293
調査機材	Research materials					4,128	9,650	3,700	2,186	2,295
合 計	Total	31,887	31,607	37,941	37,240	43,439	43,500	21,326	14,444	16,878
	(1000US$)	290	287	345	339	395	395	199	138	197

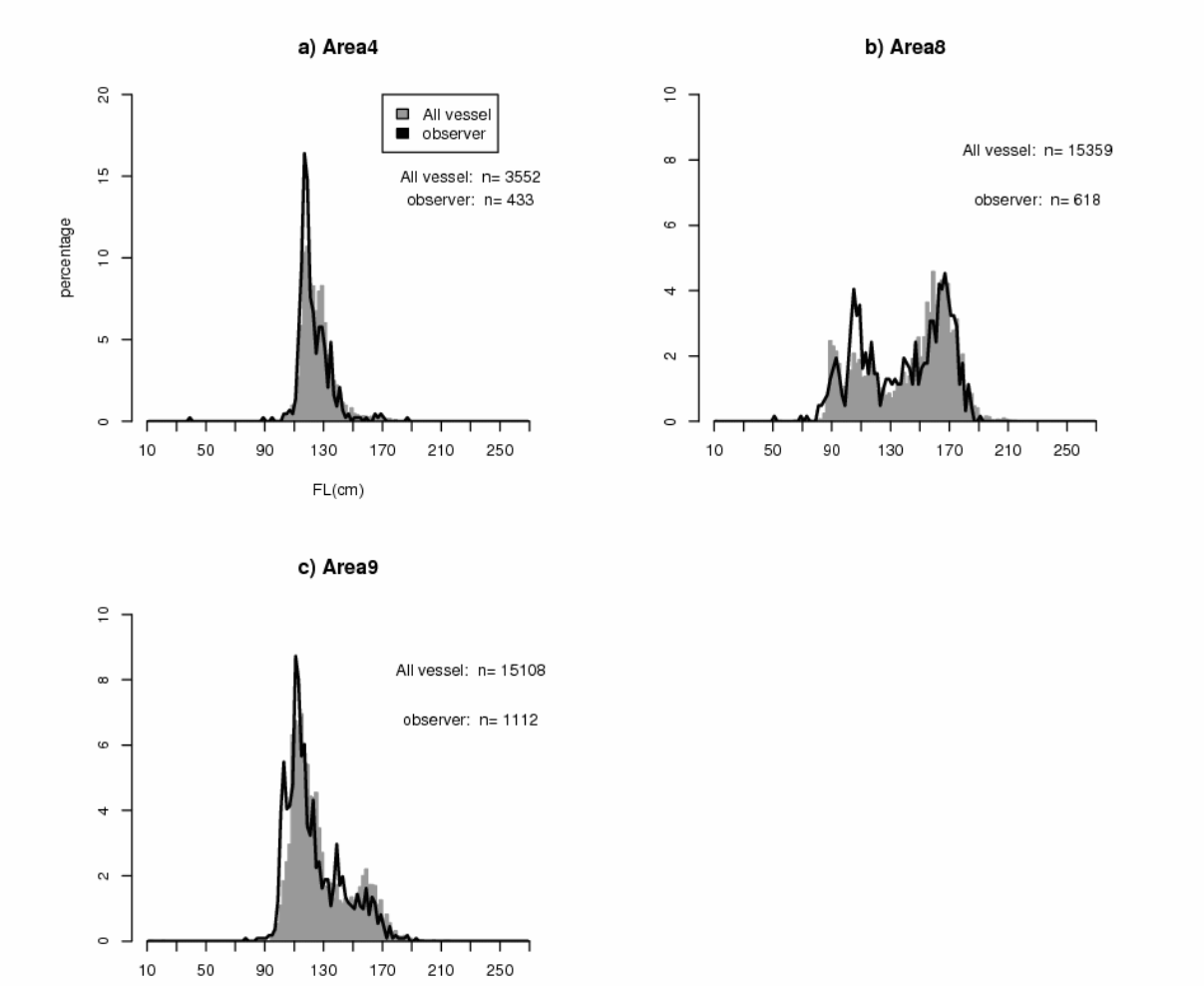

Fig. 1 Length frequency distribution of SBT by area in the 2010 Japanese longline observer program.

Lines are from observer data. Bars are from RTMP data in all vessels. Data were between Jun. and Aug. for area 4 (a), between Aug. and Dec. for area 8 (b), between Jun. and Oct. for area 9 (c).