

Report of Japanese scientific observer activities for southern bluefin tuna fishery in 2010/2011

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：2010/2011年

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要約

2010年度に日本は商業延縄漁船11隻へ科学オブザーバを派遣し調査を実施した。オブザーバが乗船した11隻のうち、7隻が主要なCCSBT統計海区(4-9海区)にてミナミマグロを対象とした操業を行った(4海区では1隻、8海区では3隻、9海区では4隻)。調査カバー率は、隻数で9.6%、使用釣鉤数で6.5%、ミナミマグロ漁獲尾数で7.2%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、観察釣鉤数は全操業の5.8%と推定された。オブザーバが記録した漁獲体長と、RTMPで漁業者から報告された漁獲体長には、差が見られなかった。オブザーバは乗船中にミナミマグロから耳石(93個体分)、胃内容物(79個体分)、および筋肉(148個体分)の生物標本を採集した。また、ミナミマグロ12個体にポップアップタグを装着放流し、通常標識4個体分を回収した。2010年度のオブザーバ派遣に要した費用は総額1,860万円(233,223米ドル)であった。

Summary

In 2010/2011, scientific observers were sent to 11 Japanese longline vessels for the observer program of southern bluefin tuna (SBT). Seven vessels of them operated in main CCSBT statistical area (area 4-9) targeting of Southern Bluefin Tuna: a vessel with observer operated in area 4, two vessels operated in area 8, and four vessels operated in area 9. Observer coverage against all of Japanese SBT longline fishing was 9.6% in the number of vessels, 6.5% in the number of hooks used, and 7.2% in the number of SBT caught (coverage of hook and SBT were calculated for Apr. - Dec. 2010 in area 4-9). Taking into account of the duration of observed during hauling, the number of hooks observed was estimated as 5.8% against all hauling durations by all SBT vessels. There were no differences in the length frequency distributions between the investigation by the observers and report from all vessels in area 4, 8, and 9. Observers collected the otolith (from 93 individuals), stomach (from 79 individuals), and muscle (from 148 individuals) as the scientific sample of SBT. Observers deployed 12 Pop-up archival tags, and retrieved the 4 conventional tags (from 4 individuals). The total costs of the observer program in 2010/2011 were 18,601,044 yen (US\$ 233,213).

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

2010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11名のオブザーバを訓練した。うち7名は日本人、4名はインドネシア人であり、全員が過去にミナミマグロ漁業に関わる豊富な経験を有していた。全てのオブザーバは、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。一部の研修では、テキストに基づく講習に加え、実物の魚を用いて調査方法や生物サンプルの採取方法の実習も行なった。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 2010, Japan trained 11 observers on scientific research activities before send to Japanese commercial longline vessels. Seven observers of them were Japanese researcher, and four observers of them were Indonesian. All observers had much experience for Southern Bluefin Tuna (SBT) fisheries. They brushed up their knowledge and skills on research method, recording procedure and safety by the training program. Some training included the practical training with the actual tuna to measure the fish size and 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

2010年にRTMPにおいて主要漁期にミナミマグロ操業を行った83隻の遠洋まぐろ延縄漁船のうち、ランダムに選定した11隻に科学オブザーバを派遣した(全体の約13.3%)。2006年以降のミナミマグロ漁業は、漁期規制の撤廃、燃費の高騰、およびIQ制の導入により、各船の操業計画は流動的となっている(CCSBT-ESC/1107/31)。また、近年の漁獲枠の減少およびCPUEの向上は、ミナミマグロを狙った操業数を大幅に減少させている。そのため、近年、操業隻数の少ない海域(5-7海区)へのオブザーバの配置は困難になっている。2010年に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9操業(1隻)、8海区の65操業(2隻)、および9海区の203操業(4隻)、合計277操業である。

Scientific observers were sent to 11 vessels which were chosen at random from all Japanese vessels operated during 2010 fishing season in the CCSBT statistical Area 4-9 (83 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, and drastic/ temporal increase of fuel price (CCSBT-ESC/1107/31). Moreover, recent lower catch quota and increasing of CPUE caused a reduction of fishing operation targeting the SBT. 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 5-7). Total numbers of operation observed in area 4, 8 and 9 were 277 in 2010 (9 operations in area 4, 65 operations in area 8, and 203 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 9.6%（4 海区で 4.3%、8 海区で 12.5%、9 海区で 10.0%）、使用釣鈎数で 6.5%（4 海区で 1.3%、8 海区で 11.2%、9 海区で 9.0%）、ミナミマグロ漁獲尾数で 7.2%（4 海区で 7.3%、8 海区で 10.7%、9 海区で 10.2%）であった。なお、釣鈎数と漁獲尾数のカバー率の総計は 2010 年 4 月～12 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。2010 年には、オブザーバの乗船期間中の全操業 503 回のうち、501 回の操業（99.6%）で実際に調査が行われた。調査した揚縄操業において、実際に観察した鈎数の割合は総使用鈎数の 76.9%であった。したがって、オブザーバが実際に観察した延縄努力量は、平均 5.0%（6.5%×99.6%×76.9%）と推定された。なお、オブザーバが調査を行った 502 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 277 回（55.2%）、主に他魚種が対象の操業（1～2 および 13～15 海区）は 225 回（44.8%）だった。

体長を測定した種別個体数を海域・月別に Table 2 に示す。全体では 21,376 個体の体長を測定し、このうちミナミマグロは 3,351 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 4,801 個体、メバチ 3,518 個体、ガストロ 1,523 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 3）。ミナミマグロからは 93 個体から耳石を、79 個体から胃内容物を、148 個体から筋肉を採集した。また、ミナミマグロ 3,217 個体、合計 13,503 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 and/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-December 2010 in area 4-9. The coverage rates were 9.6% in the number of vessels (4.3% in area 4, 12.5% in area 8, and 10.0% in area 9), 6.5% in the number of hooks used (1.3% in area 4, 11.2% in area 8, and 9.0% in area 9) and 7.2% in the number of SBT caught (7.3% in area 4, 10.7% in area 8, and 10.2% 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. In 2010, the observers monitored 99.6% operations while they were onboard. Moreover, they observed 76.9% of all hooks. Thus, the coverage of effort which was actually observed by the observers was estimated as 5.0% (6.5% of 99.8% of 76.9%) on average. The operations observed in the major fishing ground of SBT (area 4-9) were 277 (55.2%), and in the fishing ground for the other tunas (area 1-2 and 13-15) were 225 (44.8%).

Table 2 summarizes the number of individuals whose length was measured by the observers by area and month. Total number of measurements was 21,376, including 3,351 SBT. Other dominant fish species which were measured were Albacore (n=4,801), Bigeye tuna (n=3,518), and Butterfly tuna (n=1,523). Biological samples were also collected (Table 3); otoliths from 93 SBT, stomachs from 79

SBT, and muscle tissues from 148 SBT. Observer identified sex of 13,503 individuals, including 3,217 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 月、8 海区は 5, 10-12 月、9 海区は 5-8 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は、非常に類似していた。

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 in area 4, May, October-December in area 8 and May-August 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.

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

調査を通じて回収した CCSBT 通常標識（通常標識）は、3 隻から 4 個体分（4 本）であった。

Scientific observer collected 4 “CCSBT” conventional tags from 4 recaptured SBT on 3 vessels.

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

みなみまぐろ漁場における科学オブザーバ調査は、1992 年からほぼ同一の調査方法で実施してきた。オブザーバの派遣人数は、当初は 10~18 名/年であったが、予算上の制約により 2007 年以降のオブザーバ派遣人数は 7 名/年程度に留まってきた。2010 年には、インドネシア人調査員を加えてオブザーバを増員したが、オブザーバ乗船中にミナミマグロを対象とした操業を行わない漁船もあり、カバー率の大幅な向上には至っていない。なお、インドネシア人オブザーバには、耳石や胃内容物などの生物サンプルの採集を求めている。インドネシア人オブザーバには、調査員としての経験が少ないため、未だ種査定等に関わるデータの質に改善すべき点がある。

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 11 名の雇用日数は、延べ 799 日であり、漁船への乗船実日数は 85%の 679 日であった (Table 4)。2010 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 767 万円 (96 千 US \$)、オブザーバの派遣旅費約 681 万円 (85 千 US \$)、保険・資機材他 412 万円 (52 千 US \$)、総額約 1,860 万円 (233 千 US \$) であった。日本はこれらの必要経費を捻出し、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 5)。

Japanese observer program for the southern bluefin tuna fisheries has been performed systematically in consistent method since 1992. Japan had regularly deployed 10-18 observers per year in the early years, although recent observer program was forced to reduce the observer number by budgetary restrictions: In 2007-2009, seven observers were deployed per year. In 2010, Japan increased the number of the observers by the employment of Indonesian researcher. Despite that, observer coverage didn't increase drastically in 2010, because some vessels didn't conduct the fishing operation targeting the southern bluefin tuna while the scientific observer was onboard. Indonesian researchers have not had much experience as the scientific observer for the southern bluefin tuna, thus there are still much needs to be improved in the data quality (e.g. species identification, recordation, scientific sampling, etc.). They were not required to collect the biological sample (otolith, muscle, and stomach contents) in 2010 observer program.

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.

Total periods of employment and cruise of 11 observers were 799 days and 679 days (85%), respectively (Table 4). Total expenses which were spent for Japanese observer program in 2010 were 18,601,044 yen (US\$ 233,217); 7,665,871 yen for the observer's salary, 6,810,996 yen for the overseas travel expenses for observers, 286,730 yen for the insurance premium for observers, and 3,837,447 yen for the research materials (Table 5). Japanese has been expending these costs in fulfilling the responsibilities as the responsible fishing nation.

Reference

Itoh, T. 2011 Change in operation pattern of Japanese SBT longliners in 2010 resulting from the introduction of the individual quota system in 2006. CCSBT-ESC/1107/31

Table 1 Observed effort and catch of SBT in Japanese longline observer program 2010.

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		9	0.0%		355,170	0.0%		0	
	May		17	0.0%		1,143,954	0.0%		3029	0.0%
	Jun	1	5	20.0%	29,865	766,336	3.9%	311	1196	26.0%
	Jul		3	0.0%		26,800	0.0%		0	
	Aug		2	0.0%		50,270	0.0%		7	0.0%
	Sep		1	0.0%		14,000	0.0%		6	0.0%
Area5	Jun		3	0.0%		14,020	0.0%		0	
	Jul		5	0.0%		249,530	0.0%		1	0.0%
	Aug		1	0.0%		14,000	0.0%		0	
Area6	May		4	0.0%		371,520	0.0%		3050	0.0%
	Jun		4	0.0%		109,170	0.0%		708	0.0%
Area7	Apr.		17	0.0%		971,540	0.0%		6761	0.0%
	May		9	0.0%		200,824	0.0%		1942	0.0%
Area8	Apr.		5	0.0%		170,505	0.0%		192	0.0%
	May	1	6	16.7%	3,360	310,083	1.1%	0	91	0.0%
	Jun.		9	0.0%		297,259	0.0%		418	0.0%
	July		3	0.0%		12,750	0.0%		35	0.0%
	Aug.		12	0.0%		844,923	0.0%		3,269	0.0%
	Sep.		2	0.0%		42,680	0.0%		154	0.0%
	Oct.	2	2	100.0%	26,680	26,790	99.6%	65	70	92.9%
	Nov.	2	4	50.0%	191,160	333,820	57.3%	499	1,137	43.9%
	Dec.	1	1	100.0%	7,200	7,200	100.0%	14	15	93.3%
Area9	Apr.		17	0.0%		1,115,073	0.0%		5,307	0.0%
	May	1	27	3.7%	80,172	1,760,734	4.6%	318	6,678	4.8%
	Jun.	2	29	6.9%	184,788	1,789,817	10.3%	539	5,095	10.6%
	July	3	16	18.8%	238,130	915,494	26.0%	1,459	4,021	36.3%
	Aug.	3	7	42.9%	61,918	445,921	13.9%	115	1,643	7.0%
	Sep.		3	0.0%		77,320	0.0%		297	0.0%
	Oct.		2	0.0%		71,608	0.0%		193	0.0%
	Nov.		2	0.0%		120,364	0.0%		706	0.0%
	Dec.		1	0.0%		3,492	0.0%		3	0.0%
	Area4	Total	1	23	4.3%	29,865	2,356,530	1.3%	311	4,238
Area5	Total		5	0.0%		277,550	0.0%		1	0.0%
Area6	Total		4	0.0%		480,690	0.0%		3,758	0.0%
Area7	Total		22	0.0%		1,172,364	0.0%		8,703	0.0%
Area8	Total	3	24	12.5%	228,400	2,046,010	11.2%	578	5,381	10.7%
Area9	Total	4	40	10.0%	565,008	6,299,823	9.0%	2,431	23,943	10.2%
Total		8	83	9.6%	823,273	12,632,967	6.5%	3,320	46,024	7.2%

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

Table 2 Number of individuals its length measured in the 2010 Japanese longline observer program.

	Area	# 1			# 2		# 4	# 8				# 9				# 13				# 14				# 15	総計		
		Month	Oct.	Nov.	Dec.	May	Jun.	Jun.	May	Oct.	Nov.	Dec.	May.	Jun.	Jul.	Aug.	Sep	Oct	Nov	Dec	2011/ Jan	May	Jun	Dec		2011/ Jan	Jun
ミナミマグロ	Southern bluefin					29	303		64	480	14	318	546	1469	118							10					3351
キハダ	Yellowfin tuna	23	1	2		2						7	23	100	23	7	54	1	16	20	15	35	63	65	16	473	
メバチ	Bigeye tuna	1055	182	23		23		2				35	72	47	26	77	754	38	439	592	32	95	8	3	15	3518	
ビンナガ	Albacore	27	47	10	21	318	65	46				318	810	880	502	11	104	16	117	66	572	743	25	11	92	4801	
バショウカジキ	Sailfish															1	1		2	2				2		8	
フウライカジキ	Shortbill spearfish					2						7	4	2	1		3			3	6	20	11	3		62	
マカジキ	Striped marlin																		1	1	1	1	7	8		19	
メカジキ	Swordfish	15	2	4		15	4	1				4	10	14	1	11	23	4	19	9	9	27	10	2	0	184	
クロカジキ	Blue marlin	4		1												1	10		8	7		1	2	1		35	
シロカジキ	Black marlin	1															1		2	2		1	2	1		10	
ガストロ	Butterfly tuna					4	1		74	623	0	72	234	256	256						2	1			0	1523	
カツオ	Skipjack											2	6	1	1		2		1			9		2		24	
サメ類	Sharks	11	3	18		25	95	5	119	353	0	297	643	849	81	27	76	2	185	209	58	76	20	22	0	3174	
その他魚類	Other fish	15	10	31	14	175	57	19	8	54	0	116	345	630	328	235	510	63	443	410	186	221	34	18	6	3928	
海亀類	Sea turtles	0														1	8	2								11	
海鳥類	Sea birds					7			1	8		33	51	115	34							3				252	
その他	Other	0	0									1					0			2						3	
	総計	1151	245	89	35	593	532	73	266	1518	14	1210	2744	4363	1372	378	1540	124	1233	1323	881	1243	182	138	129	21376	

Table 3 Number of individuals investigated.

Each observers identified species and sex, and took biological samples in the 2010 Japanese longline observer program.

		Number of biological samples			Sex		Total catch number
		Otolith	Stomach	Muscle	Male	Female	
ミナミマグロ	Southern bluefin tuna (Total)	93	79	148	1778	1439	3482
	~89cm	0	0	1	10	2	16
	90~99cm	1	1	1	23	10	37
	100~109cm	5	0	2	93	62	174
	110~119cm	3	4	4	406	278	714
	120~129cm	10	6	8	500	406	950
	130~139cm	11	11	19	205	175	394
	140~149cm	19	10	31	100	117	229
	150~159cm	11	9	23	93	128	221
	160~169cm	16	14	29	157	147	307
	170~179cm	13	17	24	142	94	242
	180~189cm	3	6	4	40	16	56
	190cm~	1	1	2	8	2	11
	No data	0	0	0	1	2	131
キハダ	Yellowfin tuna	11	57	53	191	183	500
メバチ	Bigeye tuna	24	136	129	1648	1542	3669
ビンナガ	Albacore	0	0	3	34	18	5260
バショウカジキ	Sailfish	0	0	0	4	2	8
フウライカジキ	Shortbill spearfish	0	1	0	11	22	62
マカジキ	Striped marlin	0	0	1	2	2	19
メカジキ	Swordfish	0	10	2	44	83	194
クロカジキ	Blue marlin	0	1	0	25	3	36
シロカジキ	Black marlin	0	0	1	1	5	10
ガストロ	Butterfly tuna	1	78	83	279	1364	2128
カツオ	Skipjack	0	0	0	1	0	31
サメ類	Sharks	0	0	23	1193	2404	5257
その他魚類	Other fish	0	39	1	253	961	6173
海亀類	Sea turtles	0	0	0	1	0	2
海鳥類	Sea birds	0	0	0	0	0	270
その他	Other	0	0	0	6	4	61
Total		129	401	444	5471	8032	27162

Table 4 Employment and cruise period of the scientific observers from 2001 to 2010.

		Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
雇用日数	Number of days employed	(A)	1,199	1,135	1,482	1,441	1593	1408	686	465	594	799
乗船日数	Number of days on board the longline vessels	(B)	858	642	1,135	861	1181	1257	616	418	475	679
乗船率	Rate of on board	(B/A)	72%	57%	77%	60%	74%	89%	90%	90%	80%	85%

Table 5 Expenses which were spent for Japanese observer program from 2001 to 2010.

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
報酬	Observer's salary (1000 YEN)	17,109	18,365	21,286	20,170	22,302	20,570	9,618	6,520	8,316	7,666
旅費	Overseas travel expenses for observers (1000 YEN)	14,259	12,571	15,878	16,350	16,157	12,580	7,694	5,498	5,974	6,811
保険	Insurance premium for observers (1000 YEN)	519	672	778	720	852	700	314	240	293	287
調査機材	Research materials (1000 YEN)					4,128	9,650	3,700	2,186	2,295	3,837
合計	Total (1000 YEN)	31,887	31,607	37,941	37,240	43,439	43,500	21,326	14,444	16,878	18,601
	(1000US\$)	290	287	345	339	395	395	199	138	197	233

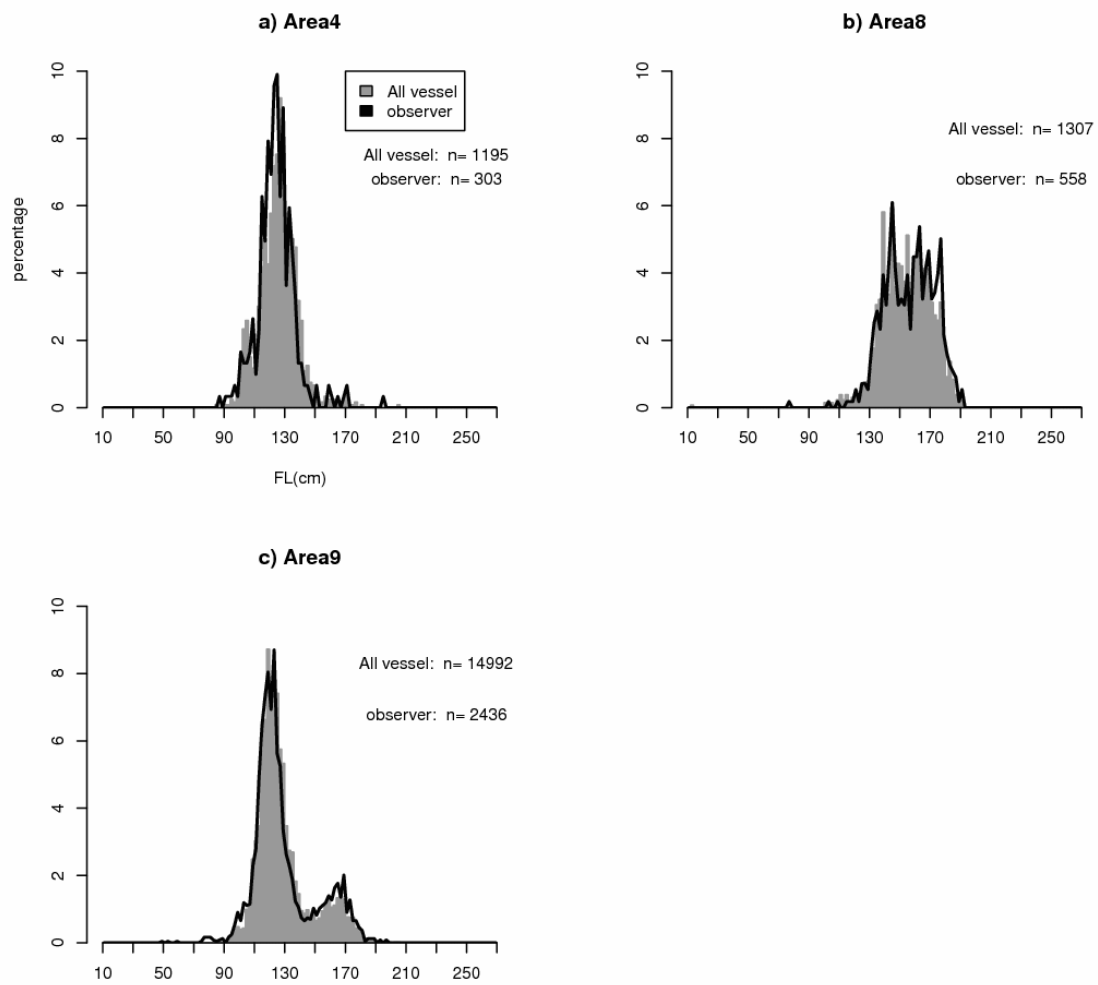


Fig. 1 Length frequency distribution of SBT by area in the 2010 Japanese longline observer program.

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).