

Report of Japanese scientific observer activities for southern bluefin tuna fishery in 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：2011年漁期

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要約

2011年度に日本はミナミマグロの操業許可を持つ商業延縄漁船16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16隻のうち、12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、5海区では1隻、7海区では2隻、8海区では4隻、9海区では5隻)。調査カバー率は、隻数で14.8%、使用釣鉤数で11.8%、ミナミマグロ漁獲尾数で14.8%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9.3%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とは良く一致したが、8海区で多少の差が見られた。オブザーバは乗船中にミナミマグロから耳石(200個体分)、胃内容物(553個体分)、および筋肉(269個体分)の生物標本を採集した。通常標識9個体分を回収した。2011年度のオブザーバ派遣に要した費用は総額3,414万円(422,258米ドル)であった。

Summary

In 2011, scientific observers were sent to 16 Japanese longline vessels for the observer program of southern bluefin tuna (SBT). 12 vessels of them operated in main CCSBT statistical area (area 4-9) targeting of SBT: one vessel with observer operated in area 4 and 5, two vessels operated in area 7, four vessels operated in area 8, and five vessels operated in area 9. Observer coverage against all of Japanese SBT longline fishing was 14.8% in the number of vessels, 11.8% in the number of hooks used, and 14.8% in the number of SBT caught (coverage of hook and SBT were calculated for Apr. - Dec. 2011 in area 4-9). Taking into account of the duration of observed on deck or bridge during hauling, the number of hooks observed was estimated as 9.3% against all hauling durations by all SBT vessels. There were no differences in the length frequency distributions between reported by the observers and reported from all vessels, though slight difference was observed in area 8. Observers collected the otolith (from 200 individuals), stomach (from 553 individuals), and muscle (from 269 individuals) as the scientific sample of SBT. Observers retrieved the 12 conventional tags (from 9 individuals). The total costs of the observer program in 2011 were 34,135,355 yen (US\$ 422,258).

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

2011年度には、ミナミマグロ操業を行う商業延縄船へオブザーバを派遣する前に講習会を2回開催した。講習会では、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 2011, training seminars were held twice a year to train scientific observers before they were sent to Japanese commercial longline vessels. During the training seminars, the candidate observers 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

2011年にRTMPにおいて主要漁期にミナミマグロ操業を行った82隻の遠洋まぐろ延縄漁船のうち、ランダムに選定した16隻に科学オブザーバを派遣した（全体の約19.5%）。オブザーバのうち8名は日本人、8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。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/1208/34）。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、オブザーバの乗船中にミナミマグロ漁場での操業を行わない漁船もみられた。2011年4-12月のオブザーバ乗船中にミナミマグロ主要漁場にて操業を行ったのは16隻のうち12隻である。得られた操業観察データは4海区の25操業（1隻）、5海区の23操業（1隻）、7海区の44操業（2隻）、8海区の180操業（4隻）、および9海区の335操業（5隻）、合計607操業であった。

Scientific observers were sent to 16 vessels which were chosen at random from all of authorized Japanese vessels targeting Southern Bluefin Tuna (SBT) during 2011 fishing season (83 vessels). Eight observers were Japanese researcher, and eight observers were Indonesian. All observers had much experience for SBT fisheries. 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/1208/34). Moreover, recent lower catch quota and increasing of CPUE caused a reduction of fishing operation targeting SBT. Because of these factors, annual fishing schedules of Japanese longline vessels became unpredictable, thus there were difficulties to deploy all observers only to SBT fishing ground. Actually 4 vessels were operated in the other tuna's fishing ground, while 12 vessels operated in main CCSBT statistical area (area 4-9) in

April-December, 2011. Total numbers of operation observed in area 4, 5, 7, 8, and 9 were 607 (25 operations in area 4, 23 operations in area 5, 44 operations in area 2, 180 operations in area 8, and 335 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/漁獲成績報告書データ（操業隻数）を用いた。推算されたカバー率は、隻数で 14.8%（4 海区で 3.7%、5 海区で 8.3%、7 海区で 7.7%、8 海区で 30.8%、9 海区で 12.5%）、使用釣鈎数で 11.8%（4 海区で 3.0%、5 海区で 4.9%、7 海区で 7.7%、8 海区で 23.6%、9 海区で 13.9%）、ミナミマグロ漁獲尾数で 14.8%（4 海区で 0.3%、5 海区で 16.8%、7 海区で 6.3%、8 海区で 19.8%、9 海区で 18.8%）であった。なお、釣鈎数と漁獲尾数のカバー率の総計は 2011 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。2011 年には、オブザーバの乗船期間中の全操業のうち、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 76.1%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に基づくカバー率は、9.3%（ $11.8\% \times 99.3\% \times 79.1\%$ ）と推定された。

4～12月の1～9海区においてオブザーバが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 38,095 個体の体長を測定し、このうちミナミマグロは 8,607 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 9,894 個体、メバチ 2,218 個体、ガストロ 3,541 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 200 個体から耳石を、553 個体から胃内容物を、269 個体から筋肉を採集した。また、ミナミマグロ 8,242 個体、合計 20,210 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 and logbook. On the basis of these data sets, we calculated observer coverage. Total numbers of hooks and SBT caught for the calculation of the coverage were aggregated between April and December in area 4-9. The coverage rates were 14.8% in the number of vessels (3.7% in area 4, 8.3% in area 5, 7.7% in area 7, 30.8% in area 8, and 12.5% in area 9), 11.8% in the number of hooks used (3.0% in area 4, 4.9% in area 5, 7.7% in area 7, 23.6% in area 8, and 13.9% in area 9) and 14.8% in the number of SBT caught (0.3% in area 4, 16.8% in area 5, 6.3% in area 7, 19.8% in area 8, and 18.8% 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 2011, the observers monitored 99.3% operations while they were onboard. Moreover, they observed 79.1% of all hooks. Thus, the coverage of effort which was actually observed by the observers was estimated as 9.3% (11.8% of 99.3% of 79.1%) on average.

Table 2 summarizes the number of individuals whose length were measured by the observers in area 1-9 from April to December, 2011. Total number of measurements was 38,095, including 8,607 SBT. Other dominant fish species which were measured were albacore (n=9,894), bigeye tuna (n=2,218), and butterfly tuna (n=3,541). Biological samples were also collected (Table 3); otoliths from 200 SBT, stomachs from 553 SBT, and muscle tissues from 269 SBT. Observer identified sex of 20,210 individuals, including 8,242 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（7 海区は 4-5 月、8 海区は 5-11 月、9 海区は 4-7 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類似していた。詳細にみると 8 海区の 110-120cmFL 前後の体調組成に差が見られたが、この差は小型魚の放流活動に起因すると思われる。なお、放流魚は CCSBT の枠組みにおいて各国のクォータには含まれないことに留意されたい。日本のクォ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 April-May in area 7, May-November in area 8, and April-July 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. Seeing in detail, there was a discrepancy around 110-120 cm FL in area 8, and the cause of this difference would be the release activity for small SBT. 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 time 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 CCSBT 通常標識（通常標識）は、5 隻から 9 個体分（12 本）であった。

Scientific observer collected 12 CCSBT conventional tags from 9 recaptured SBT on 5 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年以降は、インドネシア人調査員を加えてオブザーバを増員した。ただし、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、種査定等に関わるデータの質に改善の余地がある。また、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。

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16名の乗船実日数はのべ1636日であり、近年10年間のオブザーバ調査で最も多くなった (Table 4)。2011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1,534万円 (190千US\$)、オブザーバの派遣旅費約1,086万円 (134千US\$)、保険約72万円 (9千US\$)、資機材他721万円 (89千US\$)、総額約3,414万円 (422千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. Since 2010, Japan has increased the number of the observers by the employment of Indonesian researcher. Indonesian researchers have not had much experience as the scientific observer for SBT, thus there are still much needs to be improved in the data quality (e.g. species identification, recordation, scientific sampling, etc.). They were not requested to collect the biological sample (otolith, muscle, and stomach contents) in 2011 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 cruise periods of 16 observers were 1636 days in total (Table 4). This is the longest of recent 10-year SBT observer program in Japan. Total expenses which were spent for Japanese observer program in 2011 were 34,135,355 yen (US\$ 422,258); 15,339,776 yen for the observer's salary, 10,860,925 yen for the overseas travel expenses for observers, 721,110 yen for the insurance premium for observers, and 7,213,544 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. 2012 Change in operation pattern of Japanese SBT longliners in 2011 resulting from the introduction of the individual quota system in 2006. CCSBT-ESC/1208/34

Table 1 Observed effort and catch of SBT in Japanese longline observer program 2011.

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/logbook 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	4		11	0.0%		189504	0.0%		48	0.0%
	5		21	0.0%		960401	0.0%		1601	0.0%
	6	1	13	7.7%	41190	681634	6.0%	0	1144	0.0%
	7	1	9	11.1%	45650	517681	8.8%	10	45	22.2%
	8		3	0.0%		25200	0.0%		55	0.0%
	9		4	0.0%		258750	0.0%		5	0.0%
	10		4	0.0%		128900	0.0%		1	0.0%
	11		2	0.0%		94700	0.0%		0	
Area5	7	1	8	12.5%	7040	157704	4.5%	1	0	
	8	1	12	8.3%	56040	846955	6.6%	14	92	15.2%
	9	1	7	14.3%	17500	455975	3.8%	2	7	28.6%
	10		4	0.0%		173977	0.0%		2	0.0%
Area7	4	2	24	8.3%	102202	1526423	6.7%	615	11297	5.4%
	5	1	11	9.1%	44950	386000	11.6%	279	2858	9.8%
Area8	4		6	0.0%		88343	0.0%		1	0.0%
	5	1	8	12.5%	13200	171910	7.7%	2	70	2.9%
	6	1	9	11.1%	16080	106080	15.2%	5	30	16.7%
	7	1	3	33.3%	19400	47770	40.6%	57	147	38.8%
	8	3	11	27.3%	177242	632980	28.0%	353	1662	21.2%
	9	3	11	27.3%	215454	692838	31.1%	446	1839	24.3%
	10	2	4	50.0%	54010	221070	24.4%	212	870	24.4%
	11	1	5	20.0%	93665	406645	23.0%	188	1305	14.4%
	12		2	0.0%		129500	0.0%		461	0.0%
Area9	4	3	22	13.6%	61240	693425	8.8%	218	2149	10.1%
	5	5	30	16.7%	363621	1795266	20.3%	1169	5746	20.3%
	6	5	32	15.6%	376491	1810923	20.8%	2570	10092	25.5%
	7	5	30	16.7%	184022	1169016	15.7%	1979	8850	22.4%
	8		19	0.0%		782901	0.0%		2020	0.0%
	9		15	0.0%		619641	0.0%		2360	0.0%
	10		6	0.0%		195732	0.0%		288	0.0%
	11		2	0.0%		16434	0.0%			
Area4	Apr-Dec	1	27	3.7%	86840	2856770	3.0%	10	2899	0.3%
Area5	Apr-Dec	1	12	8.3%	80580	1634611	4.9%	17	101	16.8%
Area7	Apr-Dec	2	26	7.7%	147152	1912423	7.7%	894	14155	6.3%
Area8	Apr-Dec	4	13	30.8%	589051	2497136	23.6%	1263	6385	19.8%
Area9	Apr-Dec	5	40	12.5%	985374	7083338	13.9%	5936	31505	18.8%
total	Apr-Dec	12	81	14.8%	1888997	15984278	11.8%	8120	55045	14.8%

Total number of hook and SBT were the aggregated number in Area 4-9 from April to December 2011.

Table 2 Number of individuals its length measured in the 2011 Japanese longline observer program.

Area Month	Area1		Area2				Area4			Area5			Area7		Area8				Area9				Total					
	Sep	Oct	May	Jun	Jul	Aug	Sep	Oct	Jun	Jul	Jul	Aug	Sep	Apr	May	May	Jun	Jul	Aug	Sep	Oct	Nov		Apr	May	Jun	Jul	
ミナミマグロ	Southern bluefin tuna	1	1	0	5	76	47	0	0	0	11	1	50	6	664	304	4	5	58	379	474	213	191	220	1178	2619	2100	8607
クロマグロ	Pacific bluefin tuna	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5
キハダ	Yellowfin tuna	0	11	2	1	20	57	0	1	7	22	0	3	0	0	0	0	0	0	0	0	0	0	0	0	129	39	292
メバチ	Bigeye tuna	11	71	19	226	844	297	37	32	34	42	20	187	53	2	8	8	11	0	0	0	0	0	0	1	213	102	2218
ビンナガ	Albacore	29	53	234	421	1521	453	99	25	364	1100	114	746	197	673	354	120	474	16	127	236	10	1	7	18	1470	1032	9894
バショウカジキ	Sailfish	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
フウライカジキ	Shortbill spearfish	0	1	3	17	26	6	0	0	0	0	0	3	0	0	0	1	1	0	0	0	0	0	0	0	3	0	61
マカジキ	Striped marlin	0	6	0	1	1	3	0	5	6	5	0	11	3	0	0	0	0	0	0	0	0	0	0	0	0	0	41
メカジキ	Swordfish	0	10	1	8	47	6	1	5	43	9	2	15	0	16	18	0	2	0	0	1	0	0	0	4	13	10	211
クロカジキ	Blue marlin	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
シロカジキ	Black marlin	0	4	0	0	1	1	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
ガストロ	Butterfly tuna	0	0	3	4	5	0	0	0	0	0	0	0	0	2	1	0	1	65	552	330	356	455	145	923	658	41	3541
カツオ	Skipjack	0	5	0	4	4	0	0	0	2	4	3	13	3	0	0	0	0	0	1	0	0	0	0	0	6	3	48
サメ類	Sharks	0	16	20	113	252	58	1	9	135	137	12	102	30	364	247	4	6	5	507	688	197	463	84	841	1128	376	5795
その他魚類	Other fish	5	55	59	160	811	223	12	21	527	490	94	1044	535	157	45	39	24	18	81	97	22	44	25	770	1251	376	6985
海亀類	Sea turtles	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
海鳥類	Sea birds	0	2	0	2	8	2	0	1	1	13	0	5	3	58	19	0	0	0	31	29	31	63	4	78	29	1	380
その他	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	
Total		46	238	341	962	3616	1153	150	102	1119	1835	246	2183	832	1936	997	176	524	162	1678	1855	829	1218	485	3813	7519	4080	38095

Table 3 Number of individuals investigated.

Each observers identified species and sex, and took biological samples in the 2011 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)	200	553	269	4994	3248	8798
	~89cm	0	0	0	116	23	173
	90~99cm	5	6	4	542	137	729
	100~109cm	12	31	3	1001	356	1378
	110~119cm	17	33	15	716	465	1231
	120~129cm	22	107	45	778	698	1493
	130~139cm	30	148	72	817	778	1607
	140~149cm	31	90	41	399	368	768
	150~159cm	29	61	26	190	176	367
	160~169cm	29	47	38	218	165	385
	170~179cm	19	26	21	162	64	227
	180~189cm	6	3	4	45	14	60
	190cm~	0	1	0	8	3	11
	No data	0	0	0	2	1	369
クロマグロ	Pacific Bluefin Tuna	3	1	4	2	3	5
キハダ	Yellowfin tuna	16	31	48	142	118	293
メバチ	Bigeye tuna	24	530	124	890	999	2219
ビンナガ	Albacore	0	4	38	63	41	9956
バショウカジキ	Sailfish	0	0	0	0	0	1
フウライカジキ	Shortbill spearfish	0	1	13	7	5	61
マカジキ	Striped marlin	0	5	23	11	19	41
メカジキ	Swordfish	0	12	33	49	79	212
クロカジキ	Blue marlin	0	0	0	0	2	4
シロカジキ	Black marlin	0	1	4	3	3	10
ガストロ	Butterfly tuna	0	9	112	954	1946	3546
カツオ	Skipjack	0	0	0	1	1	48
サメ類	Sharks	0	1	953	2017	3164	5891
その他魚類	Other fish	0	258	134	468	980	7327
海亀類	Sea turtles	0	0	0	0	0	1
海鳥類	Sea birds	0	0	0	0	0	380
その他	Other	0	0	0	0	1	1

Table 4 Employment and cruise period of the scientific observers from 2002 to 2011.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
乗船日数 Number of days on board the longline vessels	642	1,135	861	1181	1257	616	418	475	679	1636

Table 5 Expenses which were spent for Japanese observer program from 2002 to 2011.

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
報酬	Observer's salary (1000 YEN)	18,365	21,286	20,170	22,302	20,570	9,618	6,520	8,316	7,666	15,340
旅費	Overseas travel expenses for observers (1000 YEN)	12,571	15,878	16,350	16,157	12,580	7,694	5,498	5,974	6,811	10,861
保険	Insurance premium for observers (1000 YEN)	672	778	720	852	700	314	240	293	287	721
調査機材 その他	Research materials etc. (1000 YEN)				4,128	9,650	3,700	2,186	2,295	3,837	7,214
合計	Total (1000 YEN)	31,607	37,941	37,240	43,439	43,500	21,326	14,444	16,878	18,601	34,135
	(1000US\$)	287	345	339	395	395	199	138	197	233	422

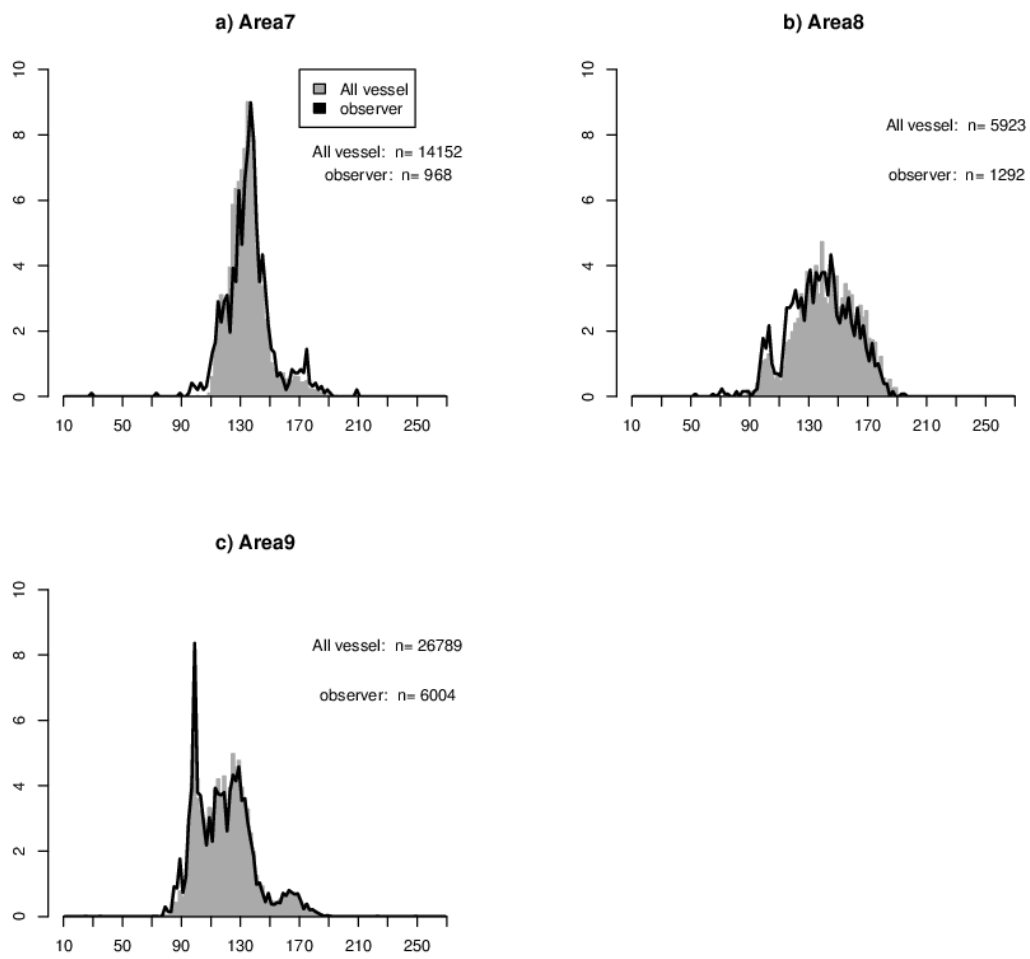


Fig. 1 Length frequency distribution of SBT by area in the 2011 Japanese longline observer program.

Lines are from observer data. Bars are from RTMP data in all vessels. Data were between April and May for area 7 (a), between May and November for area 8 (b), between April and July for area 9 (c).