Report of Japanese scientific observer activities for southern bluefin tuna fishery in 2016; Revise in 2019

日本のミナミマグロ漁業での科学オブザーバの 2016 年の活動報告：2019 年の更新

Tomoyuki ITOH, Yuichi Tsuda, Yukiko Inoue, Yasuko Semba, and Daisuke Ochi
伊藤智幸・津田裕一・井上裕紀子・仙波靖子・越智大介

National Research Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency
水産研究教育機構 国際水産資源研究所

要約

本文書ではミナミマグロを対象とした日本延縄船に対する科学オブザーバ計画について、2016 年調査の結果を報告する。2019 年にデータの一部には問題があることが見つかったことから、その航海のデータを除いて、数値を更新した。2016 年に主要な CCSBT 統計海区（4-9 海区）において 19 隻に科学オブザーバを配乗した。調査カバー率は隻数で 21.6%、使用釣鈎数で 16.6%、ミナミマグロ漁獲尾数で 17.1%であり、オブザーバが実際に観察した時間を考慮すると使用鈎数で 12.9%であった。オブザーバが記録したミナミマグロの漁獲体長と、RTMP で漁業者から報告された漁獲体長とは概ね一致したが、小型個体について放流戦略に伴う差が見られた。オブザーバは乗船中にミナミマグロから耳石 484 個体分、筋肉 1233 個体分を含む各種の生物標本を採取した。オブザーバはミナミマグロ 6 個体分の通常標識を回収した。

Summary

This document summarizes the results of Japanese scientific observer program for southern bluefin tuna (SBT) in 2016. Because we found less reliable data in 2019, we updated this document based on revised dataset which excluded data of a cruise. Scientific observers were dispatched in 19 vessels that operated in the main CCSBT statistical areas (area 4－9). Observer coverages were 21.6% in the number of vessels, 16.6% in the number of hooks used, and 17.1% in the number of SBT caught. When taking into account of the actual observation time during hauling, the coverage in the number of hooks observed were estimated as 12.9%. The length frequency distributions of SBT reported by the observers and those reported from all vessels in RTMP were generally consistent to each other, however difference was observed in small size probably due to the differences of release/retain strategies among vessels. Observers collected various biological samples including otolith from 484 SBT and muscle tissue from 1233 SBT. Observers retrieved conventional tags from 6 SBT individuals.

1. 科学オブザーバ活動の概要　Overview of the scientific observer program

2019 年にデータの一部に問題があることが見つかった。よって本文書では、その一航海のデータを除いて、数値を更新した。

みなみまぐろ漁場における日本の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。オブザーバは Table 1 に示すように、ミナミマグロおよび生態関連種の生物調査や、気象・漁具・海鳥混獲回避手段の利用状況等に関する情報を収集する。調査項目には優先順位が付けられており、時間が限られているときには重要な項目だけを調査する。調査項目の優先順位は年により異なる場合がある。オブザーバは、各大洋でミナミマグロを主要な漁獲対象として操業する遠洋延縄漁船からランダムに選定された漁船に派遣される。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、各船の操業計画が流動的となっている（CCSBT-ESC/1208/34）。また、近年のミナミマグロ CPUE の上昇はミナミマグロを対象とした操業回数の減少をもたらしている。そのため、ミナミマグロ漁獲枠を持つ船に一定期間オブザーバを派遣しても、その船の年間を通した操業戦略上の都合により、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場合がある。

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。これを改善するため、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。なお、2014 年までは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指示していなかったが、インドネシア人オブザーバの配乗比率の増加と調査能力の向上に伴い、2015 年より一部のインドネシア人オブザーバにサンプル採取を指示している。

In 2019, we found less reliable data in the scientific observer program. We submit the revised document which report activity of scientific observers on Japanese longline for southern bluefin tuna (SBT) based on dataset that excluded data from one cruise.

Japanese scientific observer program of longline fishery for SBT has been performed systematically in a consistent method since 1992. In this program, scientific observers collect biological data and samples from SBT and ecologically related species during the hauling operations. They also collect information about the fishing operations (e.g., fishing configuration, weather and sea conditions, mitigation measures used to reduce incidental take of seabirds). Table 1 summarizes the research items of the observers. When they are busy and have little time to complete all the research items (because of the severe sea, weather, and/or fishing conditions), observers reduce their research activities in accordance with the established priorities. This priority levels differ depending on the fishing year. Scientific observers were sent to the vessels which were chosen at random from all of authorized Japanese commercial longline vessels targeting SBT in each ocean. Since 2006, annual operational patterns and schedule of Japanese vessels targeting SBT have been possibly affected by introduction of the individual quota (IQ) system, abolishing of the seasonal area closure, and drastic/temporal increase of fuel price (CCSBT-ESC/1208/34). Moreover, recent increase of CPUE caused decrease of the number of fishing operations targeting SBT. Because of these factors, annual fishing schedules of Japanese longline vessels became unpredictable. Thus, there are difficulties to deploy the observers for a specific period toward the SBT fishing trips in a timely manner; some vessels with SBT quota do not operate in SBT fishing grounds during the period that observers are on-board because of their fishing strategy.

Japan had regularly deployed 10-18 observers per year in the early period of the program, although the program was

forced to reduce the number of observers by budgetary restrictions. In 2007-2009, only seven observers were deployed to the vessel operated in the SBT fishing grounds per year. Since 2010, the number of observers has increased with the employment of Indonesian researchers. Collection of biological samples (otolith and muscle) had not been included in the direction to Indonesian researchers by 2014, however it has been ordered to a part of selected Indonesian researchers since 2015, along with increasing the ratio of trips with Indonesian researchers and improvement of their research skill.

2. 科学オブザーバの訓練　Observer Training

オブザーバは派遣される前に講習会にて訓練を受ける。2016 年には 5 回の講習会を開催し、オブザーバ候補者に対し、調査方法、記録方法、および安全確保について講習を行った。講習では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。オブザーバは、調査航海終了後に、乗船中の調査活動について報告をした。

Before cruises, scientific observer candidates have to take a training seminar. The training seminars for SBT fishery were held 5 times in 2016. In the training seminars, the candidates brushed up their knowledge and skills on research methods, recording procedures and safety. It also included practical training using the actual tuna to measure the fish size and to collect the biological samples. After returning from the cruises, observers reported their research activities in the debriefing.

3. 科学オブザーバのデザインとカバー率　Design and coverage

2016 年に主要な CCSBT 統計海区（海区 4-9）で操業を行った漁船に 19 名のオブザーバを配乗した。1 名を除く全員が過去にミナミマグロまたはマグロ類を対象とした延縄操業船での科学オブザーバ活動の実績を有していた。ミナミマグロを対象とした操業を観察したオブザーバの雇用日数（日本出国から帰国まで）は合計 1665 日、対象調査船における乗船日数は合計 1171 日であった。

海域ごと、月ごとの隻数・努力量（釣鈎数）・SBT の漁獲尾数について、全体に占めるカバー率を計算した。比較には、CCSBT へ提出したデータ（隻数、努力量、および漁獲尾数）を用いた。2016 年の 4 海区から 9 海区でのカバー率は、隻数で 21.6%、使用釣鈎数で 16.6%、ミナミマグロ漁獲尾数で 17.1%であった(Table 2)。ただし 8 海区でのカバー率が低かった。

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。2016 年にオブザーバが実際に観察した鈎数の割合は総使用鈎数の 77.3%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、16.6%×0.773=12.9%と計算された。

Scientific observers were dispatched in 19 vessels that operated in the main CCSBT statistical areas (area 4－9). All except one observers had experiences of scientific observer activities for SBT or other tunas. The total number of days employed was 1665 while the total number of days on-boarded was 1171.

We calculated observer coverage between January and December in area 4-9 (calendar year). The data reported from

the fishermen (the denominator for coverage calculation) were based on the logbook which were submitted in the CCSBT data exchange. Observer coverages were 21.6% in the number of vessels, 16.6% in the number of hooks used, and 17.1% in the number of SBT caught (Table 2). The coverage in area 8 was low.
Scientific observers did not observe whole of the hauling operations because of rest for meal, rough weather condition, and other reasons. The observers actually monitored 77.3% of all hauling time in 2016. Thus, the coverage of effort which was actually observed by the observers was calculated as 12.9% (16.6% x 0.773).

4. 収集データ Observer data collected

4～9 海区において、オブザーバが記録した硬骨魚類、サメ類、海鳥類、その他のリストを Table3～5 に示す。オブザーバによる生物の種査定の一部については、後日、オブザーバが撮影した写真に基づいて国際水産資源研究所の専門家が確認している。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 6 に示す。合計 53,624 個体の体長を測定し、このうちミナミマグロは 13,663 個体であった。オブザーバは乗船中に耳石、筋肉などの生物標本を収集し、性別を判定した（Table 7）。ミナミマグロについては耳石を 484 個体、筋肉を 1233 個体から採取した。

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。RTMP による日本延縄船全船によるミナミマグロ全漁獲個体数の体長組成と比較した。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。カバー率の低かった 8 海区では比較できる量のデータが得られなかった。詳細にみると 120cmFL 以下の組成に違いが見られた。この差は各船の操業戦略による小型魚放流活動の有無に起因すると思われる。放流尾数は RTMP によって全漁船から放流なしを含めて報告されており、オブザーバの乗船に関わらず放流戦略は船側が決定している。

Table 3-5 summarize the number of animals observed, by teleosts, sharks, and seabird and others. Some of them were identified its more detailed taxonomic classification later in the laboratory by specialists in the National Research Institute of Far Seas Fisheries based on photographs which scientific observers took on-board. Table 6 summarizes the number of individuals of which body length were measured by the observers by area and month. A total of 53,624 individuals were length measured, including 13,663 SBT. Biological samples collected, as well as sex identified, were summarized by species, area and month in Table 7. Otoliths were collected from 484 SBT and muscle tissue were collected from 1233 SBT.
Fig. 1 shows length frequency of SBT from observers comparing to those from RTMP by area. The length frequency distributions of the observer data and RTMP data were generally similar to each other. Small amount of data was collected in the area 8 where its coverage was low. In detail, some difference was seen in small size < 120 cmFL, probably due to the difference of release/retain strategy in vessels. Note that the number of release/discard fish were reported from all SBT vessels in RTMP (including zero release) and that release strategy was determined by the vessel regardless of the presence of scientific observer.

5. 標識魚の再捕 Tag return monitoring

調査を通じて回収した CCSBT 通常標識（通常標識）は、5 隻から 6 個体分（10 本）であった。

Scientific observers collected 10 conventional tags from 6 recaptured SBT on 5 vessels.

6. 科学オブザーバ事業の問題点　Problem experienced

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、洋上転船には天候次第で大きな危険を伴う等の問題点が指摘されている。

Japanese commercial longline vessels rarely come into ports 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.

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. Research items of observers in Japanese SBT longline observer program.

Item	Records
Data collection during line setting	- Location (start and end points of line setting) - Time (start and end times of line setting) - Weather and sea condition - Gear configuration - Bait types used - Use of mitigation measures to reduce incidental take of seabirds - Number of seabirds around the vessel
Data and sample collection during line hauling	- Location (start and end points of line hauling) - Time
(for animals caught by longline)	- Body length - Body weight - Life status - Sex - Photographing (especially for seabirds)
(as biological sampling)	- Otolith (for the age estimation of SBT) - Vertebrae (for the age estimation of tagged sharks) - Muscle tissue (for the genetic and isotope research of SBT, other fishes, and the bycatch species including seabirds)
(as tag recapture)	- Tag recovery for SBT, sharks, and others.

Table 2. Observer coverage in Japanese SBT longline observer program in 2016.

Area	Month	Number of vessels			Number of hooks used (x1000)			Number of SBT retained		
		Observed	All vessels	Cover rate	Observed	All vessels	Cover rate	Observed	All vessels	Cover rate
Area 4	2	0	1	0.0%		2	0.0%		0	0.0%
	3	1	6	16.7%	17	115	14.5%	0	0	0.0%
	4	0	2	0.0%		35	0.0%		0	0.0%
	5	3	15	20.0%	49	242	20.0%	278	1,326	21.0%
	6	3	14	21.4%	170	610	27.9%	256	1,701	15.0%
	7	1	3	33.3%	7	57	12.0%	0	377	0.0%
Area 5	6	0	5	0.0%		95	0.0%		0	0.0%
	7	2	10	20.0%	103	706	14.7%	0	7	0.0%
	8	0	8	0.0%		457	0.0%		8	0.0%
Area 7	3	3	13	23.1%	37	301	12.4%	115	1,198	9.6%
	4	6	23	26.1%	484	1,990	24.3%	2,352	11,276	20.9%
	5	6	25	24.0%	398	1,502	26.5%	2,508	10,627	23.6%
	6	2	5	40.0%	29	101	28.3%	330	1,202	27.5%
Area 8	3	0	11	0.0%		255	0.0%		141	0.0%
	4	1	19	5.3%	72	1,455	5.0%	1	127	0.8%
	5	1	23	4.3%	49	1,223	4.0%	11	134	8.2%
	6	1	10	10.0%	27	197	13.7%	8	117	6.8%
	7	0	13	0.0%		92	0.0%		324	0.0%
	8	0	26	0.0%		2,357	0.0%		13,266	0.0%
	9	0	22	0.0%		863	0.0%		4,826	0.0%
Area 9	4	2	13	15.4%	78	436	17.8%	437	3,086	14.2%
	5	8	32	25.0%	476	1,805	26.3%	1,993	9,757	20.4%
	6	11	32	34.4%	666	1,932	34.5%	3,044	9,799	31.1%
	7	9	26	34.6%	378	1,203	31.4%	2,090	8,690	24.1%
	8	2	7	28.6%	38	136	27.5%	137	574	23.9%
	9	0	2	0.0%		139	0.0%		676	0.0%
	10	1	3	33.3%	19	91	21.2%	24	354	6.8%
Area 4	Jan-Dec	5	20	25.0%	242	1,262	19.2%	534	3,404	15.7%
Area 5	Jan-Dec	2	10	20.0%	103	1,299	8.0%	0	15	0.0%
Area 7	Jan-Dec	6	25	24.0%	948	3,894	24.4%	5,305	24,303	21.8%
Area 8	Jan-Dec	1	26	3.8%	149	6,441	2.3%	20	18,935	0.1%
Area 9	Jan-Dec	12	36	33.3%	1,655	5,743	28.8%	7,725	32,936	23.5%
Area 4-9	Jan-Dec	19	88	21.6%	3,097	18,639	16.6%	13,584	79,593	17.1%

Table 3. Number of teleost fish recorded by the Japanese SBT longline observer program in 2016 in CCSBT statistical area 4-9.

種名	Species	N
ミナミマグロ	*Thunnus maccoyii*	13,990
アロツナス	*Allothunus fallai*	68
ガストロ	*Gasterochisma melampus*	7,323
ビンナガ	*Thunnus alalunga*	15,668
キハダ	*Thunnus albacares*	266
メバチ	*Thunnus obesus*	618
クロマグロ	*Thunnus thynnus*	2
カツオ	*Katsuwonus pelamis*	31
フウライカジキ	*Tetrapturus angustirostris*	4
マカジキ	*Tetrapturus audax*	36
メカジキ	*Xiphias gladius*	462
ミズウオ類	*Alepisaurus spp.*	758
アカマンボウ類	Lamprididae	1,502
シマガツオ	*Brama spp.*	7,096
クロタチカマス科	*Gamphylidae*	210
アブラソコムツ	*Lepidocybium flavobrunneum*	1,001
バラムツ	*Ruvettus pretiosus*	355
マンボウ	*Mola mola*	212
その他魚類	Other fishes	793

Table 4. Number of sharks recorded by the Japanese SBT longline observer program in 2016 in CCSBT statistical area 4-9.

種名	Species	N
ヨシキリザメ	*Prionace glauca*	5,401
アオザメ	*Isurus oxyrinchus*	245
ニシネズミザメ	*Lamna nasus*	1,141
その他サメ類	Other sharks	583

Table 5. Number of seabirds and the other animals recorded by the Japanese SBT longline observer program in 2016 in CCSBT statistical area 4-9.

種名	Species	N
大型アホウドリ類	Large albatrosses	67
暗色アホウドリ類	Dark colored albatrosses	52
その他のアホウドリ類	Other albatrosses	1185
ミズナギドリ類	Unidentified petrels	217
その他の海鳥	Other birds	114
ウミガメ類	Sea turtles	1
鰭脚類	*Pinnipedia*	3
ハクジラ類	*Odontoceti*	2

Table 6. Number of individuals its length measured under the Japanese SBT longline observer program in 2016.

		Area 4					Area 5		Area 7					Area 8					Area 9							Total
分類	Name	Mar	May	Jun	Jul	Total	Jul	Total	Mar	Apr	May	Jun	Total	Apr	May	Jun	Total	Apr	May	Jun	Jul	Aug	Oct	Total	
ミナミマグロ	Southern bluefin tuna		278	270		548	22	22	130	2,363	2,550	331	5,374	28	17	10	55	438	1,978	3,010	2,075	139	24	7,664	13,663
クロマグロ	Bluefin tuna										2		2												2
メバチ	Bigeye tuna	3	24	91	4	122	389	389			5		5	1	12		13					23	35	58	587
キハダ	Yellowfin tuna	30	40	64		134	16	16														89	12	101	251
ビンナガ	Albacore	139	769	2,156	45	3,109	707	707	239	5,279	3,107	74	8,699	824	852	334	2,010			3	2	276	142	423	14,948
カツオ	Skipjack tuna		4	3		7	19	19		1			1		1		1						2	2	30
ガストロ	Butterfly tuna		3	3		6				11	24	7	42	55	8	3	66	287	2,173	2,628	1,654	110		6,852	6,966
メカジキ	Swordfish	1	14	228	1	244	25	25		63	75	7	145	3	4	1	8					2	4	6	428
マカジキ	Striped marlin	15	3	10		28	5	5		2			2												35
フウライカジキ	Shortbill spearfish	2		2		4																			4
その他魚類	Other fishes	31	104	859	145	1,139	799	799	51	583	714	22	1,370	348	248	105	701	156	1,974	2,693	676	35	33	5,567	9,576
サメ類	Sharks	3	42	215	17	277	114	114	100	983	777	86	1,946	600	168	85	853	158	1,159	716	229	162	10	2,434	5,624
海鳥	Seabirds		19	65	1	85	13	13	49	494	248	15	806	84	3	3	90	37	204	168	93	11	3	516	1,510
総計	Total	224	1,300	3,966	213	5,703	2,109	2,109	569	9,779	7,502	542	18,392	1,943	1,313	541	3,797	1,076	7,488	9,218	4,729	847	265	23,623	53,624

Table 7. Number of individuals its biological samples collected and sex identified in the Japanese SBT longline observer program in 2016.

種	Name	Otolith	Muscle	Sex
ミナミマグロ	Southern bluefin tuna	484	1,233	12,663
クロマグロ	Bluefin tuna	2	2	2
メバチ	Bigeye tuna	44	48	580
キハダ	Yellowfin tuna	43	55	241
ビンナガ	Albacore	1	99	44
カツオ	Skipjack tuna		2	
ガストロ	Butterfly tuna		478	6,076
メカジキ	Swordfish		67	305
マカジキ	Striped marlin		19	32
フウライカジキ	Shortbill spearfish		2	4
その他魚類	Other fishes		839	1,570
サメ類	Sharks		485	5,730
海鳥	Seabirds		223	

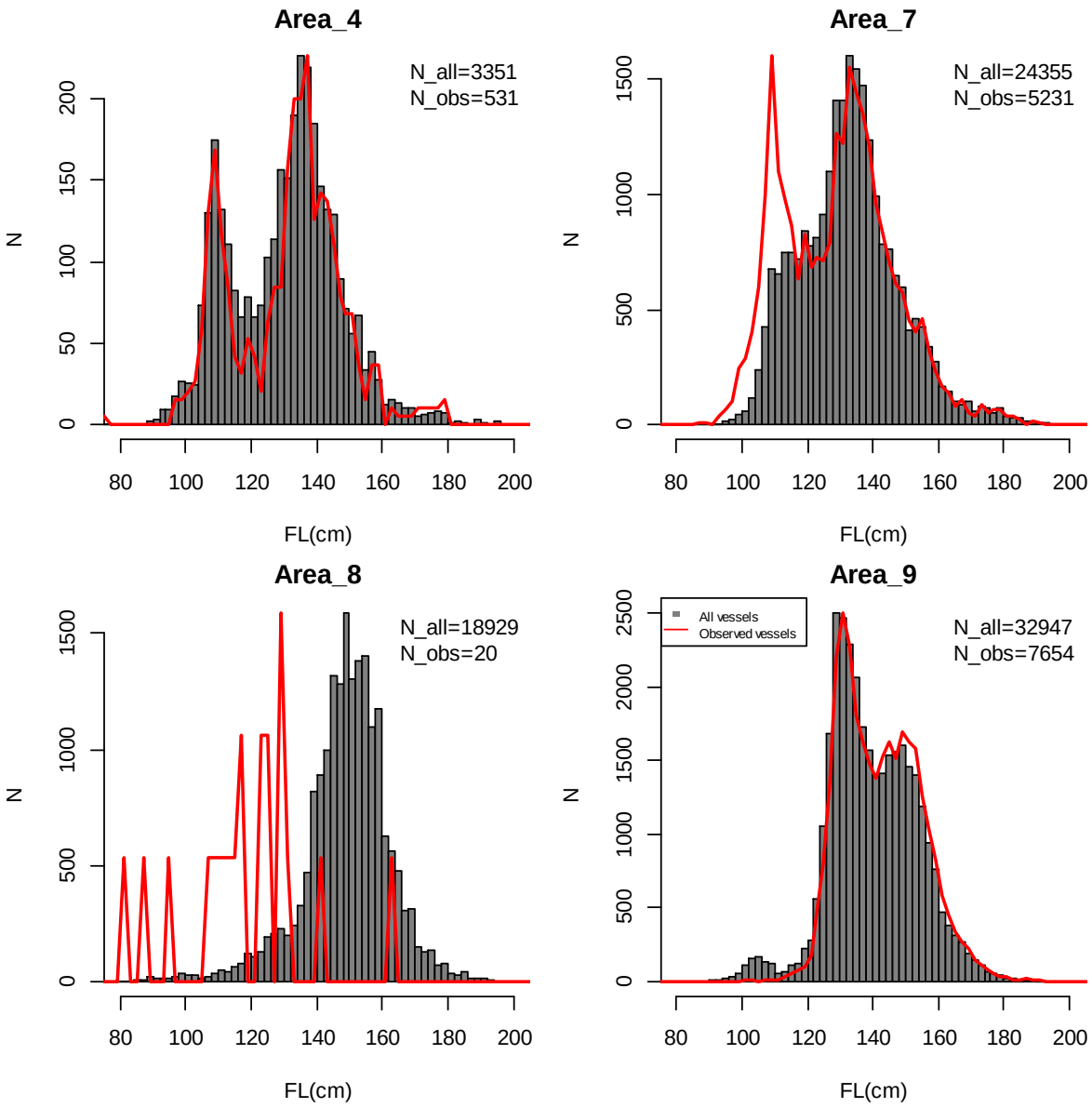

Fig. 1. Length frequency distribution of SBT retained by area in the Japanese SBT longline observer program in 2016.

Bars are from data in all vessels, red lines are from the observed data.