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

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

Tomoyuki ITOH, Yuichi Tsuda, Yukiko Inoue, Yasuko Semba, and Kazuhiro Oshima
伊藤智幸・津田裕一・井上裕紀子・仙波靖子・大島和浩

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 年調査の暫定的結果を報告する。主要な CCSBT 統計海区（4-9 海区）において 19 隻に配乗した。調査カバー率は、隻数で 21.3%、使用釣鈎数で 17.5%、ミナミマグロ漁獲尾数で 18.3%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 13.6%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 tentative results of Japanese scientific observer program for southern bluefin tuna (SBT) in 2016. Scientific observers were dispatched in 19 vessels that operated in the main CCSBT statistical areas (area 4－9). Observer coverages were 21.3% in the number of vessels, 17.5% in the number of hooks used, and 18.3% 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 13.6%. 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

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。

Japanese scientific observer program of longline fishery for the southern bluefin tuna (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。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 1464 日、対象調査船における乗船日数は合計 1320 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。オブザーバデータベースは暫定版である点に留意。7 海区での操業を観察した 1 航海のデータについては、データベースに未入力である。この航海の hook 数、SBT 漁獲尾数は、海区別のカバー率には含めたが、月別の集計値には含めていない。また後述の種別観察個体数や生物標本採集個体数には含めていない。2016 年の 4 海区から 9 海区でのカバー率は、隻数で 21.3%、使用釣鈎数で 17.5%、ミナミマグロ漁獲尾数で 18.3%であった(Table 2)。

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 77.9%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に基づくカバー率は、17.5%×0.779=13.6%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 observers had experiences of scientific observer activities for SBT or other tunas. The total number of days employed was 1464 while the total number of days on-boarded was 1320.

We calculated observer coverage between January and December in area 4-9 (calendar year). It should be noted that the observer dataset was tentative and data from a cruise in area 7 were not included. This currently lucking data were not included in the monthly summary and biological samples collected, however, the total number of hooks used and SBT retained those reported from the vessel were added in the case of summary by area. The data reported from the

fishermen (the denominator for coverage calculation) were based on the RTMP and/or the logbook which were submitted in the CCSBT data exchange. Observer coverages were 21.3% in the number of vessels, 17.5% in the number of hooks used, and 18.3% in the number of SBT caught (Table 2).
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 77.9% of all hauling time in 2016. Thus, the coverage of effort which was actually observed by the observers was calculated as 13.6% (17.5% x 0.779).

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 51,976 個体の体長を測定し、このうちミナミマグロは 13,725 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。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 51,976 individuals were length measured, including 13,725 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. 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	
	3	1	6	16.7%	17	115	14.5%		0	
	4	0	2	0.0%		35	0.0%		0	
	5	2	15	13.3%	28	249	11.2%	277	1,370	20.2%
	6	2	14	14.3%	101	597	16.9%	222	1,604	13.8%
	7	0	3	0.0%		57	0.0%		377	0.0%
Area 5	6	0	5	0.0%		95	0.0%		0	
	7	1	10	10.0%	56	706	7.9%		7	0.0%
	8	0	8	0.0%		327	0.0%		8	0.0%
Area 7	3	2	13	15.4%	14	301	4.5%	54	1,198	4.5%
	4	5	23	21.7%	384	1,986	19.3%	1,902	11,276	16.9%
	5	5	25	20.0%	338	1,497	22.6%	2,133	10,605	20.1%
	6	2	5	40.0%	29	114	25.1%	330	1,299	25.4%
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	1,227	4.0%	11	139	7.9%
	6	1	10	10.0%	27	197	13.7%	8	120	6.7%
	7	0	12	0.0%		92	0.0%		324	0.0%
Area 9	4	2	13	15.4%	78	456	17.0%	437	3,076	14.2%
	5	8	32	25.0%	476	1,876	25.4%	1,993	9,758	20.4%
	6	11	32	34.4%	666	1,939	34.4%	3,044	9,803	31.1%
	7	9	26	34.6%	378	1,206	31.4%	2,090	8,702	24.0%
	8	2	6	33.3%	38	136	27.5%	137	574	23.9%
	9	0	2	0.0%		135	0.0%		676	0.0%
	10	1	3	33.3%	19	91	21.2%	24	354	6.8%
Area 4	Jan-Dec	4	20	20.0%	145	1,054	13.8%	499	3,351	14.9%
Area 5	Jan-Dec	1	10	10.0%	56	1,128	4.9%	0	15	0.0%
Area 7	Jan-Dec	5	25	20.0%	1,054	3,898	27.0%	5,773	24,378	23.7%
Area 8	Jan-Dec	2	27	7.4%	306	6,445	4.8%	598	18,943	3.2%
Area 9	Jan-Dec	12	36	33.3%	1,655	5,838	28.3%	7,725	32,943	23.4%
Area 4-9	Jan-Dec	19	89	21.3%	3,215	18,362	17.5%	14,595	79,630	18.3%

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*	13,759
アロツナス	*Allothunus fallai*	3
ガストロ	*Gasterochisma melampus*	7,491
ビンナガ	*Thunnus alalunga*	11,554
キハダ	*Thunnus albacares*	161
メバチ	*Thunnus obesus*	345
クロマグロ	*Thunnus thynnus*	2
カツオ	*Katsuwonus pelamis*	12
フウライカジキ	*Tetrapturus angustirostris*	2
マカジキ	*Tetrapturus audax*	21
メカジキ	*Xiphias gladius*	323
ミズウオ類	*Alepisaurus spp.*	525
アカマンボウ類	Lamprididae	1,136
シマガツオ	*Brama spp.*	7,058
クロタチカマス科	*Gamphylidae*	274
アブラソコムツ	*Lepidocybium flavobrunneum*	538
バラムツ	*Ruvettus pretiosus*	301
マンボウ	*Mola mola*	150
その他魚類	Other fishes	534

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*	5,477
アオザメ	*Isurus oxyrinchus*	152
ニシネズミザメ	*Lamna nasus*	1,074
その他サメ類	Other sharks	551

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	58
暗色アホウドリ類	Dark colored albatrosses	52
その他のアホウドリ類	Other albatrosses	707
種不明アホウドリ類	Unidentified albatrosses	93
オオフルマカモメ類	Unidentified giant petrels	37
ミズナギドリ類	Unidentified petrels	141
その他の海鳥	Other birds	115
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.

		Area 4				Area 5		Area 7					Area 8							Area 9							Total
分類	Name	Mar	May	Jun	Total	Jul	Total	Mar	Apr	May	Jun	Total	Apr	May	Jun	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Oct	Total	
ミナミマグロ	Southern bluefin tuna		279	224	503			55	1,925	2,164	337	4,481	76	23	10	533	338	980	438	1,996	3,051	2,109	143	24	7,761	13,725
クロマグロ	Bluefin tuna									2		2															2
メバチ	Bigeye tuna	3	1	43	47	220	220			5		5	1	13	1			15					23	35	58	345
キハダ	Yellowfin tuna	32		19	51	7	7																91	12	103	161
ビンナガ	Albacore	143	143	752	1,038	269	269	105	4,659	2,754	76	7,594	910	928	375	1	5	2,219			3	2	287	142	434	11,554
カツオ	Skipjack tuna			2	2	6	6		1			1		1				1						2	2	12
ガストロ	Butterfly tuna		3	1	4				11	18	8	37	59	11	3	127	51	251	287	2,214	2,771	1,716	120		7,108	7,400
メカジキ	Swordfish	1	7	156	164	14	14		52	69	7	128	5	4	2			11					2	4	6	323
マカジキ	Striped marlin	15		1	16	3	3		2			2														21
フウライカジキ	Shortbill spearfish	2			2																					2
その他魚類	Other fishes	73	57	462	592	345	345	20	752	977	75	1,824	387	306	127	116	77	1,013	156	2,124	3,034	905	74	33	6,326	10,100
サメ類	Sharks	16	41	135	192	64	64	29	911	958	190	2,088	668	188	94	771	313	2,034	158	1,223	956	255	172	10	2,774	7,152
海鳥	Seabirds		5	20	25	3	3	1	284	129	15	429	91	3	3	26	22	145	37	206	179	128	21	3	574	1,176
ウミガメ	Sea turtles									1		1														1
哺乳類	Marine mammals			2	2																					2
総計	Total	285	536	1,817	2,638	931	931	210	8,597	7,077	708	16,592	2,197	1,477	615	1,574	806	6,669	1,076	7,763	9,994	5,115	933	265	25,146	51,976

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	12,322
クロマグロ	Bluefin tuna	2	2	2
メバチ	Bigeye tuna	44	48	311
キハダ	Yellowfin tuna	43	55	146
ビンナガ	Albacore	1	99	46
カツオ	Skipjack tuna		2	
ガストロ	Butterfly tuna		478	6,240
メカジキ	Swordfish		67	191
マカジキ	Striped marlin		19	19
フウライカジキ	Shortbill spearfish		2	2
その他魚類	Other fishes		837	1,009
サメ類	Sharks		485	5,850
海鳥	Seabirds		222	

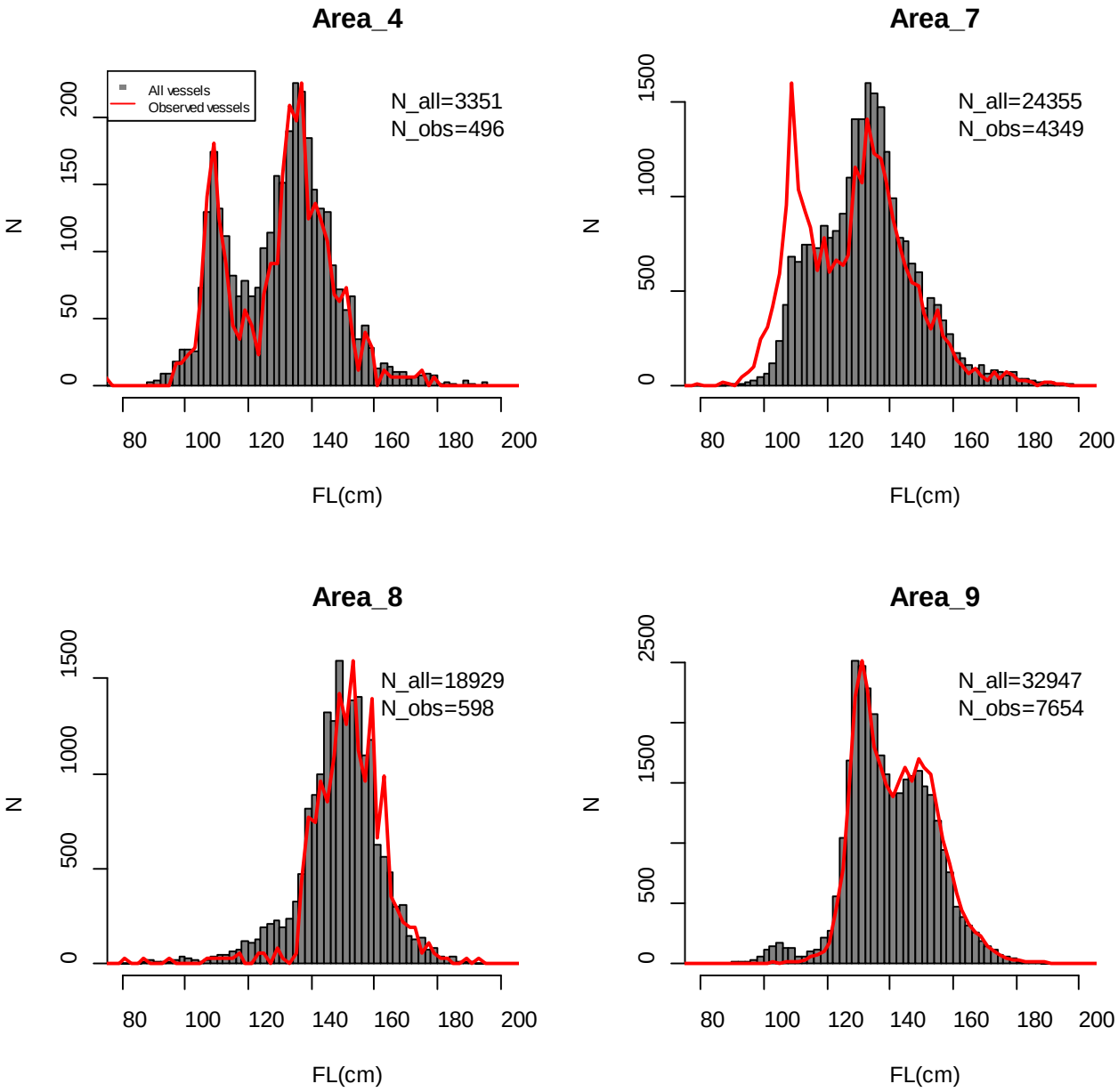

Fig. 1. Length frequency distribution of SBT by area in the Japanese SBT longline observer program in 2016.

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