

Report of Japanese scientific observer activities for southern bluefin tuna fishery in 2007/2008

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：2007/2008年

Osamu SAKAI¹, Tomoyuki ITOH¹, Shingo FUKUI² and Toshiyuki TANABE¹

境 磨¹・伊藤智幸¹・福井真吾²・田辺智唯¹

1:National Research Institute of Far Seas Fisheries 遠洋水産研究所

2:Fisheries Agency of Japan 水産庁

要約

2007年度に水産庁は商業延縄漁船8隻へ科学オブザーバを、1隻へ科学調査員を派遣し、調査を実施した。オブザーバ/調査員の乗船中に8海区で操業を行ったのは3隻、9海区で操業を行ったのは7隻である。4-9海区での調査カバー率は、隻数で6.7%、使用釣鉤数で7.6%、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5.7%と推定された。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/調査員は乗船中に通常標識30個体分を回収した。国別漁獲枠の減少のため各船の操業計画は流動的であり、4-7海区のような操業隻数が少数である海区にはオブザーバを配置することが出来なかった。2007年度のオブザーバ派遣に要した費用は総額2,132.6万円(199,308米ドル)であった。

Summary

In 2007/2008, seven scientific observers and 1 researcher were sent to 9 longline vessels for the observer program of southern bluefin tuna (SBT). These scientific observers were employed by the Fisheries Agency of Japan. Three vessels with the observer/researcher operated in the area 8, and seven vessels with the observer/researcher operated in the area 9. The observer coverage against all of Japanese SBT longline fishing in the area 4-9 (Apr.-Dec.) was 6.7% in the number of vessels, 7.6% in the number of hooks used, and 7.2% in the number of SBT caught. Taking into account of the duration of observed during hauling, the number of hooks observed was estimated as 5.7% against all hauling durations by all SBT vessels. Partly, there were differences in the length frequency distributions between vessels with observers and all vessels. Observers retrieved the conventional tags from 30 SBT individuals. Due to the reduction of SBT quota, annual fishing operation plans of Japanese longline vessels were fluid. Therefore, the scientific observer program was not able to cover the area with only a small number of vessels operated (such as Area 4-7). The total costs of the observer program in 2007/2008 were 21,326,000 yen (US\$199,308).

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

2007年度には、ミナ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。全員が過去にミナ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て実物の魚を用いた実習を行なった。なお、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ている。

In 2007, Japan trained 7 observers to monitor the Japanese commercial longline vessels. All observers had quite a bit experience of scientific observer for SBT fisheries. They brushed up their knowledge and skills on research method, recording procedure and safety at sea by 2 day training program. This program included the practical training which used the actual tuna. After the return from the Japanese commercial longline vessels, every observer reported the observer activity, which is 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 The designing and coverage of the program

2007年にRTMPにおいてミナマグロ操業を行った136隻の遠洋まぐろ延縄漁船のうち、ランダムに選定した8隻に科学オブザーバを、8海区で操業を行う1隻に遠洋水産研究所の調査員を派遣した(合計9隻;全体の約6.5%)。調査員は科学オブザーバ活動に加えて、アーカイバルタグ・ポップアップタグアーカイバルタグの放流調査を実施した。科学オブザーバ8名のうち1名は、1年間に2度派遣した。例年、科学オブザーバ計画によって、ミナマグロの主要漁場である4、7、8、および9海区での操業観察データが得られていた。しかし、2007年には、オブザーバが乗船した延縄漁船が4および7海区で操業しなかったため、ミナマグロ主要漁場で得られた操業観察データは8海区の150操業(3隻)、および9海区の288操業(7隻)に限られた(Table 1)。9隻全てがミナマグロ操業に従事したが、一部の船は一部期間に他魚種(例えばキハダ、メバチ)を対象として30S以北の海域で操業した。

The scientific observers were sent to 8 vessels which were chosen at random from all vessels of Japanese SBT fisheries vessels in 2007 (136 vessels). In addition, a researcher of NRIFS was sent to 1 vessel which had a plan to operate in the CCSBT statistical area 8. The researcher performed not only the scientific observation but also the archival tagging activity. One of eight observers was sent to fishing vessel two times within the year. Before 2006, observed data in area 4, 7, 8 and 9 had been obtained from the scientific observer program. But, in 2007, the data were limited only to area 8 and 9 because the vessels which had observers on board did not operate in area 4 and 7. The number of operation with observer in area 8 and 9 were 150 (from 3 vessels) and 288 (from 7 vessels), respectively (Table 1). All of 9 vessels operated in the fishing ground of SBT, and, in addition, some of them operated at northern area of 30N to target other tuna (e.g. bigeye tuna, yellowfin tuna) with observers on board.

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。比較に供したデータは、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。4 月～12 月の 4～9 海区におけるカバー率は、隻数で 6.7%（8 海区で 5.2%、9 海区で 10.9%）、使用釣鈎数で 7.6%（8 海区で 5.6%、9 海区で 9.3%）、ミナミマグロ漁獲尾数で 7.2%（8 海区で 7.1%、9 海区で 10.5%）であった。

オブザーバは、天候等の要因により操業を観察しない場合がある。2007 年には、オブザーバの乗船期間中の全操業 559 回のうち、538 回の操業（96.2%）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 6900 時間のうち 5432 時間（78.7%）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 5.7%（7.6%×96.2%×78.7%）と推定された。なお、オブザーバが調査を行った 538 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 422 回（78.4%）、他の魚種が対象の操業（1、2、13、14 海区）は 116 回（21.6%）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 26,632 個体の体長を測定し、このうちミナミマグロは 3,926 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 6,766 個体、ガストロ 2,644 個体、メバチ 2,400 個体、キハダ 309 個体であった。生物標本として耳石、胃、全身標本などを収集した（Table 4）。ミナミマグロの耳石は 620 個体から採集した。また、ミナミマグロ 3,550 個体、合計 20,959 個体について性別を判定した。

Table 1 summarizes the catch-and-effort data reported from observers and 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. These data were used to calculate the observer coverage as follows. Between April and December, the observer coverage in area 4-9 was 6.7% (in the number of vessels), 7.6% (in the number of hooks used) and 7.2% (in the number of SBT caught). The coverage in the area 8 and 9 was 5.2% and 10.9% (in the number of vessels), 5.6% and 9.3% (in the number of hooks used), 7.1% and 10.5% (in the number of SBT caught), respectively. The scientific observer did not observe whole of the hauling operation because of rough weather condition and the other reasons. Table 2 summarizes the actual observed time rate while the observers were on board. In 2007, the observers monitored 538 / 559 operations (96.2%), and actually observed 5432 / 6900 hours (78.7%) of those operations. Thus, the coverage of effort which was actually observed by the scientific observer was estimated as 5.7% (7.6% of 96.2% of 78.7%) on average. The observed operations in the fishing ground of SBT (area 4-9) were 422 (78.4%) and, in the fishing ground of the other tunas (area 1, 2, 13, 14) were 116 (21.6%).

Table 3 summarizes the number of individual whose length was measured by the scientific observer in each area and month. Total number of measurements was 26532, and 3926 of them was SBT. Other dominant fish species which were measured were Albacore (n=6766), Butterfly tuna (n=2644), Bigeye tuna (n=2400) and Yellowfin tuna (n=309). Biological samples were also collected (Table 4), especially otolith samples were picked out from 620 SBT. Observer identified the sex of 20959 individuals, and 3550 of them were 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、オブザーバ調査が比較的多く実施された時期（8 海区は 7-11 月、9 海区は 5-11 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、8 海区で特に 90cm 前後の小型魚の体長組成に大きな差がみられた。9 海区では両者がほぼ一致したが、オブザーバが観察したほうが小型魚の割合がわずかに多かった。差がみられた原因として、以下のことが考えられる；1) オブザーバ船の体長組成データは、あまり多くはない操業観察に基づく、2) 偶然、オブザーバが観察した操業で小型魚が多く漁獲された、3) RTMP やオブザーバの報告ミス、4) 2007 年漁期には、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ていた。なお、CCSBT の枠組みにおいて、放流魚は各国のクォータには含まれないことを留意されたい。

Fig. 1 shows the comparison of the SBT length frequency between the observer data and RTMP. The data period and area to compare were July-November in area 8 and May-November in area 9, which corresponded to the observed period and area by the scientific observer. The length frequency distribution of both data did not correspond very well in area 8, especially around the length frequency of 90 cm FL. Possible reasons for the difference in the length frequency were follows: 1) The length frequency distribution of observer data was based on not many operations. 2) The observers coincidentally monitored operations in which many small fishes were caught. 3) Somewhat of mistake in the observer data or RTMP data. 4) A part of Japanese commercial vessels released the small SBT. Meanwhile, it should be noted that released SBT is not included in the national quota within the CCSBT.

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、6 隻から 30 個体分（CCSBT タグ 28 個体分（49 本）、CSIRO タグ 1 個体分（2 本）、その他の機関（NSW）のタグ 1 個体分（1 本））であった。また、1 隻から豪州南西沿岸で装着放流された音響タグ 1 個が回収された。

The scientific observers collected conventional tags from 30 recaptured SBT on six vessels. The recaptured conventional tags included two “CSIRO” tags (from one SBT), one “NSW” tag (from one SBT), and 49 “CCSBT” tags (from 28 SBT). In addition, an observer recaptured one acoustic tag that was released around the South-western coast of Australia.

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。2007 年は予算上の制約によりオブザーバ数を減らさざるをえなかったが、ミナミマグロ漁場全体でのオブザーバカバー率は例年並みの水準を

維持した。ただし、4海区・7海区ではオブザーバ調査が出来なかった。これは、船別漁獲枠（IQ）の減少や、近年の4海区・7海区の漁模様の低迷により、両海区で操業する漁船数が減少し、両海区で操業する船にオブザーバを配置することが困難になったためである。

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、例年、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ていた。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ため、2007年は全オブザーバが港で乗下船した。そのため、補給可能な港が漁場から遠い8海区で調査を行ったオブザーバの乗船期間が長期化した（平均126日間）。

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686日であり、漁船への乗船実日数は90%の616日であった（Table 5）。科学オブザーバ調査には多額の費用がかかっており、2007年については、オブザーバへの報酬費約962万円（90千US\$）、オブザーバの派遣旅費約769万円（72千US\$）、保険・資機材他401万円（38千US\$）、総額約2,133万円（199千US\$）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日本の義務を果たすよう努めている（Table 6）。

Japanese observer program has been performed systematically since 1992. The program is very cost-intensive. In 2007, the number of observers was forced to decrease by budgetary restrictions. The coverage rate was kept the level in an average year, though the observer had no opportunities to monitor in area 4-7. The number of Japanese vessels in area 4-7 decreased because of the reduction of IQ and the depression of CPUE in recent years; therefore it was difficult to deploy the observer on area 4-7.

Japanese commercial longline vessels rarely come into port for cost-cutting; thus, in past years, the observers were forced to transfer from supply vessels to fishing vessels on high seas. The transfer on high seas has risks, whose magnitudes are depending on weather conditions. However, all observers in 2007 got on and leave their fishing vessels at the port. Therefore, the on-board periods of some observers who monitored in area 8 were prolonged because the port that Japanese vessels replenished was far from the fishing ground (126 days in average).

The quality of observer was good because most of observers were retired fishermen who had the experience of SBT fisheries. This quality was kept by not rehiring the observer who had problems and by enhancing the training program.

Total periods of employment and cruise of 7 observers were 686 days and 616 days, respectively (Table 5). Total expenses which were spent for Japanese observer program in 2007 were 21,326,000 yen (US\$ 199,000); 9,618,000 yen for the observer's salary, 7,694,000 yen for the overseas travel expenses for observers, 314,000 yen for the insurance premium for observers, and 3,700,000 yen for the research materials. Japanese government expended these budgets in fulfilling the responsibilities as the responsible fishing nation.

Table 1 Observed effort and catch of SBT in Japanese longline observer program 2007.

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 (x1000)	Number of hooks by all vessels (x1000)	Rate of observed hooks	Number of SBT observed	Number of SBT by all vessels	Rate of observed SBT
Area8	7	2	21	9.52%	51	314	16.36%	87	411	21.17%
	8	2	31	6.45%	168	2,450	6.87%	687	4,395	15.63%
	9	2	33	6.06%	119	2,009	5.95%	231	3,866	5.98%
	10	2	24	8.33%	103	1,245	8.23%	77	1,778	4.33%
	11	1	34	2.94%	57	2,509	2.27%	64	5,280	1.21%
	12	0	13	0.00%		396	0.00%	0	535	0.00%
Area9	4	0	4	0.00%		227	0.00%	0	966	0.00%
	5	2	18	11.11%	54	500	10.73%	42	1,165	3.61%
	6	3	34	8.82%	218	1,840	11.86%	113	1,831	6.17%
	7	5	40	12.50%	132	2,199	6.00%	380	4,998	7.60%
	8	4	41	9.76%	209	2,404	8.69%	1,359	9,784	13.89%
	9	2	36	5.56%	168	1,995	8.42%	480	5,322	9.02%
	10	2	16	12.50%	117	570	20.44%	303	1,665	18.20%
	11	1	1	100.00%	17	15	112.45%*1	37	46	80.43%
Area8	Total	3	58	5.17%	499	8,924	5.59%	1,146	16,265	7.05%
Area9	Total	7	64	10.94%	914	9,751	9.38%	2,714	25,777	10.53%
Total (Area4-9) (Apr.-Dec.)		9	135	6.67%	1,413	18,676	7.57%	3,860	53,936	7.16%

*1 In November area9, one operation with observer was not reported under RTMP because SBT was not caught at that operation.

Table 2 Actual observation times and rate in 2007 Japanese longline observer program.

	Operated	Observed	Rate	
Number of operation		559	538	96.2%
Time (hour) of operations ¹		6,900	5,432	78.7%

1: Total hours of line hauling of operation in which observed (i.e. 538 operations).

Table 3 Number of individuals the length of which was measured in 2007 Japanese longline observer program.

	Area 1			Area 2			Area 8			Area 9			Area 13			Area 14			Total				
	Oct.	08/Jan.	Feb.	July	Oct.	July	Aug.	Sep.	Oct.	Nov.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.		08/Jan.	Aug.	Sep.	
ミナミマグロ				66	18	86	678	226	76	64	36	112	376	1352	479	296	36			13	12	3926	
キハダ	33	25	17	9									8	4	3	22	3	28	91	33	33	309	
メバチ	236	39	110	269	4								98	316	198	121	8	50	616	308	25	2400	
ビンナガ	34	20	30	1730	40	1	6	3			2	9	657	1585	1360	468	36	23	110	169	433	6766	
バショウカジキ												1						4	1	1		7	
フウライカジキ																					2	2	
マカジキ	1			1																		2	
メカジキ	8	2	4	21	1								7	15	17	14	2	1	11	10	8	121	
クロカジキ			1																6	5		12	
シロカジキ	1																		4			5	
ガストロ				4	1	163	738	461	610	260	50	315	39	3								2644	
カツオ	15	2	3										1	1	2	1	2	1	7	1	3	38	
サメ類	101	39	46	288	309	115	393	469	110	143	288	429	772	909	425	419	40	11	125	91	90	5613	
その他魚類	404	24	56	455	142	34	217	255	10	7	93	295	361	669	599	391	141	37	142	66	172	4594	
海亀類			1														1					2	
海鳥類				1	8	1	72	17	6	1	7	15	1	12	17	25	6					189	
その他												1	1									2	
総計	833	152	267	2844	523	400	2104	1431	812	475	476	1177	2321	4866	3098	1758	273	153	1116	684	780	89	26632

Table 4 Number of individuals investigated. Each observers identified species and sex, and kept the biological samples in the Japanese longline observer program in 2007.

和名	Species	Number of biological samples			Sex		Total catch number
		Otolith	Stomach	Whole body	Male	Female	
ミナミマグロ	Southern bluefin tuna (Total)	620	648	0	2066	1484	3970
	~89cm	41	57	0	199	73	367
	90~99cm	58	101	0	501	302	909
	100~109cm	51	105	0	508	321	922
	110~119cm	40	47	0	161	166	350
	120~129cm	43	35	0	81	91	196
	130~139cm	36	27	0	69	79	160
	140~149cm	63	42	0	115	127	250
	150~159cm	114	103	0	190	183	380
	160~169cm	103	86	0	154	103	265
	170~179cm	54	37	0	72	34	108
	180~189cm	13	6	0	12	4	16
	190cm~	3	2	0	3	0	3
	No data	1	0	0	1	1	44
キハダ	Yellowfin tuna	0	236	0	169	137	311
メバチ	Bigeye tuna	76	5379	0	1145	1200	2420
ビンナガ	Albacore	1	38	0	17	19	6962
バショウカジキ	Sailfish	0	0	0	5	1	6
フウライカジキ	Shortbill spearfish	0	0	0	1	1	2
マカジキ	Striped marlin	0	3	0	0	2	2
メカジキ	Swordfish	0	140	0	40	49	123
クロカジキ	Blue marlin	0	0	0	6	5	12
シロカジキ	Black marlin	0	2	0	4	1	5
ガストロ	Butterfly tuna	0	3278	0	895	1685	2690
カツオ	Skipjack	0	0	0	1	1	39
サメ類	Sharks	0	21	0	2087	4493	7075
その他魚類	Other fish	3	1165	9	463	1430	5436
海亀類	Sea turtles	0	0	0	2	0	2
海鳥類	Sea birds	0	0	2	0	0	200
その他	Other	0	0	0	0	0	2

Table 5 Employment and cruise period of the scientific observers from 2001 to 2007.

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

Table 6 Expenses which were spent for Japanese observer program from 2001 to 2007.

		2001	2002	2003	2004	2005	2006	2007
報酬	Observer's salary	17,109	18,365	21,286	20,170	22,302	20,570	9,618
旅費	Overseas travel expenses for observers	14,259	12,571	15,878	16,350	16,157	12,580	7,694
保険	Insurance premium for observers	519	672	778	720	852	700	314
調査機材	Research materials					4,128	9,650	3,700
合計	Total	31,887	31,607	37,941	37,240	43,439	43,500	21,326
	(1000US\$)	290	287	345	339	395	395	199

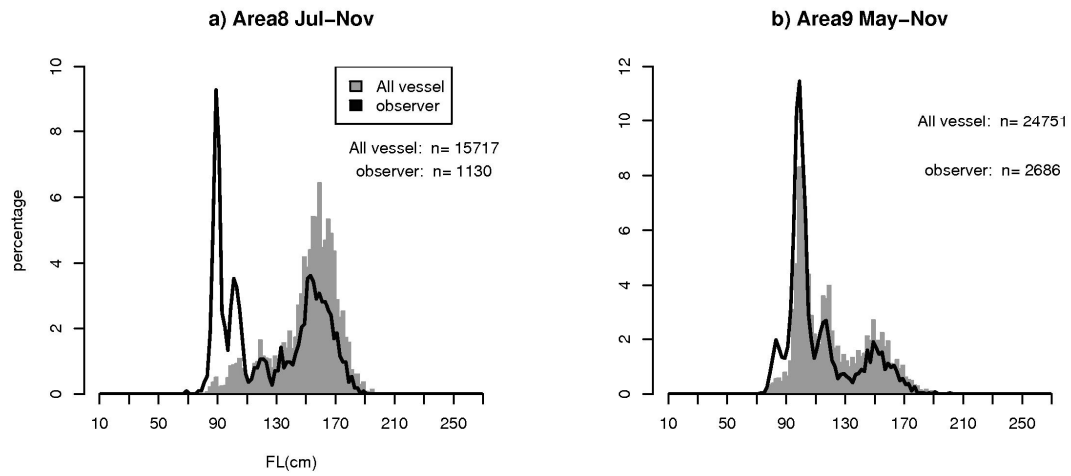


Fig. 1 Length frequency distribution of SBT by area in the 2007 Japanese longline observer program.

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