Report of Japanese scientific observer activities for southern bluefin tuna fishery in 2008/2009

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：2008/2009 年

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要約

2008 年度に水産庁は商業延縄漁船 6 隻へ科学オブザーバを派遣し調査を実施した。オブザーバの乗船中に 8 海区で操業を行ったのは 2 隻、9 海区で操業を行ったのは 3 隻である。調査カバー率は、隻数で 4.8%、使用釣鈎数で 4.3%、ミナミマグロ漁獲尾数で 2.4%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、観察釣鈎数は全操業の 3.0%と推定された。8 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。オブザーバは乗船中にミナミマグロから耳石（301 個体分）、胃内容物（241 個体分）、および筋肉（354 個体分）の生物標本を採集し、通常標識 6 個体分を回収した。2008 年度のオブザーバ派遣に要した費用は総額 1,444 万円（138,284 米ドル）であった。

Summary

In 2008/2009, five scientific observers were sent to six 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 operated in the area 8, and seven vessels with the observer operated in the area 9. The observer coverage against all of Japanese SBT longline fishing was 4.8% in the number of vessels, 4.3% in the number of hooks used, and 2.4% in the number of SBT caught (coverage of hook and SBT were calculated for Apr.-Dec. in area 4-9). Taking into account of the duration of observed during hauling, the number of hooks observed was estimated as 3.0% against all hauling durations by all SBT vessels. Partly, there were some differences in the length frequency distributions between vessels with observers and all vessels in area 8. Observers collected the otolith (from 301 individuals), stomach (from 241 individuals), and muscle (from 354 individuals) as the scientific sample of SBT, and retrieved the 10 conventional tags (from 6 individuals). The total costs of the observer program in 2008/2009 were 14,443,746 yen (US$138,284).

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

2008 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 5 名のオブザーバを訓練した。全員が過去にミナミ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 2008, Japan trained 5 observers to monitor the Japanese commercial longline vessels. All observers had quite a bit experience of scientific observer for Southern Bluefin Tuna (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

2008 年に RTMP において主要漁期にミナミマグロ操業を行った 126 隻の遠洋まぐろ延縄漁船のうち、ランダムに選定した 6 隻に科学オブザーバを派遣した（全体の約 4.7%）。科学オブザーバ 5 名のうち 1 名は、1 年間に 2 度派遣した。近年のミナミマグロ漁業は、漁期規制の撤廃、IQ 制の導入、燃油の高騰、魚価の低迷等の影響により、各船の操業計画は流動的となっている。そのため 2007 年度には操業隻数の少ない 4-7 海区へのオブザーバの配置が出来なかったが、2008 年度には例年と同様に、ミナミ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ることができた。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 46 操業（1 隻）、7 海区の 21 操業（1 隻）、8 海区の 122 操業（2 隻）、および 9 海区の 61 操業（3 隻）である（Table 1）。一部の船はオブザーバ乗船中にミナミマグロ主要漁場で操業せず、30S 以北の海域で他魚種（例えばキハダ、メバチ）を漁獲した。

The scientific observers were sent to six vessels which were chosen at random from all Japanese vessels operated in 2008 fishing season (126 vessels). One of the five observers was sent to fishing vessel two times within the fishing season. Recent annual operational pattern and schedule of Japanese longline vessels are affected by many factors for example the introduction of individual quota (IQ) system, the abolish of seasonal area closure, the drastic/ temporal increase of fuel price, and the market price slump of SBT (Itoh 2009). Due to this, we could not deploy the observers to area 4 and 7 in 2007 fishing season. Nonetheless, we could obtain the observed data of area 4, 7, 8 and 9 in 2008 fishing season as before 2006. Total numbers of operation observed in area 4, 7, 8 and 9 were 250 (46 operations in area 4, 21 operations in area 7, 122 operations in area 8, 61 operations in area 9). One of vessel with observer operated at northern area of 30S to target other tunas (e.g. bigeye tuna, yellowfin tuna) instead of SBT.

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 4.8%（4 海区で 5.3%、7 海区で 6.7%、8 海区で 4.3%、9 海区で 4.3%）、使用釣鈎数で 4.3%（4 海区で 12.3%、7 海区で 6.5%、8 海区で 5.3%、9 海区で 2.1%）、ミナミマグロ漁獲尾数で 2.4%（4 海区で 2.5%、7 海区で 3.0%、8 海区で 3.4%、9 海区で 1.7%）であった。なお、釣鈎数と漁獲尾数のカバー率の総計は 4 月～12 月の 4～9 海区で集計している

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。2008 年には、オブザーバの乗船期間中の全操業 325 回のうち、315 回の操業（96.9%）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 4220 時間のうち 3094 時間（73.3%）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 3.0%（4.3%×96.9%×73.3%）と推定された。なお、オブザーバが調査を行った 315 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 250 回（79.4%）、他の魚種が対象の操業（1、2、15 海区）は 65 回（20.6%）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 10,832 個体の体長を測定し、このうちミナミマグロは 1, 206 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 1,882 個体、ガストロ 1,772 個体、メバチ 1,211 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 4）。ミナミマグロからは 301 個体から耳石を、241 個体から胃内容物を、354 個体から筋肉を採集した。また、ミナミマグロ 1,059 個体、合計 7,476 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. On the basis of these data sets, we calculated the observer coverage. Coverage of number of hooks and SBT were aggregated between April and December in area 4-9. The coverage rates were 4.7% in the number of vessels (5.3% in area 4, 6.7% in area 7, 4.3% in area 8, 4.3% in area 9), 4.3% in the number of hooks used (12.3% in area 4, 6.5% in area 7, 5.3% in area 8, 2.1% in area 9) and 2.4% in the number of SBT caught (2.5% in area 4, 3.0% in area 7, 3.4% in area 8, 1.7% in area 9). 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 2008, the observers monitored 315 / 325 operations (96.9%), and actually observed 3094 / 4220 hours (73.3%) of those operations. Thus, the coverage of effort which was actually observed by the scientific observer was estimated as 3.0% (4.3% of 96.9% of 73.3%) on average. The observed operations in the fishing ground of SBT (area 4-9) were 250 (79.4%), and in the fishing ground for the other tunas (area 1, 2, 15) were 65 (20.6%).

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 10,832, and 1,206 of them was SBT. Other dominant fish species which were measured were Albacore (n=1,882), Butterfly tuna (n=1,772), Bigeye tuna (n=1,211). Biological samples were also collected (Table 4), for example the otolith samples from 301 SBT, stomach samples from 241 SBT, and muscle samples from 354 SBT.

Observer identified the sex of 7,476 individuals, and 1,059 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、オブザーバ調査が実施された時期（4 海区は 5-6 月、7 海区は 5 月、8 海区は 7-11 月、9 海区は 5-7 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。その他の海区では両者がほぼ一致した。この差は、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たことに起因する可能性が高い。なお、CCSBT の枠組みにおいて、放流魚は各国のクオータには含まれないことに留意されたい。さらに、日本漁船により漁獲された全てのミナミマグロは漁獲時に体重と体長が測定され、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 May-June in area 4, May in area 7, 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 the observer data and RTMP data generally correspond with each other expect for area 8, in which that did not correspond very well especially around the length frequency of 90 cm FL. The reasons for this difference in the length frequency would be the release of small fishes conducted by some fishermen. Meanwhile, it should be noted that released SBT is not included in the national quota within the CCSBT. Furthermore, it should be noted all SBT caught by Japanese vessels are measured in weight and length at the time of catch and inspected by governmental officials at the timed 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ミナミマグロ標識（通常標識）は、3 隻から 6 個体分（CCSBT タグ 4 個体分（6 本）、CSIRO タグ 2 個体分（4 本））であった。

The scientific observers collected 10 conventional tags from 6 recaptured SBT on 3 vessels. The recaptured conventional tags included 4 “CSIRO” tags (from 2 SBT) and 6 “CCSBT” tags (from 4 SBT).

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。2008 年度は 2007 年度と同様に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ため、ミナミマグロ漁場全体でのオブザーバカバー率は例年よりも低下した。

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 5 名の雇用日数は、延べ 465 日であり、漁船への乗船実日数は 90％の 418 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、2008 年については、オブザーバへの報酬費約 652 万円（62 千ＵＳ＄)、オブザーバの派遣旅費約 550 万円（53 千ＵＳ＄)、保険・資機材他 243 万円(23 千ＵＳ＄)、総額約 14,444 万円（138 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 2008, total number of observers was forced to decrease by budgetary restrictions as same as in 2007. As a result of that, the coverage rate was decreased relative to the level in an average year.

Japanese commercial longline vessels rarely come into port for cost-cutting; thus, some 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. All observers have good quality 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 5 observers were 465 days and 418 days, respectively (Table 5). Total expenses which were spent for Japanese observer program in 2008 were 14,443,746 yen (US$ 138,284); 6,520,080 yen for the observer’s salary, 5,497,796 yen for the overseas travel expenses for observers, 239,770 yen for the insurance premium for observers, and 2,186,100 yen for the research materials. Japanese government expended these budgets in fulfilling the responsibilities as the responsible fishing nation.

Reference

Itoh, T. 2009 Change in operation pattern of Japanese SBT longliners in 2008 resulting from the introduction of the individual quota system in 2006. CCSBT-ESC/0909/28

Table 1 Observed effort and catch of SBT in Japanese longline observer program 2008.

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
Area4	May	1	12	8.33%	25	493	5.04%	90	1760	5.11%
	Jun.	1	11	9.09%	95	495	19.23%	4	1257	0.32%
	July	1	7	14.29%	46	147	31.02%	0	664	0.00%
Area7	May	1	14	7.14%	82	640	12.76%	192	3305	5.81%
Area8	July	1	24	4.17%	25	567	4.43%	20	667	3.00%
	Aug.	1	33	3.03%	94	3,012	3.13%	127	5,227	2.43%
	Sep.	2	33	6.06%	149	1,588	9.41%	140	3,010	4.65%
	Oct.	1	14	7.14%	92	439	20.99%	114	618	18.45%
	Nov.	1	16	6.25%	36	1,232	2.90%	30	1,935	1.55%
Area9	May	1	19	5.26%	32	711	4.46%	51	1,504	3.39%
	Jun.	2	48	4.17%	104	2,495	4.16%	215	6,655	3.23%
	July	2	55	3.64%	70	3,199	2.20%	127	7,396	1.72%
Area4	Total	1	19	5.26%	166	1,348	12.30%	94	3,820	2.46%
Area7	Total	1	15	6.67%	82	1,249	6.54%	192	6,466	2.97%
Area8	Total	2	47	4.26%	397	7,533	5.27%	431	12,647	3.41%
Area9	Total	3	70	4.29%	206	9,716	2.12%	393	22,698	1.73%
Total		6	126	4.76%	850	20,014	4.25%	1110	45,681	2.43%

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

Table 2 Actual observation times and rate in 2008 Japanese longline observer program.

	Operated	Observed	Rate
Number of operation	325	315	96.9%
Time (hour) of operations[1]	4,220	3,094	73.3%

1: Total hours of line hauling of operation in which observed (i.e. 315 operations).

Table 3　Number of individuals the length of which was measured in 2008 Japanese longline observer program.

		Area 1			Area 2	Area 4			Area 7	Area 8					Area 9			Area 15	総計
		08/Jan.	08/Feb.	08/Mar.	July	May	Jun.	July	May	July	Aug.	Sep.	Oct.	Nov.	May	Jun.	July	Jun.	Total
ミナミマグロ	Southern bluefin tuna					91	10		195	33	160	177	114	30	51	217	128		1206
クロマグロ	Pacific bluefin tuna							1											1
キハダ	Yellowfin tuna	29	24	4			16	2											75
メバチ	Bigeye tuna	395	319	99	9	30	266	92										1	1211
ビンナガ	Albacore	25	16	9	61	203	936	300	152	18	59	28				33	1	41	1882
バショウカジキ	Sailfish	2	1																3
フウライカジキ	Shortbill spearfish					1										1			2
マカジキ	Striped marlin					3	4												7
メカジキ	Swordfish	23	21	6	4	4	32	11	9		3								113
クロカジキ	Blue marlin	7	2	2															11
シロカジキ	Black marlin	1	1																2
ガストロ	Butterfly tuna								2	74	209	363	563	74	157	185	145		1772
カツオ	Skipjack	3					1									1			5
サメ類	Sharks	122	114	20	25	6	99	69	133	209	585	483	454	245	110	154	75	16	2919
その他魚類	Other fish	366	465	97	10	8	42	25	55	13	46	115	67	57	13	79	52	2	1512
海亀類	Sea turtles	2	2	1															5
海鳥類	Sea birds					1	6	1	5		4	23	36	11	3	5	10	1	106
その他	Other								0										0
総計	Total	975	965	238	109	347	1412	501	551	347	1066	1189	1234	417	334	675	411	61	10832

Table 4　Number of individuals investigated.　Each observers identified species and sex, and kept the biological samples in the Japanese longline observer program in 2008.

		Number of biological samples			Sex		Total catch
		Otolith	Stomach	Muscle	Male	Female	number
ミナミマグロ	Southern bluefin tuna（Total）	301	241	354	565	494	1219
	～89cm	5	3	5	6	2	57
	90～99cm	6	4	6	14	5	44
	100～109cm	14	4	14	53	31	111
	110～119cm	15	6	18	40	26	77
	120～129cm	20	10	22	32	39	76
	130～139cm	27	17	26	44	43	93
	140～149cm	39	21	44	49	78	131
	150～159cm	57	71	85	117	135	266
	160～169cm	66	67	84	135	102	241
	170～179cm	44	34	39	59	32	93
	180～189cm	8	4	11	14	1	15
	190cm～	0	0	0	2	0	2
	No data	0	0	0	0	0	13
キハダ	Yellowfin tuna	0	13	1	33	22	76
メバチ	Bigeye tuna	1	45	19	530	290	1223
ビンナガ	Albacore	0	2	13	3	2	1920
バショウカジキ	Sailfish	0	0	0	3	0	3
フウライカジキ	Shortbill spearfish	0	1	0	1	0	2
マカジキ	Striped marlin	0	0	0	0	0	7
メカジキ	Swordfish	0	13	1	21	21	115
クロカジキ	Blue marlin	0	0	0	9	2	12
シロカジキ	Black marlin	0	0	0	0	2	2
ガストロ	Butterfly tuna	0	138	32	429	1093	1846
カツオ	Skipjack	0	0	0	1	0	5
サメ類	Sharks	0	6	6	700	1918	3700
その他魚類	Other fish	0	74	17	109	165	2737
海亀類	Sea turtles	0	0	0	2	2	5
海鳥類	Sea birds	0	0	0	0	0	182
その他	Other	0	0	0	0	0	1

Table 5 Employment and cruise period of the scientific observers from 2001 to 2008.

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

Table 6 Expenses which were spent for Japanese observer program from 2001 to 2008.

		2001	2002	2003	2004	2005	2006	2007	2008
報 酬	Observer's salary	17,109	18,365	21,286	20,170	22,302	20,570	9,618	6,520
旅 費	Overseas travel expenses for observers	14,259	12,571	15,878	16,350	16,157	12,580	7,694	5,498
保 険	Insurance premium for observers	519	672	778	720	852	700	314	240
調査機材	Research materials					4,128	9,650	3,700	2,186
合 計	Total	31,887	31,607	37,941	37,240	43,439	43,500	21,326	14,444
	(1000US$)	290	287	345	339	395	395	199	138

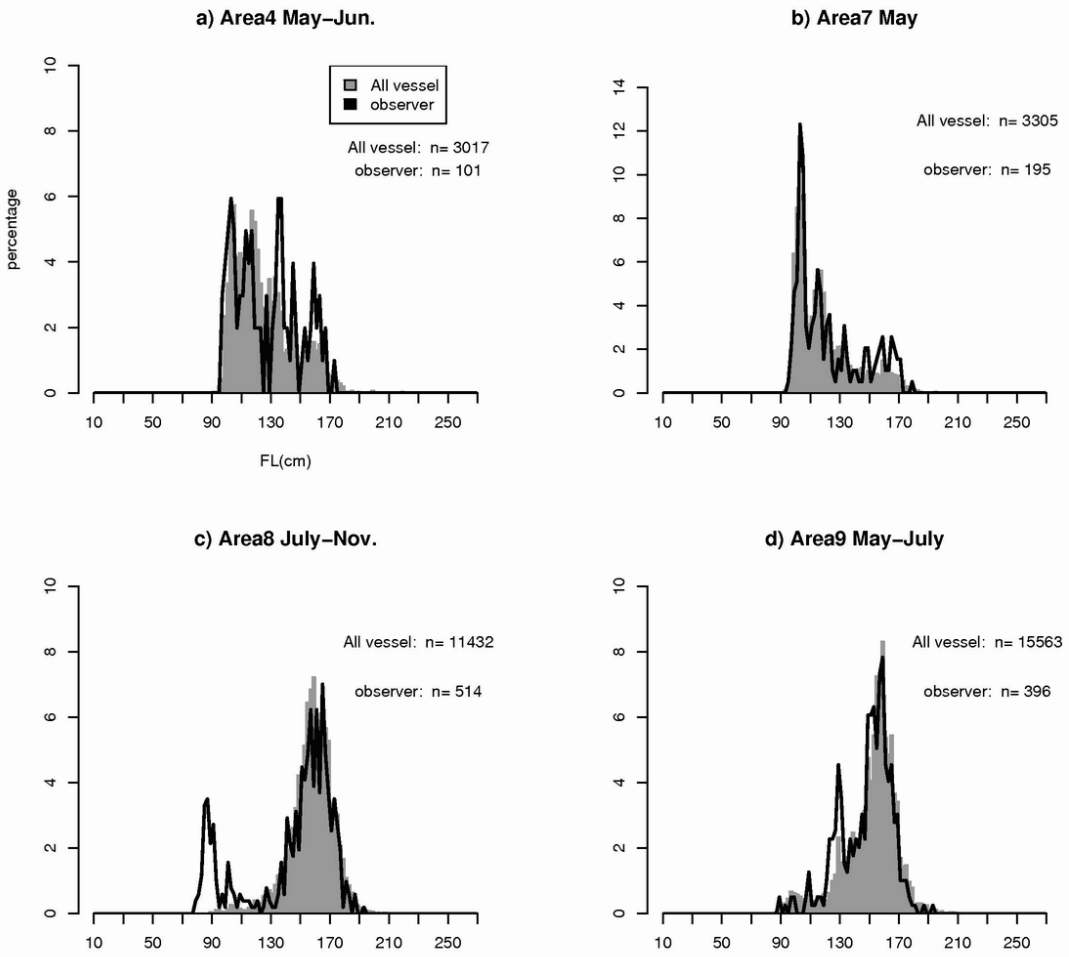

Fig. 1 Length frequency distribution of SBT by area in the 2008 Japanese longline observer program.

Lines are from observer data. Bars are from RTMP data in all vessels. Data were between May and July for area 4 (a), in May for area 7 (b), between July and November for area 8 (c), between May and July for area 9 (d).