National Report of Japan

Overview of Researches on Ecologically R
elated Species
in Japanese SBT Longline Fishery, 2016-2017

Daisuke Ochi[1], Yasuko Semba[1], Yukiko Inoue[1], Tomoyuki Itoh[1],
Sachiko Tsuji[1], Hiroshi Minami[1] and Takahiro Ara[2]

[1]National Research Institute of Far Seas Fisheries, Japan Fisheries Research and
Education Agency
[2]Fisheries Agency of Japan

要約
　日本の漁業においてミナミマグロを対象とするのは、はえ縄漁業である。2016 年と2017年におけるミナミマグロはえ縄漁業に従事した漁船数は両年とも、88 隻であった。日本のミナミマグロはえ縄漁船が操業する水域は、CCSBT 統計海区の4、5、7、8 及び9海区である。水産庁は、漁獲成績報告書の提出を船に義務付けると共に、1991年からミナミマグロ漁獲量情報を収集するために漁業データ即時収集プログラム(RTMP)を実施してきた。1995 年にはRTMPをすべてのミナミマグロはえ縄漁船を対象に実施している。
　日本の科学オブザーバー計画は、1992 年から開始されており、操業位置、漁獲努力量、漁獲対象・非対象種の漁獲量、生物情報及び海鳥の偶発的捕獲などが本計画において記録されている。2016 年と2017 年におけるミナミマグロはえ縄漁船の科学オブザーバー配乗隻数はそれぞれ、19隻と 4隻であった。両年の科学オブザーバーによる調査カバー率はそれぞれ、隻数は21.6%と4.5%で、総投下鈎数の16.6%と5.0%が観察された。本文書において、ミナミマグロはえ縄漁船に乗船した科学オブザーバーによって記録されたサメ類、海鳥類及び海亀類の捕獲数を報告した。

Summary
　　　Japanese fleet is using only longline gear to catch southern bluefin tuna (SBT). Number of vessels engaging the SBT longline fishery was 88 both in 2016 and 2017. Fishing grounds for SBT in recent years correspond to the CCSBT statistical areas of 4, 5, 7, 8 and to 9. Historically, logbook was submitted from fishermen to government as an obligation. In addition, Fisheries Agency of Japan started Real Monitoring Program (RTMP) to monitor the catch of SBT in 1991. All the vessels for the SBT longline fishery have been monitored through this program since 1995.
　　　Scientific observer program on the SBT fishery has been conducted by Japan since 1992, collecting information on fishing position, effort, catch of target and non-target species, biological information, incidental catch of seabirds, etc. The scientific observers were deployed to 19 and 4 fishing vessels in 2016 and 2017, respectively. Coverage rates of observation were 21.6% and 4.5% for vessels and 16.6% and 5.0% for hooks in 2016 and 2017, respectively. This document reported captures of sharks, seabirds and sea turtles recorded by the scientific observers on-board the Japanese SBT longline vessels.

1. Introduction
　　　Japanese fleet is using only longline gear to catch southern bluefin tuna (SBT). Since 1952, Japanese longline operation has started in the Indian Ocean that targeting yellowfin and bigeye tuna and caught, although SBT was sub-target species for the longline fishery targeting yellowfin and bigeye tuna during the early stage of

fishery. This is because of the fact that SBT in the tropical region were mostly spent of spawning with low meat quality so fishermen did not target it. Further south fishing grounds in the temperate waters for this species were developed in the late 1950s and 1960s. In addition, the innovation of super cold freezer has accelerated demand of "sashimi" grade SBT meat to the Japanese market. Recently the number of fishing vessels targeting SBT has gradually decreased due to the strong regulation for stock management and government policy to reduce number of longline vessels several times done in the past.

Regarding the incidental catch of seabirds, tori-line was used voluntarily by the fishermen in the early 1990s, and the Government of Japan has introduced a mandatory measure for SBT longliners to use tori line since 1997. Research effort to modify tori-line and to develop alternative methods possibly avoiding incidental catch of seabirds have continued. According to the international plans of action for reducing incidental catch of seabirds in longline fisheries and for the conservation and management of sharks, Japan established National Plans of Action in 2001 and has promoting mitigation of incidental take of seabirds, sea turtles and management of pelagic sharks.

2. Review of SBT Fisheries

Fleet size and distribution

The number of longline fishing vessels for SBT has been decreasing since the peak of about 300 in 1985. Fisheries Agency of Japan (FAJ) had reduced number of such vessels by 69 in 1981, 100 in 1982 and 132 in 1998. Vessel reduction policy in 1998 would have influenced further decline of number of vessels after then. The number of vessels has been less than 100 recently. Recent fishing grounds were off Cape of Good Hope (Area 9), southeastern Indian Ocean (Area 8), southeast of Australia (Area 4) and water near Tasmania Island (Area 7). Thus, the Japanese vessels were mainly operating in these areas, namely Area 4, 7, 8 and 9, in the second and third quarters for SBT.

Distribution of Catch and Effort

Catch and Effort data submitted to CCSBT were summarized. Effort of Japanese longline as the number of hooks used distributed widely in the southern hemisphere (Fig. 1). However, the major area of SBT catch came from Area 4, 7, 8 and 9 (Fig. 2).
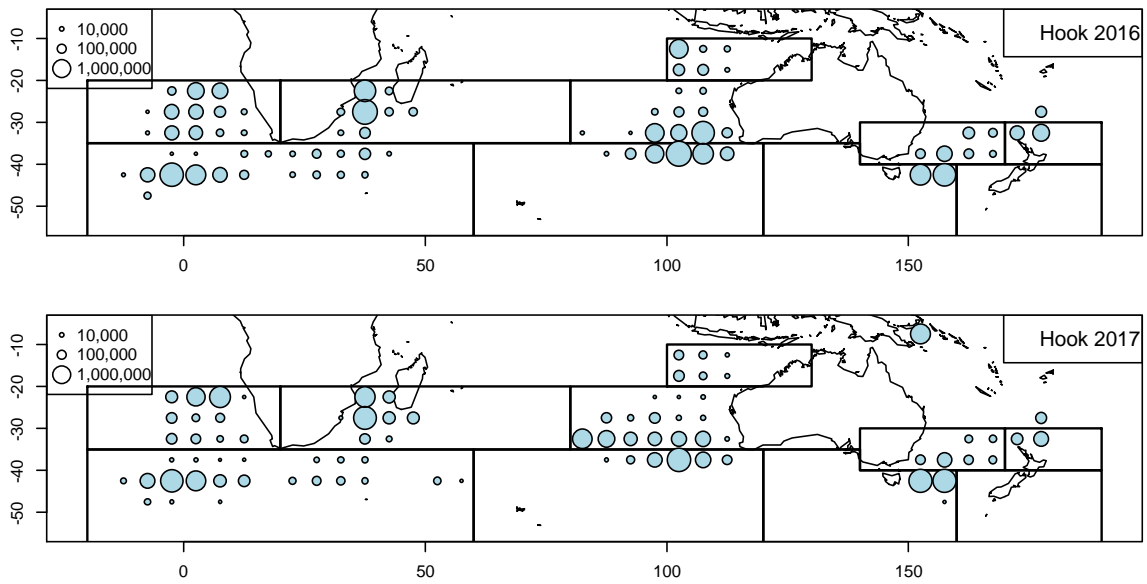
Fig.1. Number of hooks of Japanese longline by 5x5 degrees square in 2016 and 2017.
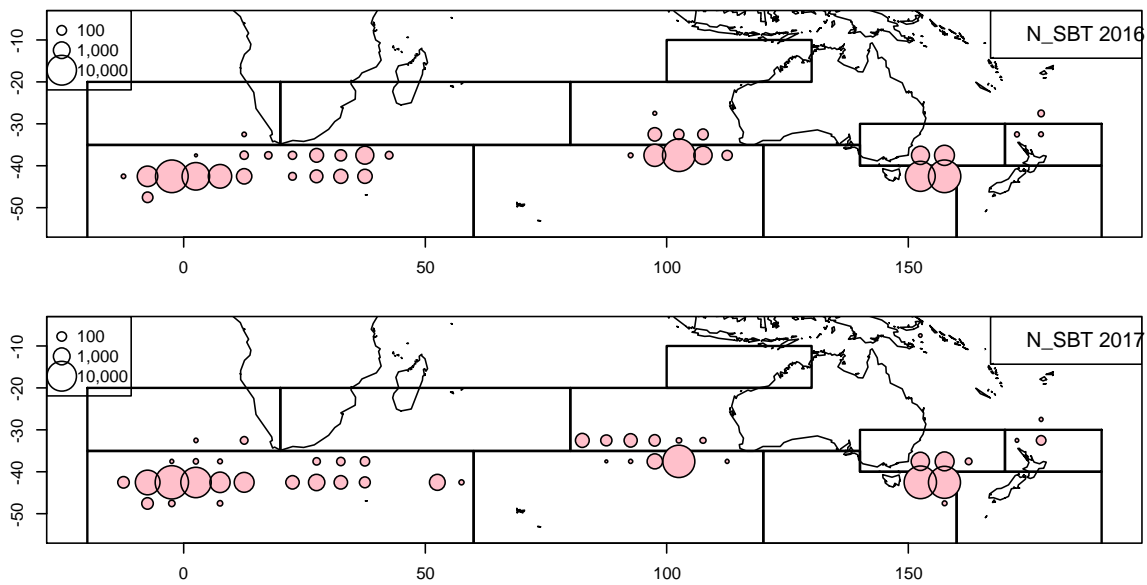

Fig.2. Number of SBT caught by Japanese longline by 5x5 degrees square in 2016 and 2017.

3. Fisheries Monitoring for Each Fleet

Since 1991, FAJ has carried out Real Time Monitoring Program (RTMP) to monitor the catch of SBT. The number of vessels monitored by the program was 12-15 during 1991-1994, and all the vessels operating SBT fishing ground have been monitored by the RTMP since 1995. Each vessel sends daily reports including fishing position, effort, and catch by species in number and weight to the Fisheries Agency. The information is entered into the database in a short time.

Since 1992, Japan has conducted scientific observer program on SBT fishery and collected information including fishing position, effort, catch of target and non-target species, biological information, incidental catch of seabirds, etc. In 2016 and 2017, Japan deployed scientific observers to 19 and 4 fishing vessels, respectively. While the observers were boarded on the vessels, the vessels used 3,097 thousand and 770 thousand hooks in 2016 and 2017, respectively. Coverage of observation was 21.6% and 4.5% for vessels and 16.6% and 5.0% for hooks in 2016 and 2017, respectively (Table 1).

Table 1. Number and coverage of cruises, sets and hooks observed in the Japanese RTMP observer program in 2016-2017.

Area	Calendar year	Number of all vessels	Number of vessels observed	Cover rate for the number of vessel	Number of hooks used by all vessels (x 1000)	Number of hooks used by observed vessels (x 1000)	Cover rate for the number of hook
Area 4	2016	20	5	25.0%	1,262	242	19.2%
	2017	18	1	5.6%	921	53	5.7%
Area 5	2016	10	2	20.0%	1,299	103	8.0%
	2017	8	0	0.0%	774	0	0.0%
Area 7	2016	25	6	24.0%	3,894	948	24.4%
	2017	26	3	11.5%	4,865	551	11.3%
Area 8	2016	26	1	3.8%	6,441	149	2.3%
	2017	22	1	4.5%	3,870	166	4.3%
Area 9	2016	36	12	33.3%	5,743	1,655	28.8%
	2017	40	0	0.0%	5,102	0	0.0%
Total	2016	88	19	21.6%	18,639	3,097	16.6%
	2017	88	4	4.5%	15,532	770	5.0%

4. Seabird

Annual number of incidental catch of seabirds in the Japanese SBT longline fishery in 2016 and 2017 were updated based on the data collected through the scientific observer programs (see Table 2 and Appendix). Annual total captures were 67 and 3 birds for large albatrosses, 52 and 0 birds for dark colored albatrosses, 865 and 26 birds for other albatrosses and, 317 and 5 birds for unidentified albatrosses, 217 and 5 birds for other petrels, and 116 and 0 for other seabirds in 2016 and 2017, respectively (Table 2). Large albatross mortality was estimated by the SEFRA approach which were developed in collaborate with New Zealand scientist. The approach can

estimate species specific susceptibility by longline operations based on observer observed bycatch data and seabird density surfaces then calculate overall bycatch numbers with using the estimated parameters.

5. Other Non-target Fish

The captures and mortalities of sharks in CCSBT fisheries are summarized in Table 2 (page 9-33). Sixteen and nine species/species group of elasmobranchs were reported by the scientific observers in 2016 and 2017, respectively. Blue shark was dominant among elasmobranch catch observed, followed by porbeagle, shortfin mako shark and pelagic stingray (CCSBT-ERS/1905/BGD 19, 20).

Many teleosts were caught by longline fishery other than tunas and billfishes in the SBT fishing ground. There were 42 and 35 species/species group of teleost fish including tuna and billfish found in the observer data in 2016 and 2017, respectively. Butterfly tuna, escoler, oilfish, opah, lancetfishes, sunfish and pomfrets were the major components of teleost catch (other than tuna and billfish) recorded in the in the high sea longline fishery (CCSBT-ERS/1905/BGD 19, 20).

6. Marine Mammal and Marine Reptile

Number of capture and mortality of marine reptile in CCSBT fisheries was one individual in 2016 (Table 2). Five captures of marine mammals were recorded in 2016 (CCSBT-ERS/1905/BGD 19, 20). Incidental catch of marine mammal and marine reptile occurred at a negligible level in the Japanese high-sea SBT longline fishery. There is not enough number of observations for the appropriate statistical estimation of the total incidental catch for these animals.

7. Mitigation Measures to Minimize Seabird and Other Species Bycatch
Current Measures
Mandatory measures

All tuna longline fishing vessels including those operating to catch SBT are obliged to comply with respective rules adopted by the WCPFC, IATTC, IOTC and ICCAT, when operating in the Convention areas of these RFMOs. In addition, the Government of Japan has prepared law every time when there is amendment of the mitigation measures of these RFMOs and instructed to obey these measures for tuna longliners to obey these regulations.

Since the ERSWG12, updated conservation and management measure to mitigate seabird bycatch were adopted at WCPFC and entered into force in December 2018 (WCPFC). Japan has amended its domestic regulations in compliance with currently active measures and implemented.

The measures that the Government of Japan to enforce and monitor the level of compliance for bycatch mitigation measures included a dispatch of enforcement vessels to the fishing areas, record of mitigation measures deployed through the logbook and collecting necessary information by scientific observers on board the operating vessels. The boarding observers and vessels carrying them are carefully selected so that avoiding the same vessels being selected in subsequent years. In addition to the mitigation measures adopted by each longline boat, Japanese observer program (JOP) has started to collect information of the general specifications of the mitigation measures adopted by each boat, such as the weight and position of swivels in the weighted branch line as well as the general configuration of tori lines, for the future detailed evaluation of the effect of mitigation measures.

Voluntary Measures, including information on proportion of fleet using the voluntary measures:

In February 2001, in accordance with "International Plan of Action for reducing incidental catch of seabirds in longline fisheries" of FAO, the Government of Japan developed "Japan's National Plan of Action for reducing incidental catch of seabirds in longline fisheries", in which FAJ instructed every fishermen to voluntarily carry out night setting, use of weighted branch line to ensure speedy precipitation of bait and use of properly defrozen bait in addition to the use tori lines which was already mandatory at that time.

Measures under Development/Testing
1) Mitigation measures:

Performance of weighted and un-weighted branch lines deployed with revised "hybrid" tori lines on two Japanese vessels participating in the 2010 tuna joint venture fishery in the South Africa EEZ was compared in collaboration with the Washington Sea Grant, University of Washington and Japan. This study showed that branch line weighting was highly effective at preventing seabird attacks within the aerial extent of streamer lines and allowing none between the two hybrid streamer lines in diving seabirds dominated system. The higher rate of tangling of weighted branch lines relative to un-weighted branch lines is the only remaining barrier to making branch line weighting practical.

Effectiveness of hybrid tori-lines with and without weighted branch lines to a control of no mitigation was compared in the North Pacific from December 2011 to June 2012. The results suggested that sole deployment of well-designed tori-lines dramatically reduce incidental catch of albatrosses by pelagic longline fisheries in the western North Pacific, and therefore are recommended as best-practice seabird mitigation for these fisheries.

Effectiveness of aerial extent of tori line (long aerial extent: 85m, middle: 70m and short: 50m) to reduce incidental catch of seabirds was examined using Japanese research vessel in the North Pacific from April to June 2013. The results showed that long and middle aerial extent of tori lines were more effective in preventing seabird attacks and incidental catch of seabirds than short aerial extent.

Effectiveness of tori-line and line weightings (lumo lead) by Japanese research vessel was examined in the North Pacific from April to May 2014-2016. The result indicated that tori-line and lumolead are effective mitigation measures for tuna longline operations in the North Pacific.

The further research on tori-line and line weighting should be useful to reduce incidental catch of seabirds in the north Pacific.

Mitigation measures to reduce incidental catch of sea turtles in longline fishery have been developed and experimented in Japan according to the FAO guidelines to reduce sea turtle mortality in fishing operations. FRA is conducting surveys on the effects of circle hooks on catch rates of sea turtles, tuna and shark. Experiment of large circle hooks (Koshina type 4.5-sun similar to foreign type 18/0) on catch rates of target species and sea turtles are on the way through operations of commercial longline in the North Pacific 2013 and 2014. The use of circle hooks is effective to reduce incidental catch or deep hooking of sea turtles. Most of sea turtles caught by shallow longlines were retrieved alive. The result indicates that careful live retrieval and release is effective in improving the post-hooking survival of hooked sea turtles.

A research cruise was conducted from April to June 2017-2018 using a longline fishing vessel in the North Pacific Ocean. The objective of this research cruise was to

investigate influences of large circle hook (approximately 16/0) on catch rates of target species under deep set targeting tunas.De-hooking devices and sea turtle handling manuals are developed to improve post-hooking survival of sea turtles.

2) Conservation and management

Large number of leatherback turtles is known to nest in Jamursba-medi and Wermon, West Papua, Indonesia. Nest counts, assessment of hatching success, and improvement of nesting environments for leatherbacks have been conducted since 1999 in Indonesia with the collaboration of the Indonesia Sea Turtle Research Center and Everlasting Nature of Asia, which is a Non-Profit Organization (NPO) in Japan. The nesting survey revealed that Indonesian population of leatherback turtles were suffering from poor reproductive success due to beach erosion, egg predation and low hatching rates. The Everlasting Nature constructed electric fences in the highest density nesting area to prevent pig predation on leatherback eggs. The electric fence drastically reduced the predation rates of eggs. Sea turtle populations have been affected by many factors on land and at sea (disappearance of nesting beaches, hatchling production, predation of eggs and turtles, interaction with fisheries such as trawl, gillnet, set-net, trap, purse-seine, and longline). Therefore, holistic management is necessary for the conservation of sea turtles, especially leatherback turtles.

8. Public Relations and Education Activities
Public Relation Activities

1) Educational materials, including booklets pamphlets, video program (DVD/VHS), cartoons were prepared by FRA, the Global Guardian Trust (GGT), and the Organization for the Promotion of Responsible Tuna Fisheries (OPRT), and were distributed to fishermen and other parties related to fishing industry to explain the importance of reducing incidental catch of seabirds and sea turtles.
   - Identification guide for sharks, seabirds and sea turtles.
   - Booklets and leaflets that illustrate methods for avoiding incidental catch and appropriate handling of seabirds and sea turtles;
   - A guide book which summarizes the NPOA-Seabirds and NPOA-Sharks.
   - A video program (VHS and DVD) which explain mitigation measures to reduce longline interactions with seabirds and sea turtles.

2) Under the government contract and with the cooperation of FRA and tuna fishing industries, GGT and Japan NUS had hold seminars for fishers at key fishing ports of longline fleets in Japan. In these seminars, mitigation techniques and methods for releasing live birds were explained by using various kinds of educational materials. Furthermore, they distributed tori lines and circle hooks to longline fishers, without charge, to facilitate the use of tori lines and circle hooks, and to test their effectiveness in commercial fishery. They also continued information exchange with fishers through discussion and questionnaires at the seminars and through port-side interviewing with fishers about practical usage and innovation/improvement on tori lines and other mitigation measures.

Education
Crew training, especially ship masters

Japan Tuna Fisheries Cooperative Association has distributed brochures on bycatch mitigation to Japanese longliners at foreign ports (i.e. Cape Town). Japan

Tuna Fisheries Cooperative Association will continue this effort.

Japan Tuna Fisheries Cooperative Association also had been hold the workshop on seabird mitigation measures for captains, fish masters and owners of Japanese SBT longline vessels in collaboration with the Birdlife International in Cape Town and Kesen-numa 2017.

Observers

Before the cruises, scientific observer candidates are obligated to take a training seminar. JOP held the training seminars twice a year to train scientific observers in usual year. During the training seminars, the candidates brushed up their knowledge and skills on research method, recording procedure and safety. Training included the practices of measuring the fish size and of collecting the biological samples. After the return from the commercial longline vessels, every observer reported their research activity. Their experiences and information have been used for the improvement of the observer program and next research activity. (CCSBT-ERS/1905/BGD 19, 20).

9. Information on other ERS (non-bycatch) such as prey and predator species

No other information.

10. Others

No other information.

11. Implementation of the NPOA-Seabirds and IPOA-Sharks

Japan developed its own National Plans of Action (NPOAs) for both seabirds and sharks in 2001 according to the FAO International Plans of Action (IPOAs) and revised them in 2016 taking into account the latest management measures taken by several RFMOs. FAJ disseminated the NPOAs to fishermen through local governments and fishermen's organizations. FAJ has reviewed implementation status of these two NPOAs and submitted its implementation reports to the FAO Committee on Fisheries (COFI) every two years since 2003.

Table 2: Reporting form for estimation of total mortality of ERS in CCSBT fisheries

Country Japan Year (calendar year) 2016
Species (or group) Blue shark

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP + WB + NS	NIL	TP	NS	WB
4	1,262	242	19.2%	340	1.404	117	0.483	223		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	112	1.082	56	0.541	54		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	2,124	2.240	425	0.448	1669		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	729	4.903	205	1.379	524		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	2,068	1.250	1,442	0.872	626		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	5,373	1.735	2,245	0.725	3096		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year) 2016
Species (or group) Shortfin mako shark

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas*)	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP + WB + NS	NIL	TP	NS	WB
4	1,262	242	19.2%	72	0.297	30	0.124	42		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	34	0.329	12	0.116	22		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	85	0.090	37	0.039	48		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	26	0.175	17	0.114	9		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	20	0.012	17	0.010	3		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	237	0.077	113	0.036	124		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2016
Species (or group)   Porbeagle

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas*)	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP + WB + NS	NIL	TP	NS	WB
4	1,262	242	19.2%	8	0.033	3	0.012	5		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	1	0.010	0	0.000	1		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	676	0.713	120	0.127	547		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	154	1.036	13	0.087	141		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	300	0.181	130	0.079	170		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	1,139	0.368	266	0.086	864		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year) 2016
Species (or group) Other Sharks

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas*)	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP + WB + NS	NIL	TP	NS	WB
4	1,262	242	19.2%	124	0.512	21	0.087	101		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	196	1.894	51	0.493	143		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	102	0.108	13	0.014	79		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	40	0.269	1	0.007	39		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	476	0.288	56	0.034	407		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	938	0.303	142	0.046	769		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2016
Species (or group) Large albatrosses

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP + WB + NS	NIL	TP	NS	WB
4	1,262	242	19.2%	14	0.058	14	0.058	0		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	1	0.010	1	0.010	0		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	27	0.028	23	0.024	4		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	5	0.034	5	0.034	0		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	20	0.012	16	0.010	4		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	67	0.022	59	0.019	8		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2016
Species (or group)   Dark colored albatrosses

| Fishery | | Observed | | | | | | | Estimate | Proportion of observed effort with specific mitigation measures | | | | | | | |
Stratum (*CCSBT Statistical Areas*)	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+NS	TP+WB	NS+WB	TP+WB+NS	NIL	TP	NS	WB
4	1,262	242	19.2%	0	0.000	0	0.000	0		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	0	0.000	0	0.000	0		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	3	0.003	3	0.003	0		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	27	0.182	27	0.182	0		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	22	0.013	22	0.013	0		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	52	0.017	52	0.017	0		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2016
Species (or group)   Other albatrosses

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP + WB + NS	NIL	TP	NS	WB
4	1,262	242	19.2%	57	0.235	57	0.235	0		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	12	0.116	12	0.116	0		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	418	0.441	416	0.439	2		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	50	0.336	50	0.336	0		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	328	0.198	321	0.194	7		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	865	0.279	856	0.276	9		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2016
Species (or group)   Unidentified albatrosses

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP + WB + NS	NIL	TP	NS	WB
4	1,262	242	19.2%	15	0.062	15	0.062	0		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	0	0.000	0	0.000	0		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	270	0.285	265	0.279	5		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	7	0.047	7	0.047	0		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	25	0.015	17	0.010	8		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	317	0.102	304	0.098	13		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2016
Species (or group)   Other petrels

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP + WB + NS	NIL	TP	NS	WB
4	1,262	242	19.2%	0	0.000	0	0.000	0		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	0	0.000	0	0.000	0		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	118	0.124	118	0.124	0		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	8	0.054	8	0.054	0		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	91	0.055	86	0.052	5		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	217	0.070	212	0.068	5		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2016
Species (or group)   Other birds

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas*)	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+NS	TP+WB	NS+WB	TP+WB+NS	NIL	TP	NS	WB
4	1,262	242	19.2%	0	0.000	0	0.000	0		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	0	0.000	0	0.000	0		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	0	0.000	0	0.000	0		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	0	0.000	0	0.000	0		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	114	0.069	92	0.056	22		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	114	0.037	92	0.030	22		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2016
Species (or group)   Unidentified birds

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas*)	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP + WB + NS	NIL	TP	NS	WB
4	1,262	242	19.2%	0	0.000	0	0.000	0		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	0	0.000	0	0.000	0		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	1	0.001	1	0.001	0		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	0	0.000	0	0.000	0		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	1	0.001	1	0.001	0		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	2	0.001	2	0.001	0		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2016
Species (or group)   Sea turtles

Fishery		Observed							Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas*)	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Mortalities (*number*)	Mortality Rate	Live releases (*number*)	Estimated total mortalities (*number*)	TP+ NS	TP+ WB	NS+ WB	TP+ WB +NS	NIL	TP	NS	WB
4	1,262	242	19.2%	0	0.000	0	0.000	0		21.6%	0.0%	0.0%	0.0%	2.1%	74.2%	2.1%	0.0%
5	1,299	103	8.0%	0	0.000	0	0.000	0		14.5%	0.0%	0.0%	0.0%	20.0%	62.1%	3.4%	0.0%
6	0	0	0.0%														
7	3,894	948	24.4%	1	0.001	0	0.000	1		16.1%	13.3%	0.0%	4.1%	0.0%	66.5%	0.0%	0.0%
8	6,441	149	2.3%	0	0.000	0	0.000	0		3.5%	0.0%	0.0%	0.0%	0.0%	96.5%	0.0%	0.0%
9	5,743	1,655	28.8%	0	0.000	0	0.000	0		33.7%	4.0%	1.1%	1.2%	11.7%	42.5%	5.3%	0.3%
TOTAL	18,639	3,097	16.6%	1	0.000	0	0.000	1		25.3%	6.2%	0.6%	1.9%	7.1%	55.6%	3.1%	0.2%

Table 2: Continued

Country   Japan   Year (calendar year)   2017
Species (or group)   Blue shark

Fishery		Observed								Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Fate (*numbers*)			Mortality Rate	Estimated total mortalities (*number*)	TP + NS	TP + WB	NS + WB	TP + WB + NS	NIL	TP	NS	WB
						Retained (Dead)	Discarded (Dead)	Released (live)										
4	921	53	5.7%	114	2.159	0	50	64	0.947	872	0.0%	56.3%	0.0%	43.7%	0.0%	0.0%	0.0%	0.0%
5	774	0	0.0%															
6	0	0	0.0%															
7	4,865	551	11.3%	1,193	2.164	0	671	522	1.217	5,923	11.3%	45.3%	0.0%	28.8%	0.0%	14.6%	0.0%	0.0%
8	3,870	166	4.3%	922	5.568	6	715	194	4.354	16,851	12.7%	0.0%	0.0%	0.0%	3.8%	83.2%	0.2%	0.0%
9	5,102	0	0.0%															
Total	15,532	770	5.0%	2,229	2.896	6	1,436	780	1.874	29,103	10.9%	36.3%	0.0%	23.6%	0.8%	28.4%	0.0%	0.0%

Table 2: Continued

Country   Japan   Year (calendar year)   2017
Species (or group)   Shortfin mako shark

Fishery		Observed									Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Fate (*numbers*)			Mortality Rate	Estimated total mortalities (*number*)	TP + NS	TP + WB	NS + WB	TP + WB + NS	NIL	TP	NS	WB	
						Retained (Dead)	Discarded (Dead)	Released (live)											
4	921	53	5.7%	14	0.265	0	6	8	0.114	105	0.0%	56.3%	0.0%	43.7%	0.0%	0.0%	0.0%	0.0%	
5	774	0	0.0%																
6	0	0	0.0%																
7	4,865	551	11.3%	38	0.069	0	25	13	0.045	221	11.3%	45.3%	0.0%	28.8%	0.0%	14.6%	0.0%	0.0%	
8	3,870	166	4.3%	6	0.036	6	0	0	0.036	140	12.7%	0.0%	0.0%	0.0%	3.8%	83.2%	0.2%	0.0%	
9	5,102	0	0.0%																
TOTAL	15,532	770	5.0%	58	0.075	6	31	21	0.048	747	10.9%	36.3%	0.0%	23.6%	0.8%	28.4%	0.0%	0.0%	

Table 2: Continued

Country   Japan   Year (calendar year)   2017
Species (or group)   Porbeagle

| Fishery | | Observed | | | | | | | | | Estimate | Proportion of observed effort with specific mitigation measures | | | | | | | |
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Retained (Dead)	Discarded (Dead)	Released (live)	Mortality Rate	Estimated total mortalities (*number*)	TP + NS	TP + WB	NS + WB	TP + WB + NS	NIL	TP	NS	WB
4	921	53	5.7%	0	0.000	0	0	0	0.000	0	0.0%	56.3%	0.0%	43.7%	0.0%	0.0%	0.0%	0.0%
5	774	0	0.0%															
6	0	0	0.0%															
7	4,865	551	11.3%	79	0.143	0	24	55	0.044	212	11.3%	45.3%	0.0%	28.8%	0.0%	14.6%	0.0%	0.0%
8	3,870	166	4.3%	432	2.609	0	270	162	1.631	6,310	12.7%	0.0%	0.0%	0.0%	3.8%	83.2%	0.2%	0.0%
9	5,102	0	0.0%															
TOTAL	15,532	770	5.0%	511	0.664	0	294	217	0.382	5,934	10.9%	36.3%	0.0%	23.6%	0.8%	28.4%	0.0%	0.0%

Table 2: Continued

Country   Japan   Year (calendar year)   2017
Species (or group)   Other sharks

Fishery		Observed								Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Fate (*numbers*)			Mortality Rate	Estimated total mortalities (*number*)	TP + NS	TP + WB	NS + WB	TP + WB + NS	NIL	TP	NS	WB
						Retained (Dead)	Discarded (Dead)	Released (live)										
4	921	53	5.7%	18	0.341	0	8	10	0.152	140	0.0%	56.3%	0.0%	43.7%	0.0%	0.0%	0.0%	0.0%
5	774	0	0.0%															
6	0	0	0.0%															
7	4,865	551	11.3%	87	0.158	0	12	74	0.022	106	11.3%	45.3%	0.0%	28.8%	0.0%	14.6%	0.0%	0.0%
8	3,870	166	4.3%	17	0.103	0	4	12	0.024	93	12.7%	0.0%	0.0%	0.0%	3.8%	83.2%	0.2%	0.0%
9	5,102	0	0.0%															
TOTAL	15,532	770	5.0%	122	0.159	0	24	96	0.031	484	10.9%	36.3%	0.0%	23.6%	0.8%	28.4%	0.0%	0.0%

Table 2: Continued

Country   Japan   Year (calendar year)   2017
Species (or group)   Large albatrosses

Fishery		Observed								Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Retained (Dead)	Discarded (Dead)	Released (live)	Mortality Rate	Estimated total mortalities (*number*)	TP + NS	TP + WB	NS + WB	TP + WB + NS	NIL	TP	NS	WB
4	921	53	5.7%	0	0.000	0	0	0	0.000		0.0%	56.3%	0.0%	43.7%	0.0%	0.0%	0.0%	0.0%
5	774	0	0.0%															
6	0	0	0.0%															
7	4,865	551	11.3%	1	0.002	0	1	0	0.002	161(118-214)	11.3%	45.3%	0.0%	28.8%	0.0%	14.6%	0.0%	0.0%
8	3,870	166	4.3%	2	0.012	0	1	1	0.006	38(22-56)	12.7%	0.0%	0.0%	0.0%	3.8%	83.2%	0.2%	0.0%
9	5,102	0	0.0%															
TOTAL	15,532	770	5.0%	3	0.004	0	2	1	0.003		10.9%	36.3%	0.0%	23.6%	0.8%	28.4%	0.0%	0.0%

Table 2: Continued

Country　　　　　　Japan　　　　Year (calendar year)　　2017
Species (or group)　　Other albatrosses

Fishery		Observed									Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Fate (*numbers*)			Mortality Rate		Estimated total mortalities (*number*)	TP + NS	TP + WB	NS + WB	TP + WB + NS	NIL	TP	NS	WB
						Retained (Dead)	Discarded (Dead)	Released (live)											
4	921	53	5.7%	2	0.038	0	2	0	0.038			0.0%	56.3%	0.0%	43.7%	0.0%	0.0%	0.0%	0.0%
5	774	0	0.0%																
6	0	0	0.0%																
7	4,865	551	11.3%	20	0.036	0	19	1	0.034			11.3%	45.3%	0.0%	28.8%	0.0%	14.6%	0.0%	0.0%
8	3,870	166	4.3%	4	0.024	0	4	0	0.024			12.7%	0.0%	0.0%	0.0%	3.8%	83.2%	0.2%	0.0%
9	5,102	0	0.0%																
TOTAL	15,532	770	5.0%	26	0.034	0	25	1	0.032			10.9%	36.3%	0.0%	23.6%	0.8%	28.4%	0.0%	0.0%

Table 2: Continued

Country   Japan   Year (calendar year)   2017
Species (or group)   Unidentified albatrosses

Fishery		Observed									Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas)*	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Fate (*numbers*)			Mortality Rate	Estimated total mortalities (*number*)	TP + NS	TP + WB	NS + WB	TP + WB + NS	NIL	TP	NS	WB
						Retained (Dead)	Discarded (Dead)	Released (live)										
4	921	53	5.7%	0	0.000	0	0	0	0.000		0.0%	56.3%	0.0%	43.7%	0.0%	0.0%	0.0%	0.0%
5	774	0	0.0%															
6	0	0	0.0%															
7	4,865	551	11.3%	1	0.002	0	1	0	0.002		11.3%	45.3%	0.0%	28.8%	0.0%	14.6%	0.0%	0.0%
8	3,870	166	4.3%	4	0.024	0	4	0	0.024		12.7%	0.0%	0.0%	0.0%	3.8%	83.2%	0.2%	0.0%
9	5,102	0	0.0%															
TOTAL	15,532	770	5.0%	5	0.006	0	5	0	0.006		10.9%	36.3%	0.0%	23.6%	0.8%	28.4%	0.0%	0.0%

Table 2: Continued

Country   Japan   Year (calendar year)   2017
Species (or group)   Other petrels

Fishery		Observed								Estimate	Proportion of observed effort with specific mitigation measures							
Stratum (*CCSBT Statistical Areas*)	Total Effort (x1000)	Total Observed Effort (x1000)	Observer Coverage	Captures (*number*)	Capture Rate	Fate (*numbers*)			Mortality Rate	Estimated total mortalities (*number*)	TP + NS	TP + WB	NS + WB	TP + WB + NS	NIL	TP	NS	WB
						Retained (Dead)	Discarded (Dead)	Released (live)										
4	921	53	5.7%	0	0.000	0	0	0	0.000		0.0%	56.3%	0.0%	43.7%	0.0%	0.0%	0.0%	0.0%
5	774	0	0.0%															
6	0	0	0.0%															
7	4,865	551	11.3%	4	0.007	0	4	0	0.007		11.3%	45.3%	0.0%	28.8%	0.0%	14.6%	0.0%	0.0%
8	3,870	166	4.3%	1	0.006	0	1	0	0.006		12.7%	0.0%	0.0%	0.0%	3.8%	83.2%	0.2%	0.0%
9	5,102	0	0.0%															
TOTAL	15,532	770	5.0%	5	0.006	0	5	0	0.006		10.9%	36.3%	0.0%	23.6%	0.8%	28.4%	0.0%	0.0%

Appendix

Table A1. Annual number of incidental catch by seabird species for 2016 and 2017.

Group	Species	2016	2017
Large albatrosses	Gibson's albatross	6	0
	Southern royal albatross	4	0
	Tristan albatross	2	0
	Wandering albatross	29	1
	Wandering albatross group	16	1
	Unidentified large albatrosses	10	1
Dark colored albatrosses	Light-mantled albatross	26	0
	Sooty albatross	26	0
Other albatrosses	Southern Buller's albatross	6	1
	Buller's albatross group	110	14
	Black-browed albatross	85	1
	Black-browed albatross group	58	1
	Campbell albatross	34	1
	Grey-headed albatross	215	3
	Indian yellow-nosed albatross	22	1
	Yellow-nosed albatross group	1	0
	Shy-type albatrosses	141	4
	Unidentified other albatrosses	193	0
Unidentified albatrosses		317	5
Other petrels	Flesh-footed shearwater	6	0
	Great shearwater	12	0
	Grey petrel	37	0
	Parkinson's petrel	1	0
	White-chinned petrel	59	4
	Unidentified petrels	67	0
	Northern giant petrel	13	1
	Southern giant petrel	18	0
	Unidentified giant petrels	4	0
Other seabirds		116	0