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Korea's Annual report

Korea

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Annual Report of Korea to the 7th Scientific Committee Meeting of the South Pacific Regional Fisheries Management Organization (SPRFMO)

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1. Description of fishery

Jack mackerel trawl fishery

Korean commercial trawl fishery targeting on *Trachurus murphyi* (Chilean jack mackerel) have been operating in the SPRFMO Convention Area since Korean research trawl vessel *Tamgu No.1* commenced in 2003. The number of active Korean fishing vessels is described in Table 1. The number of operating vessels was stable within the range of 1-3, but their size became larger than those at the beginning of fisheries.

Table 1. Number and size of vessels for Korean trawl fishery in the SPRFMO Convention Area

Year	Number of vessels	Gross registered Tonnage (GT)			
		2,000-2,999	3,000-3,999	4,000-4,999	5000<
2004	3	1	1	1	-
2005	2	1	1	-	-
2006	3	1	1	1	-
2007	3	1	1	1	-
2008	3	1	1	1	-
2009	2	-	1	1	-
2010	2	-	1	-	1
2011	2	-	1	-	1
2012	2	-	1	-	1
2013	1	-	1	-	-
2014	1	-	1	-	-
2015	2	-	1	-	1
2016	2	-	1	-	1
2017	2	-	1	-	1
2018	2	-	1	-	1
2019	2	-	1	-	1

Squid jigging fishery

Korea jigging fishery has been commercially operating in the SPRFMO Convention Area since 1990 and the target species is *Dosidicus gigas* (jumbo flying squid). The number of fishing vessels ranged from 1 to 50 with the average 15 vessels over 1990-2018. In the 1990s, the size of Korean squid jigging fleets was more 20 vessels and the largest number of fishing vessel was 50 vessels in 1995. However, the number of jigging vessels has been declining steadily since the mid-1990s and the mean value of 2010s was 6 vessels. In the recent year, 2018, the size of squid jigging fleets of Korea became lager than those of previous years as 17 vessels (Refer to Table 3).

2. Catch, effort and CPUE summaries

Catches and fishing effort by species for jack mackerel trawl fishery

Annual catches of *T. murphyi*, *Scomber japonicus* (Pacific chub mackerel), and other species are summarized in Table 2. The highest catch in the convention area was approx. 15 thousand tons in 2009, and the lowest catch was in 2017. Catches of other species were reported and added in Table 2. Catch of *Brama japonica* (Pacific pomfret) took the largest proportion in bycatch and *D. gigas* catch followed next.

The largest CPUE (ton/hour) of jack mackerel was shown when the catch was the largest in 2009 (Figure 1). Since 2012, the CPUE has remained relatively stable around 6 ton/hour. In 2016, catch was relatively increased but their CPUE was decreased around 4 ton/hour. In 2017, the fleet fishing for jack mackerel stayed in the fishing ground for 107 days. However, the number of days actually spent for fishing was only 40 days as the fleet spent most of its time on fish detection; accordingly, a low amount of catch, 1,235 tons, was taken. However, the CPUE was 5.5 ton/hour, which is an increased level compared to the previous year. In 2018, catch has recorded a threefold increase over the preceding year. Nevertheless, the CPUE slightly decreased to 4.2 ton/hour due to extended operation days.

Table 2. Annual catch and effort of target and bycatch species by Korean trawl fishery

Year	Number of fishing days	Total catch (ton)	Catches (ton)		
			Trachurus murphyi	***Scomber japonicus***	**Other species**
2004	205	8,146	7,438	708	-
2005	170	9,507	9,126	381	-

2006	232	11,934	10,474	1,460	-
2007	237	12,180	10,940	1,240	-
2008	249	13,568	12,600	968	-
2009	182	14,534	13,759	716	59
2010	136	8,267	8,183	84	-
2011	205	9,377	9,253	24	100
2012	117	5,492	5,492	-	-
2013	140	5,378	5,267	111	-
2014	86	4,099	4,078	21	-
2015	104	5,834	5,749	82	3
2016	182	6,931	6,430	486	16
2017	40	1,429	1,235	191	3
2018	138	3,963	3,717	246	-

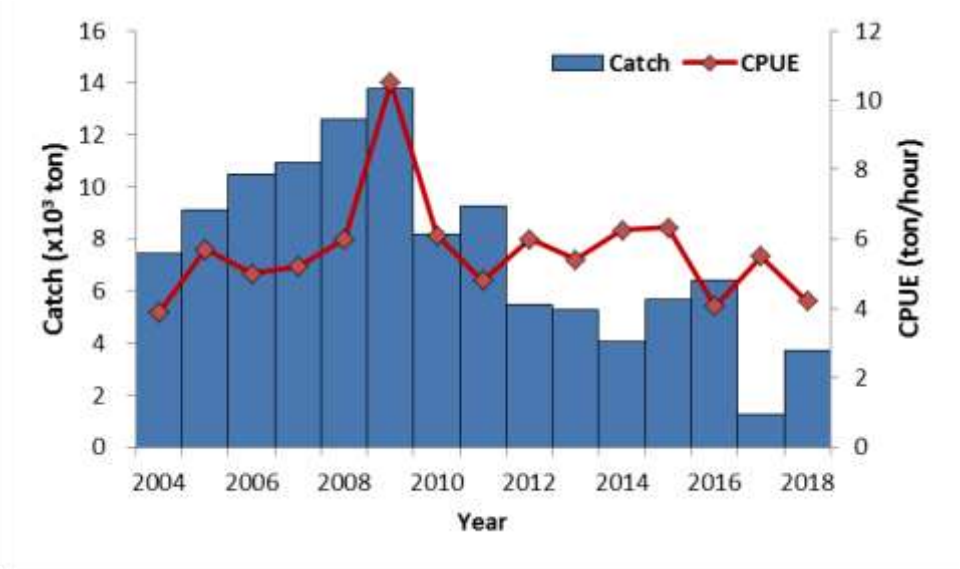

Figure 1. Annual catch and CPUE (ton/hour) of *T. murphyi* during 2004-2018.

Geographical distribution of CPUE by jack mackerel trawl fishery

Geographical distributions of CPUE of jack mackerel from 2009 to 2018 are shown in Figure 2. In 2009, when the catch was the largest, the distribution of CPUE was the widest. During 2010-2012, the distribution of CPUE was revealed in the area 35-45°S, 80-95°W. The CPUE distribution formed closely to the continent in the last 6 years. The fishing ground showed in two latitudinal separated areas; 1) 25-30°S and 2) 35-45°S.

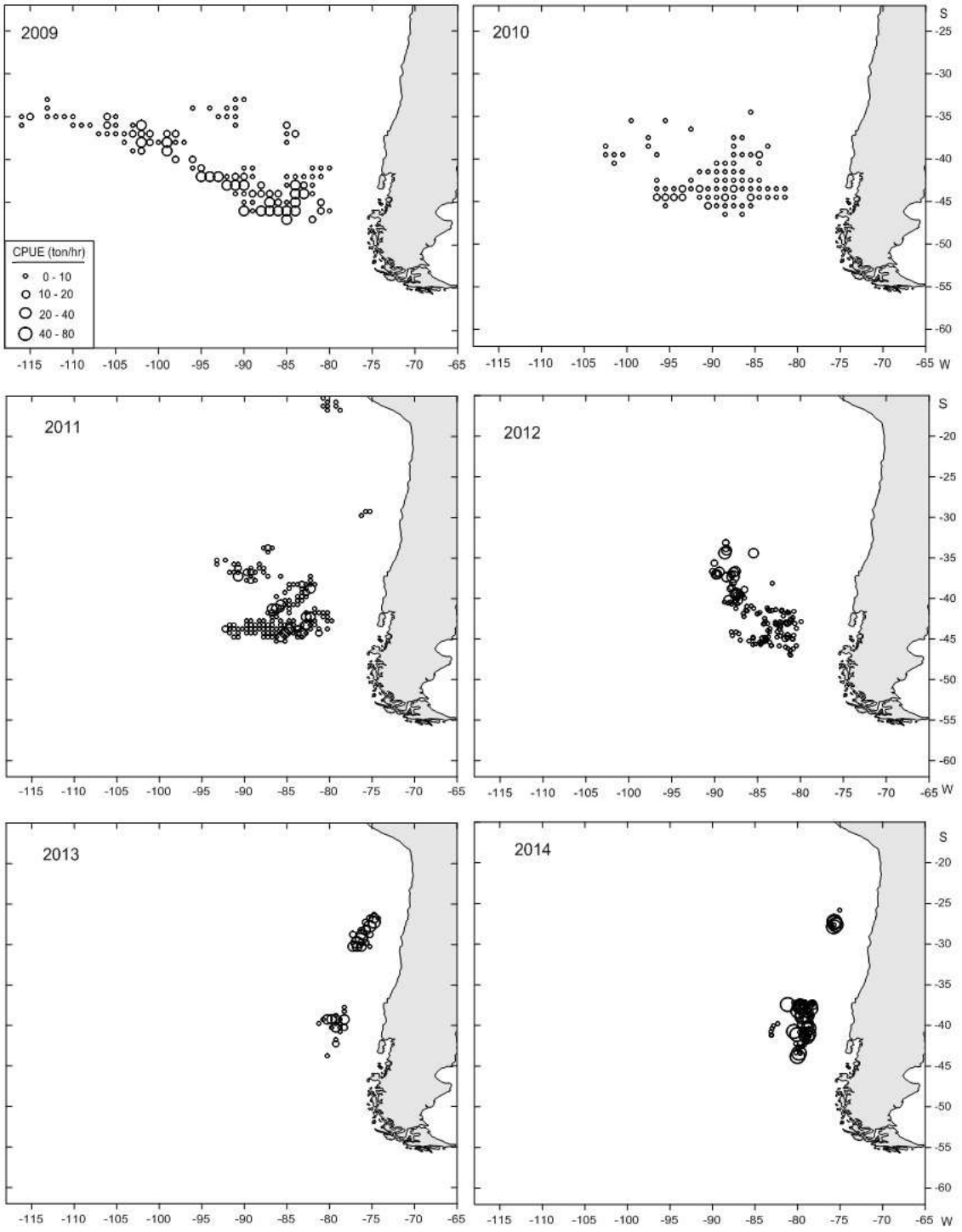

Figure 2. Distribution of CPUE (ton/hour) of *T. murphyi* in the SPRFMO Convention Area during 2009-2018.

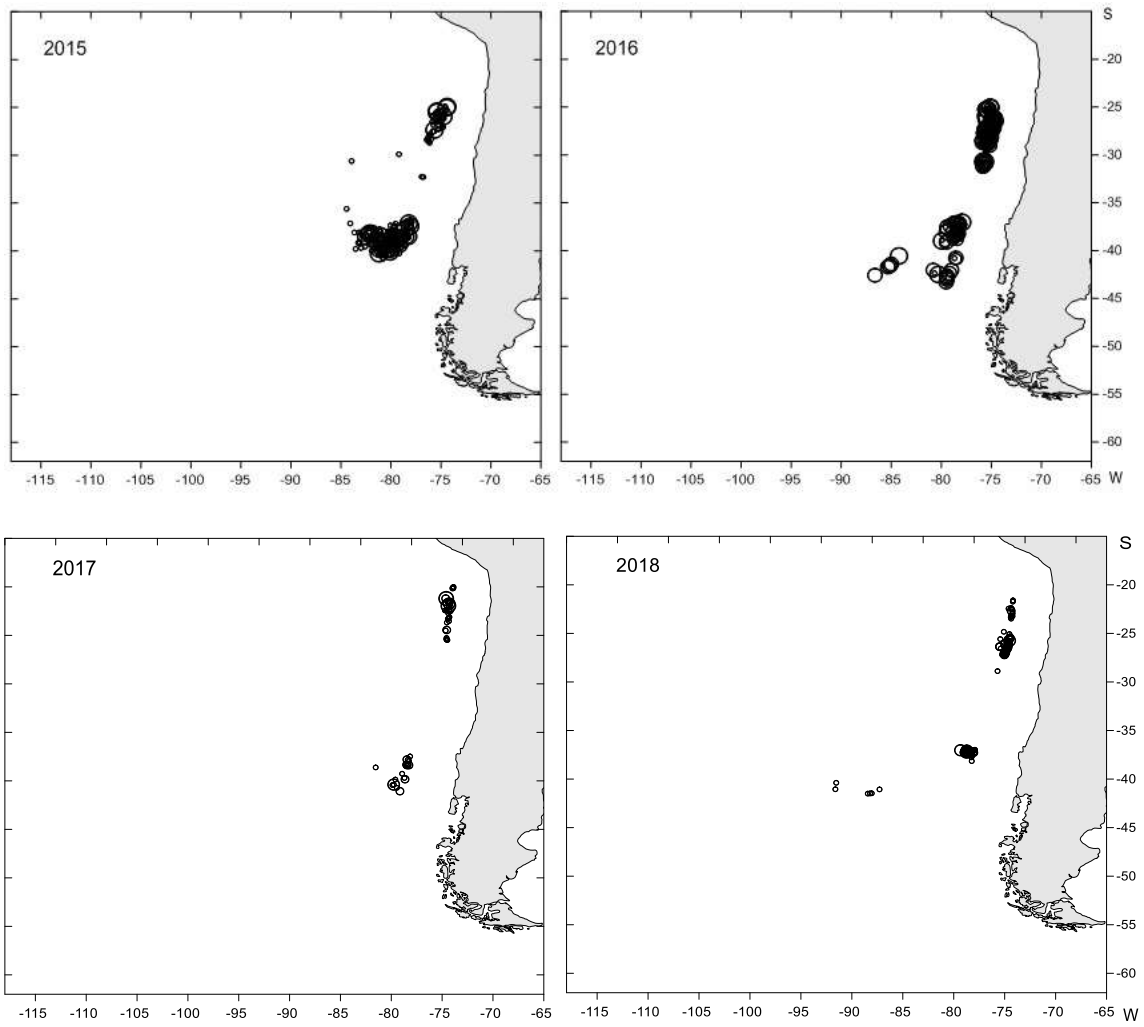

Figure 2. Continued.

Catches and fishing effort by species for jigging fishery

Korean jigging fisheries have been operating for *D. gigas* in the SPRFMO Convention Area since 1990. Annual catches of *D. gigas* and their effort were summarized in Table 3. The highest catch of *D. gigas* was about 69 thousand tons in 1994, and the lowest catch was about 2 thousand tons in 2006. The catch trend showed a continuous decrease from 1995 to 2007 (Figure 3). After 2008, the catch trend is relatively constant compared to the prior fishing seasons. CPUE of *D. gigas* ranged from 4 to 28 ton/day over the recent 7 years. In particular, the lowest CPUE appeared in 2018 due to increased number of fishing vessels.

Table 3. Annual catch of Korean jigging fisheries in the SPRFMO Convention Area

Year	No. of fishing days	No. of fishing vessels	Catch (ton)
1990	?	6	3,465
1991	?	24	24,015
1992	?	33	43,022
1993	?	42	62,887
1994	?	49	69,664
1995	?	50	35,719
1996	?	48	12,896
1997	?	27	3,359
1998	-	-	-
1999	?	11	19,728
2000	?	14	20,822
2001	?	7	5,797
2002	?	17	21,759
2003	?	5	4,722
2004	?	8	10,787
2005	?	2	2,519
2006	?	1	2,485
2007	-	-	-
2008	?	1	6,775
2009	?	1	7,221
2010	?	1	14,506
2011	?	1	7,410
2012	580	6	7,991
2013	365	6	6,034
2014	397	6	7,261
2015	151	2	4,263
2016	409	4	4,388
2017	456	8	3,460
2018	1,003	17	3,651

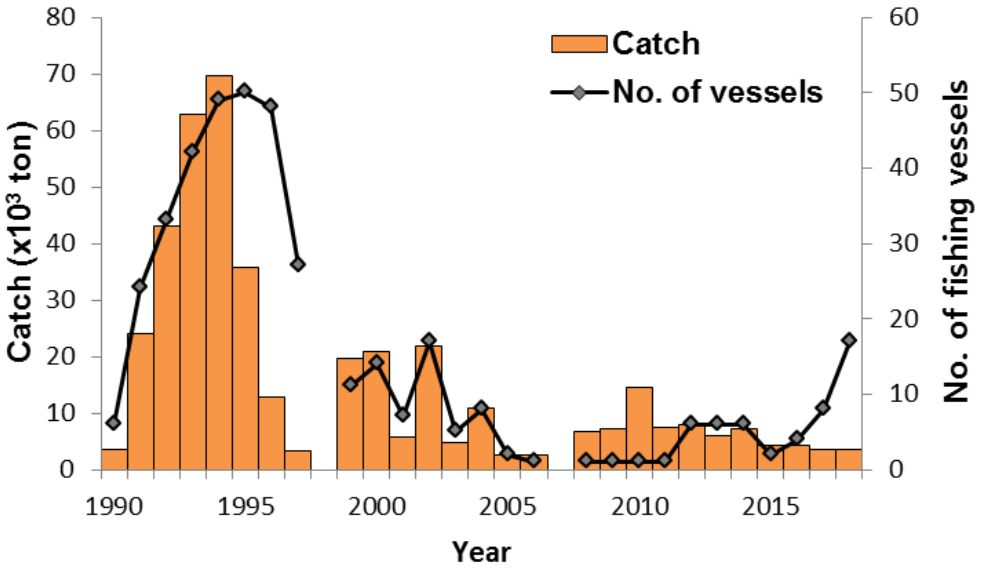

Figure 3. Annual catch and number of fishing vessels by Korean jigging vessels in the SPRFMO Convention Area during 1990-2018.

Catches and fishing effort by species for bottom trawl fishery

Korean bottom trawl fishery mainly targeting on *Hoplostethus atlanticus* (orange roughy) was not operated in the SPRFMO Convention Area since 2008 (Refer to SC6-Doc27).

3. Fisheries data collection and research activities

Fisheries data collection and verification

Official catches by distant-water fisheries was obtained by two organizations. Korea Overseas Fisheries Association (KOFA) collects total catches by gear type from Korean distant-water fishery industries, which are used as Korean official total catch. National Institute of Fisheries Science (NIFS) collects logbook data from fishing vessels.

The logbook contains daily catch and effort data on a tow-by-tow basis. Electronic report system (ERS) was developed on the basis of VMS, and catch data from vessel of distant-water fisheries has been reported through ERS to Korea Fishery Monitoring Center (KFMC) since September 2015.

Each commercial vessel of distant-water fisheries submits the electronic "Catch Report and Biological Report (e-logbook)" which are recorded on fishing vessels according to the domestic

regulation on a tow-by-tow basis. The logbook and catch data have been submitted to the SPRFMO Secretariat in accordance with the data standards of SPRFMO.

Research activities

Korea reported on the biological information of jumbo flying squid and bycatch status based on the information collected by an observer dispatched on board a jigging vessel in 2015 (SC5-SQ09). Considering its expansion of jigging fishery in the SPRFMO Convention Area, Korea has determined to investigate a fishing ground of jumbo flying squid. Accordingly, two scientific observers were dispatched to conduct survey including biological research as planned from October to December in 2018. The detailed results will be reported at the 7th SC Meeting.

In 2019, a total of 12 squid-jigging vessels are expected to be participating in the fishery, and this year also two observers will be on board two jigging vessels separately which targets jumbo flying squid in the Convention Area to conduct a scientific survey with the same objective as the last year. The survey period is expected to last longer than previous year from September to December and survey area will be also extended to the northern part of the Convention Area. The survey items include collection of fishing operation data; biological measurement of the target species; observations of bycatch species, marine mammals, seabirds and other species of concern; monitoring of marine environment and waste disposal; and biological sampling. In particular, collected samples of jumbo flying squid will be utilized for the future research on the age determination, prey composition, and genetic study.

4. Biological sampling

Length composition of T. murphyi (Chilean jack mackerel)

Yearly length frequencies and length-weight relationship of *T. murphyi* (Chilean jack mackerel) is shown in Figures 4 and 5. A comparison among the ranges of the annual fork length measurements taken from 2008 to 2018 suggests that a trend having a single mode in the earlier half of the time period has been changed to have multiple modes in the latter half. The comparison of the length distribution also suggests that the mode has been shifted left to the smaller size groups over the years of the survey.

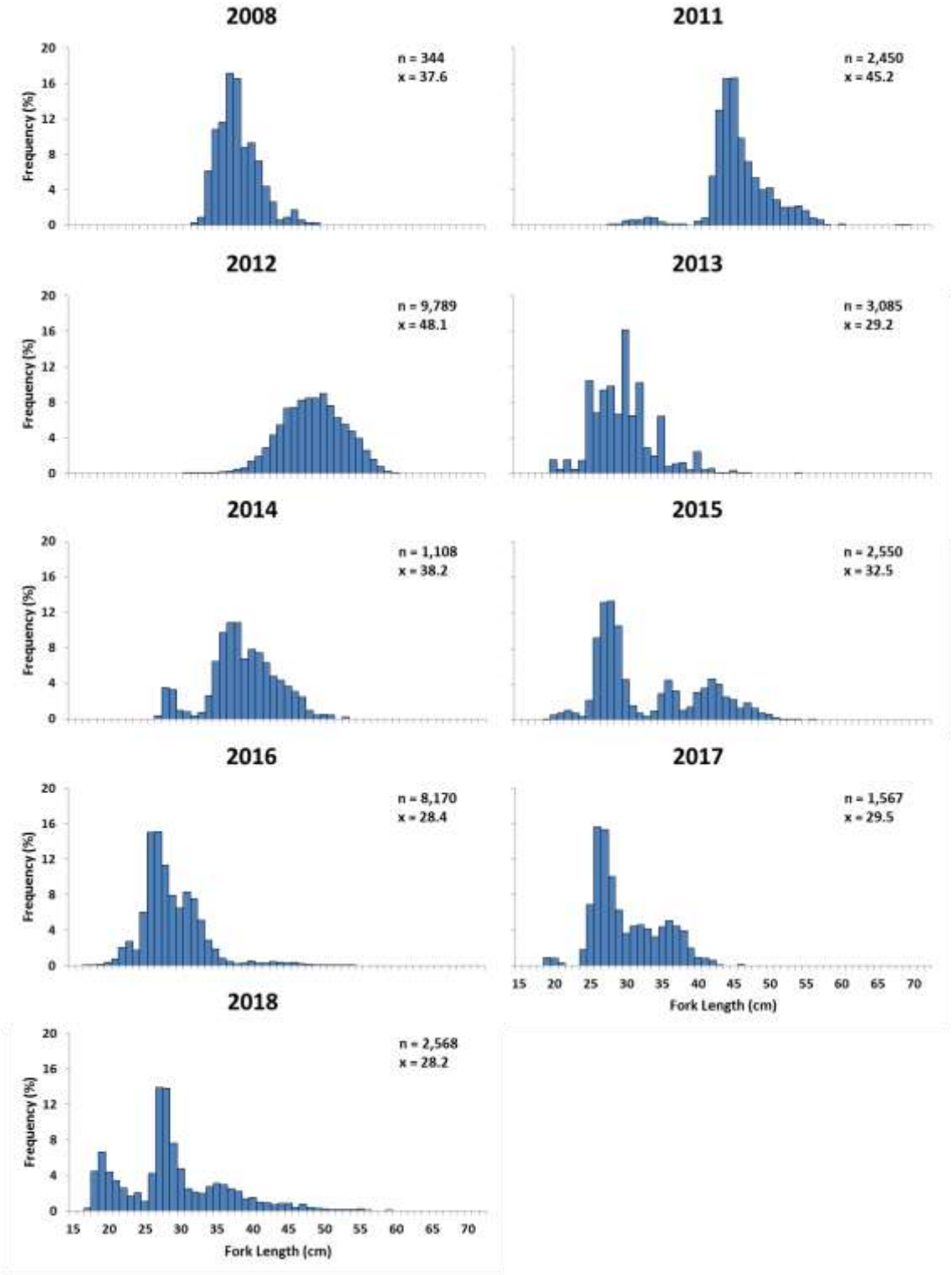

Figure 4. Length frequency of *T. murphyi* by Korean fishing vessels during 2008-2018.

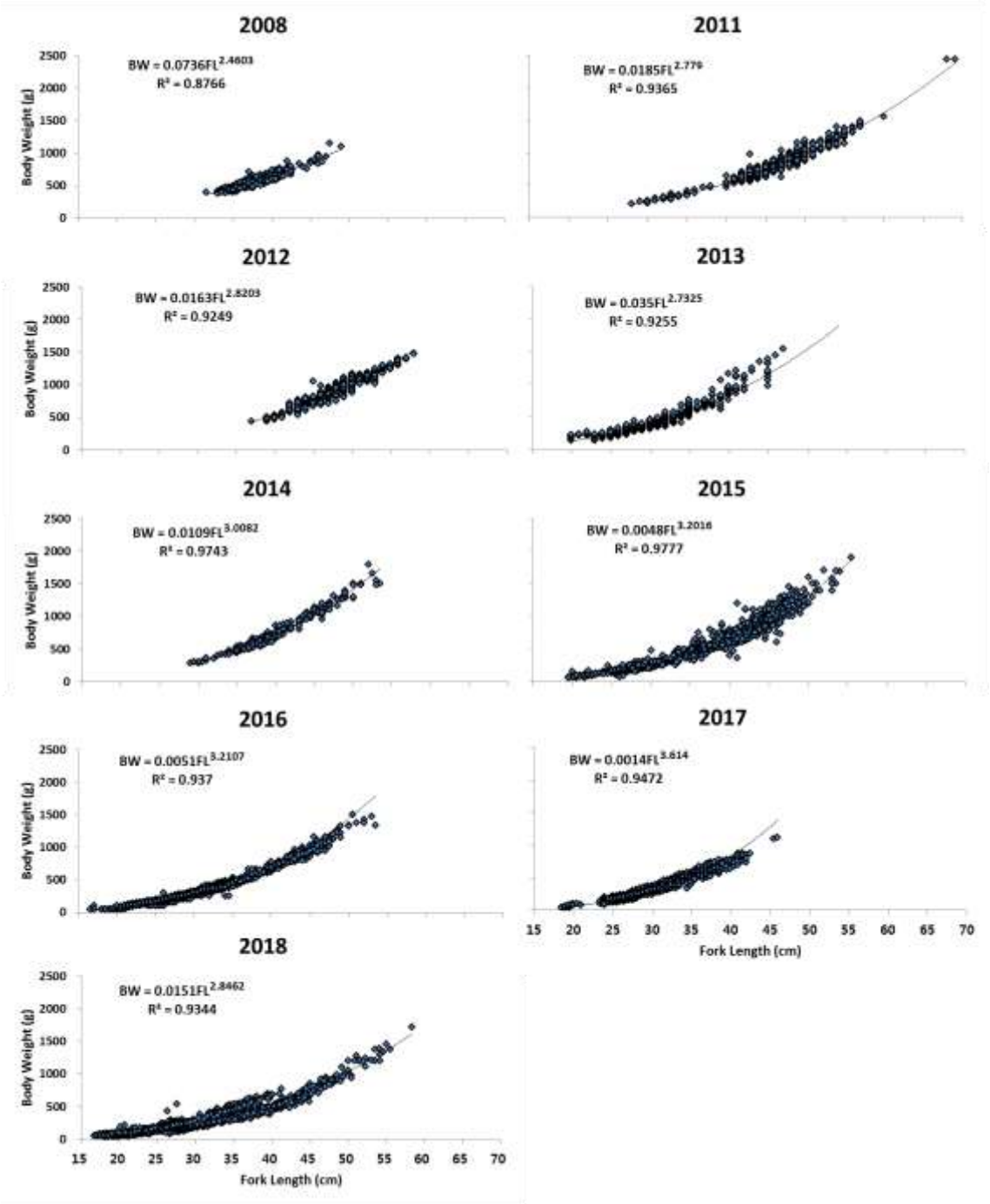

Figure 5. Length-weight relationship of *T. murphyi* during by Korean fishing vessels 2008-2018.

5. Summary of observer program

Observer training

Korean scientific observer program for distant-water fisheries started in 2002. National Institute of Fisheries Science (NIFS) is responsible for implementing and developing the observer program. The qualification for a person to be an observer is: a person who is a college graduate whose major field is nature science, or else, a fisheries high school graduate who accompanies at least 1-year experience on board having a certificate of qualification to deck officer. Candidates for observer who have passed the paper review (including medical check-up) and oral interview have to take training programs for 2 weeks. Observer training programs include basic safety training for seafaring, operations of navigation devices, biological information training for target and non-target species and data collection method for fishing activities. During the training program they have two types of test. One is the test on a technical terminology of fisheries and biology, and the other is the test on species identification. NIFS trains observers again before dispatching them to each RFMO area. The training includes the Conservation and Management Measure (CMM) of each RFMO, how to collect the data and sample, specific task needs to be done and more.

Data collection by observer at the sea

For the analysis of the biological characteristics for jack mackerel, observers measure fork length, body weight, sex and reproduction indices from the commercial vessels.

In 2008, two Korean vessels operated in the SPRFMO Convention Area and one observer was deployed on two vessels for 9 days. The observer coverage rate was 4 %. Korean vessels operated in 2010, but no observer was on these trips. In 2011, one observer embarked on one vessel from August 15 to September 5, and the coverage rate of observation was 6.8 %. In 2012, one observer operated on one vessel from April 22 to July 28, and the coverage rate of observation was 58.1 %. Since 2013, observer coverage rate has been maintained at the 100 % in the Convention Area (Table 4).

Table 4. Scientific observers on Korean trawlers during 2008-2018

Date	Vessel name	Observed days	Coverage rate (%)
2008. 10	*Insungho*	3	4
	Kwangjaho	6	
2011. 8-9	*Kwangjaho*	14	6.8
2012. 4-7	*Kwangjaho*	68	58.1
2013. 6-12	*Kwangjaho*	140	100
2014. 5-8	*Kwangjaho*	86	100

2015. 6-9	*Kwangjaho*	120	100
	Sejongho	10	100
2016. 6-12	*Kwangjaho*	179	100
	Sejongho	28	100
2017. 6-10	*Kwangjaho*	88	100
2018. 6-10	*Kwangjaho*	134	100
2018. 9-11	*Sejongho*	37	100

Since 2015, Korea dispatched scientific observers on board to each commercial jigging vessel for conduction of fishing ground survey including biological research in the SPRFMO Convention Area (Table 5). In 2018, two scientific observers were dispatched and total survey period was 175 days from October to December 2018. Observer coverage rate has been maintained at the 100 % in the Convention Area.

Table 5. Scientific observers on Korean squid jigging vessels during 2015-2018

Date	Vessel name	Observed days	Coverage rate (%)
2015.10-12	*No.705 AMOR*	75	100
2018. 10-12	*No.703 AMOR*	93	100
	No.101 AGNES	82	100

Bycatch mitigation policy

Korean trawl vessels equip mitigation devices, such as bird baffler, streamer line during operations. Their utilization rates were 40-70 % varying with sea and weather conditions. And they are prohibiting discharge of offals and discards during shooting and hauling in order to reduce seabirds' bycatch. During deploying the gear, scientific observers regularly watched the warp strike more than one time a day. However, there was no interaction with seabirds during net shooting.

In 2018, the trawl vessel consistently used bird baffler during its operation (Figure 6). The biological waste that can be used as bait for seabirds was not released in any form (e.g. whole and minced fish, liquid, etc.) during the prohibiting time.

Figure 6. Photographs of setting up the bird baffler on vessels.

Report on bycatch of seabirds, marine mammals, reptiles and other species of concern

For observation of seabirds, it was recommended that daily observation of seabirds take place at least once every set and haul for 15 minutes. Observers were instructed to observe whether the seabirds were dipping their beak or head into the water near the net to feed on their prey. The recording of observations on the abundance of seabirds and their encounter with the vessel was made quantitatively. During operations, 6-11 species of seabirds were observed on trawl vessels from 2013 to 2018 (Table 6). There was no injured, struck or died seabirds that have been observed and reported so far. Seabird abundance was commonly more than 100 individuals at the end of vessel in deploying time. *Daption capense* (cape petrel) and *Thalassarche melanophrys* (black browed albatross) were observed more than other seabird species. In 2018, 138 over the total 171 hauls were observed for seabirds, mammals, reptiles and other species of concern. And over 50 individuals consisting of 1-6 species of seabirds were observed in each 136 hauls, while no seabird was observed during the other 2 hauls.

Table 6. Lists of observed seabirds in the SPRFMO Convention Area during 2013-2018

Species code	Scientific name	English name
CSK	*Catharacta skua*	Great skua
DAC	*Daption capense*	Cape petrel
DCR	*Thalassarche chlororhynchos*	Yellow-nosed Albatross
DIB	*Thalassarche bulleri*	Buller's albatross
DIC	*Thalassarche chrysostoma*	Grey-headed albatross
DIM	*Thalassarche melanophrys*	Black-browed albatross
DIU	*Thalassarche cauta*	Shy albatross
DIX	*Diomedea exulans*	Wandering albatross
DMP	*Diomedea melanophris*	Black browed albatross
DSQ	*Sula dactylatra*	Masked Booby
FGZ	*Fregetta* spp	Storm petrels nei
FUG	*Fulmarus glacialoides*	Southern fulmar
MAH	*Macronectes halli*	Hall’s giant petrel
MAI	*Macronectes giganteus*	Southern giant petrel
OCO	*Oceanites oceanicus*	Wilson's storm petrel
PCI	*Procellaria cinerea*	Grey petrel
PFG	*Puffinus griseus*	Sooty shearwater
PHE	*Phoebetria palpebrata*	Light-mantled albatross
PHE	*Phoebetria palpebrata*	Light-mantled Sooty Albatross
PRO	*Procellaria aequinoctialis*	White-chinned petrel
PWX	*Pachyptila spp*	Prions nei
-	*Phaethon* spp	Tropicbird
-	*Pteroderma externa*	Juan Fernandez petrel

Korean has reported totally 17 events of other species of concern by the jack mackerel trawl fishery from 2015 to 2017; all reported individuals were *Lamna nasus* (porbeagle sharks) (SC6-Doc09). In 2018, observers onboard the trawl vessels which operated in the SPRFMO Convention Area have reported 4 observations of *L. nasus* from both of the trawl in operation. There was no bycatch of marine mammals, reptiles or any other species of concern.