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China's Annual Report, part I (Jack mackerel)

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Annual Report of China to the 2018 SPRFMO Science Committee
Part I: the Jack Mackerel Fishery

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1 *Description of Chinese Pelagic Trawl Fishery*

The Chinese pelagic trawlers have harvested jack mackerel (*Trachurus murphyi*) in the high seas outside the Exclusive Economic Zone (EEZ) of Chile since 2000. The first Chinese pelagic trawler KAIXIN arrived at the Southeast Pacific in June 2000 and worked for two months. During the early years the Chinese fleet fish for jack mackerel all year round, however, it only worked for 8 to 10 months that covered the main fishing season (March to October) after 2006. In 2017, the fishing season decreased to 7 months (April to September).

The number of active Chinese vessels increased to 11 in 2008, and then continued to decrease. Although it recovered to six in 2015, three of them only worked for 2 or 3 months. In 2016 and 2017, two pelagic trawlers operated in the Southeast Pacific for jack mackerel. The number of vessels during recent years is showed in table 1.

Annual catch fluctuated from 2,318 to 160,000 tons during 2000 to 2017 and peaked in 2006, and then it declined continuously and decreased to 8,329 tons in, the lowest level since 2001. In recent years, catches increase with the jack mackerel biomass recovered.

Table 1 Number of vessels from 2013 to 2018

Year	Number of fishing vessels	Registered tonnage, GRT		Gear type
		<4,000	≥4,000	
2013	2	0	2	Pelagic trawl
2014	3	0	3	Pelagic trawl
2015	6	0	6	Pelagic trawl
2016	2	0	2	Pelagic trawl
2017	2	0	2	Pelagic trawl
2018	2	0	2	Pelagic trawl

2 Catch, Effort and CPUE Summaries

The Chinese trawl fishery targets jack mackerel with some by-catch being mainly chub mackerel (*Scomber japonicus*)，which usually makes up a small fraction of the total catch. In 2017, 548 tons chub mackerel was caught which accounted for 3.20% of the total catches (17,133 tons).

Table 2 presents the summary of annual catch, fishing days, trawling hours and catch per fishing effort of the Chinese trawl fishery during the last six years. Catch, fishing days, as well as catch per fishing effort of the Chinese vessels increased in the previous five years. These increases are related to the increased biomass of jack mackerel.

Table 2 Catch, effort and catch per fishing effort of the Chinese fishing fleets over the period of 2012-2018

Year	Catch in tons	Fishing days	Catch per day in tons	Trawling time in hours	Catch per hour in tons
2012	13,012	260	50	3208.4	4.1
2013	8,329	177	47	1893.2	4.4
2014	21,155	298	71	3655.2	5.8
2015	29,180	362	81	3704.4	7.9
2016	20,208	277	73	3162.5	6.4
2017	16,586	165	101	1482.3	11.2
2018*	17,078	150	114	1742	9.8

Note: The total catch of jack mackerel was 17,078 tons through June 2018.

Annual catch in 2017 was about 16.6 thousand tons and decreased obviously when compared catch in 2015 and 2016. Up to the 31th day of July 2017 the two Chinese pelagic trawlers had caught about 12.9 thousand tons jack mackerel in 2018.

Fishing days or trawling hours based effort presented similar trend with catch from 2012 to 2017 (Table 2). Effort have continued to grow since 2013 and peaked in 2015, however, they both dropped in 2016 and 2017. Contrary to 2016, fishing days and trawling hours declined by 45.8% and 53.1% respectively, however, the

corresponding two kinds of CPUEs rose by more than 25%, the increased rate reached to 27.7% and 42.9% respectively.

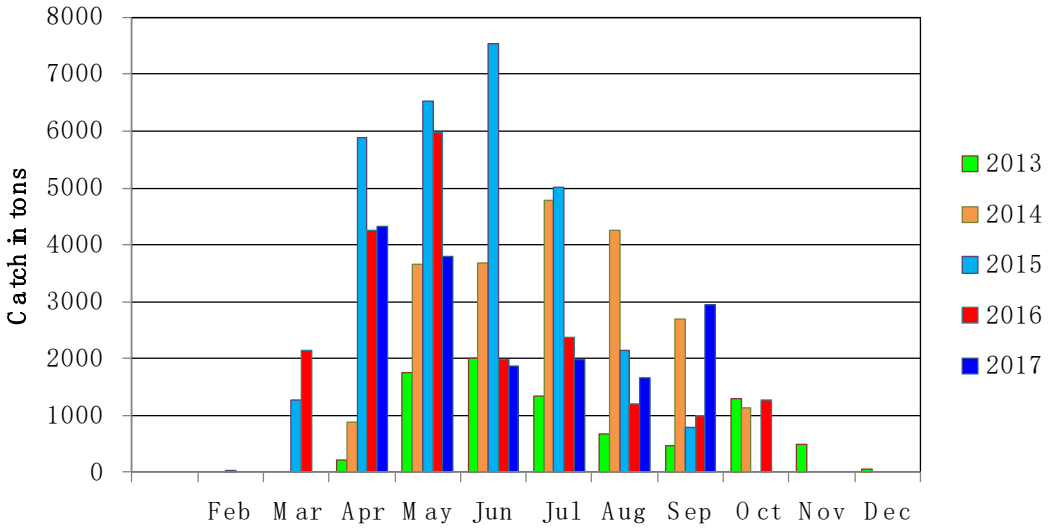


Figure 1. Monthly catches of jack mackerel by the Chinese trawling vessels during 2012-2017.

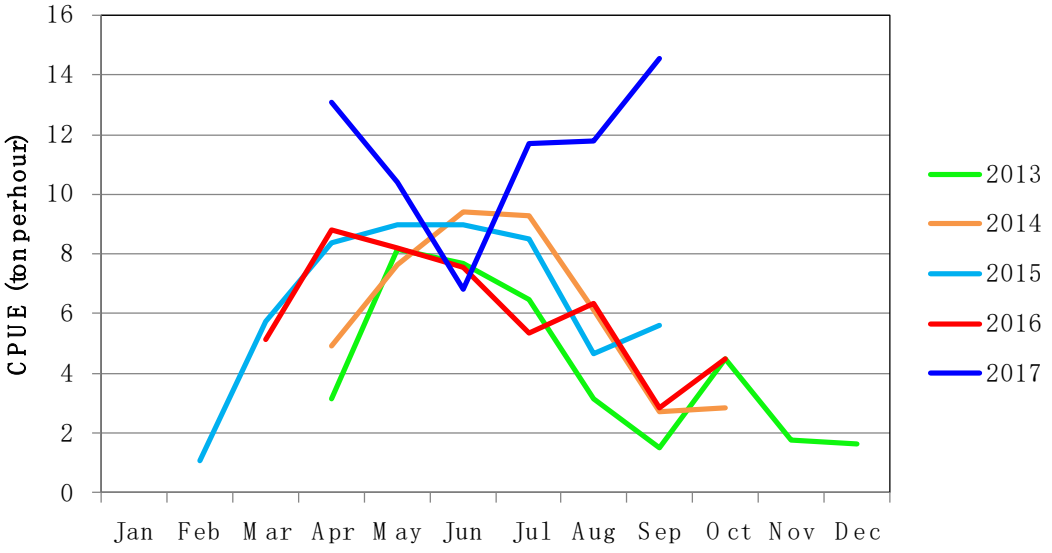


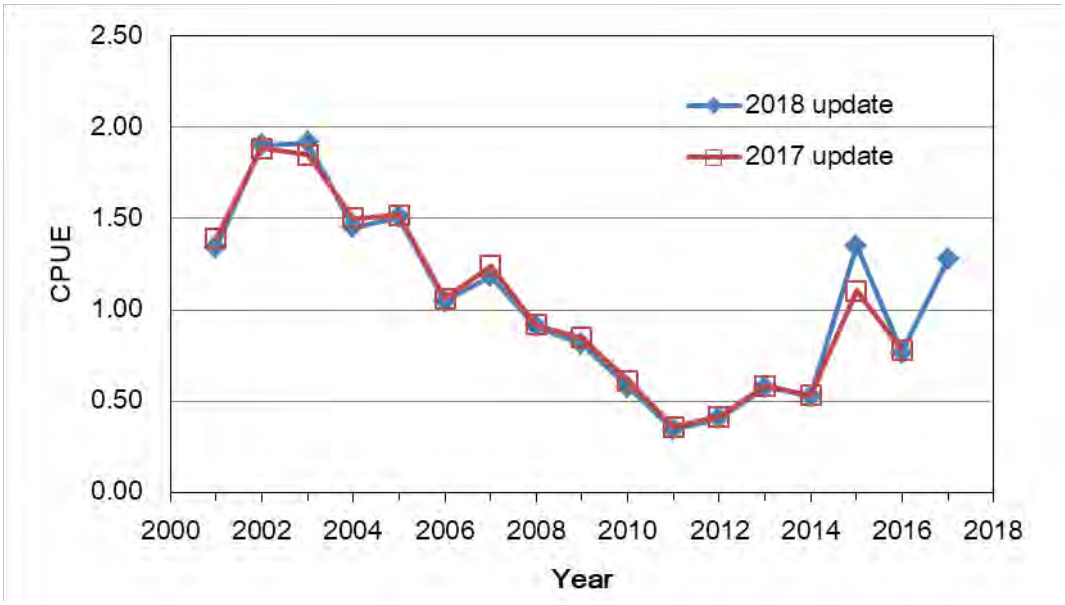
Figure 2. Monthly CPUE of the Chinese trawl fishery during 2013-2017.

Monthly catches of jack mackerel in the last five years is shown in Figure 1. The second and third quarter was the main fishing seasons during 2013-2017 and there was no fishing activity either in the first or the last two months in 2017. Jack mackerel catches in 2016 increased from the beginning of the fishing season and reached the highest value in May and then decreased sharply. In 2015 and 2014, highest catches were taken in June and July 2014 respectively. However, monthly catch was highest in April, the first month of 2017 fishing season. Jack mackerel catch decreased month

by month during April and August, but increased obviously in the September. Monthly catch in May-July of 2017 was less than year-to-date 2016, but jack mackerel catch in April, August and September 2017 was higher than a year before.

Monthly CPUE fluctuated between to 1.1 (February 2015) to 14.5 tons per hour (September 2014). Monthly CPUE trend in 2017 followed a V-shaped curve and was different obviously with those in previous years, in which monthly CPUE increased firstly and then decreased.

Nominal CPUE were standardized by generalized additive model (GAM) and the estimated Year Effect (exponential transformed) was used as abundance index for jack mackerel stock in the high seas (Li, 2012). Catch and environmental data in 2017 were added into the database to update the CPUE standardization. The variable, sea surface height (SSH), was removed from the GAM model again because remote sensing SSH data have not been available since 2016. The new abundance index was very similar to the CPUE that was standardized last year. The biggest difference between the two CPUE series occurred in 2015 (Figure 3).



Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
CPUE	1.342	1.902	1.916	1.454	1.507	1.048	1.186	0.913	0.813
Year	2010	2011	2012	2013	2014	2015	2016	2017	-
CPUE	0.578	0.345	0.405	0.578	0.530	1.352	0.767	1.276	-

Figure 3. Standardized CPUE of Jack mackerel during 2001-2017.

Monthly catch distribution in 2017 derived from the tow-by-tow information was presented in Figure 4. Catch geographical distributions of 2016 and 2015 were also showed for comparison in Figure 5 and 6. The special and temporal distribution mode did not change fundamentally during the last three years. Chinese fishing vessels operated in the waters off south-central Chile in the second quarter and move to northern Chile at the end of the third quarter. The two vessels moved to the northern fishing ground in August 2017, same as 2016 but a month earlier than 2015.

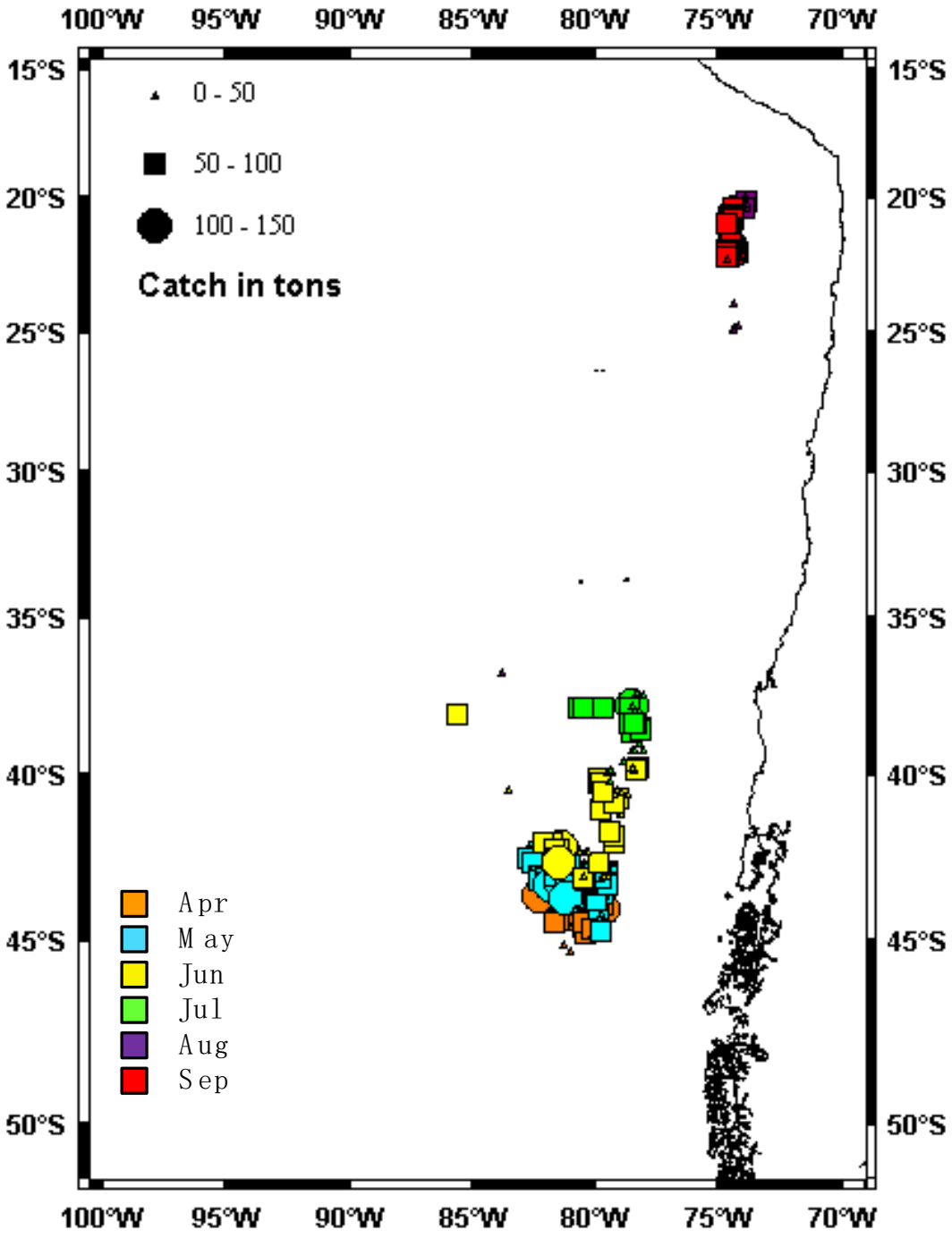


Figure 4. Monthly catch distributions by the Chinese fleets in SPRFMO area in 2017.

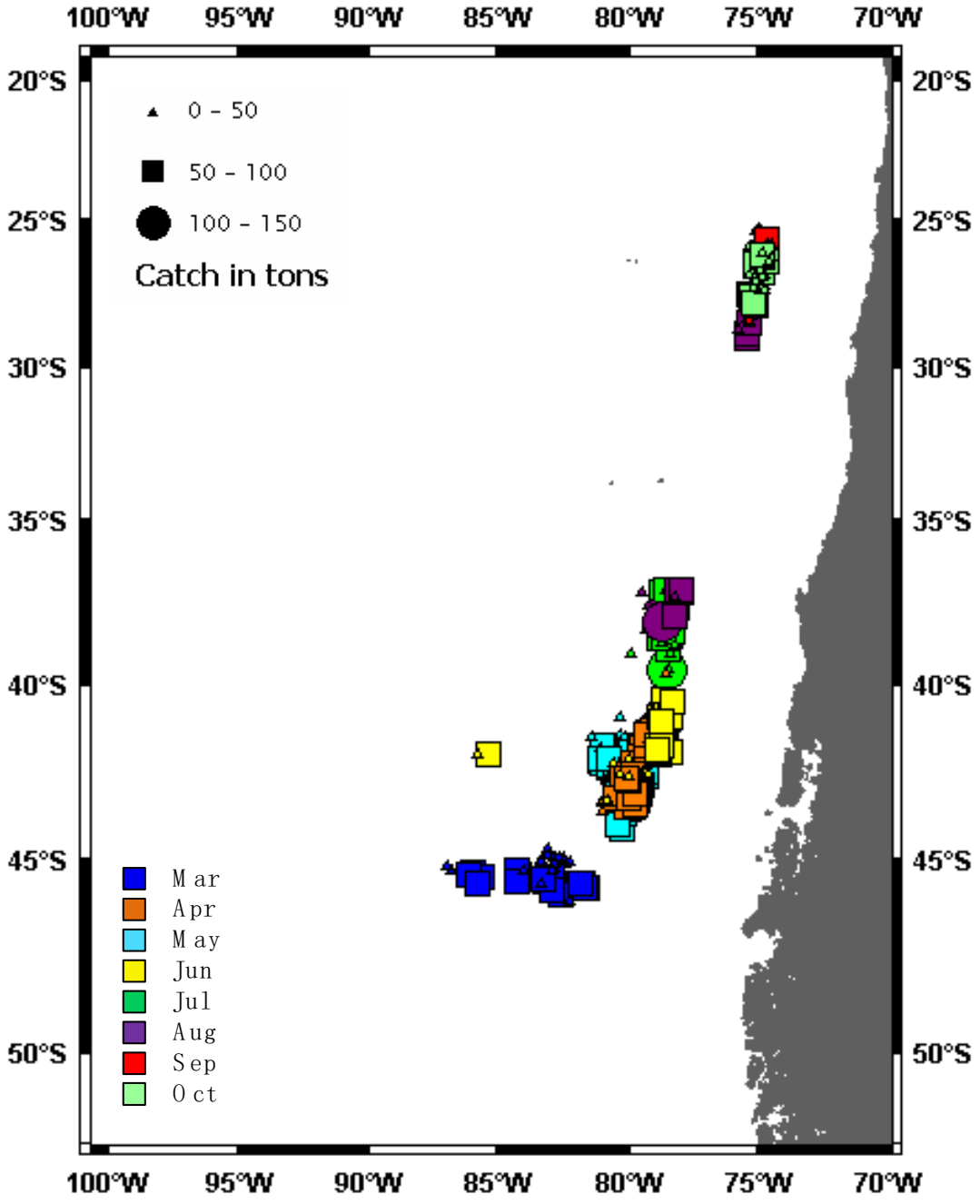


Figure 5. Monthly catch distributions by the Chinese fleets in SPRFMO area in 2016.

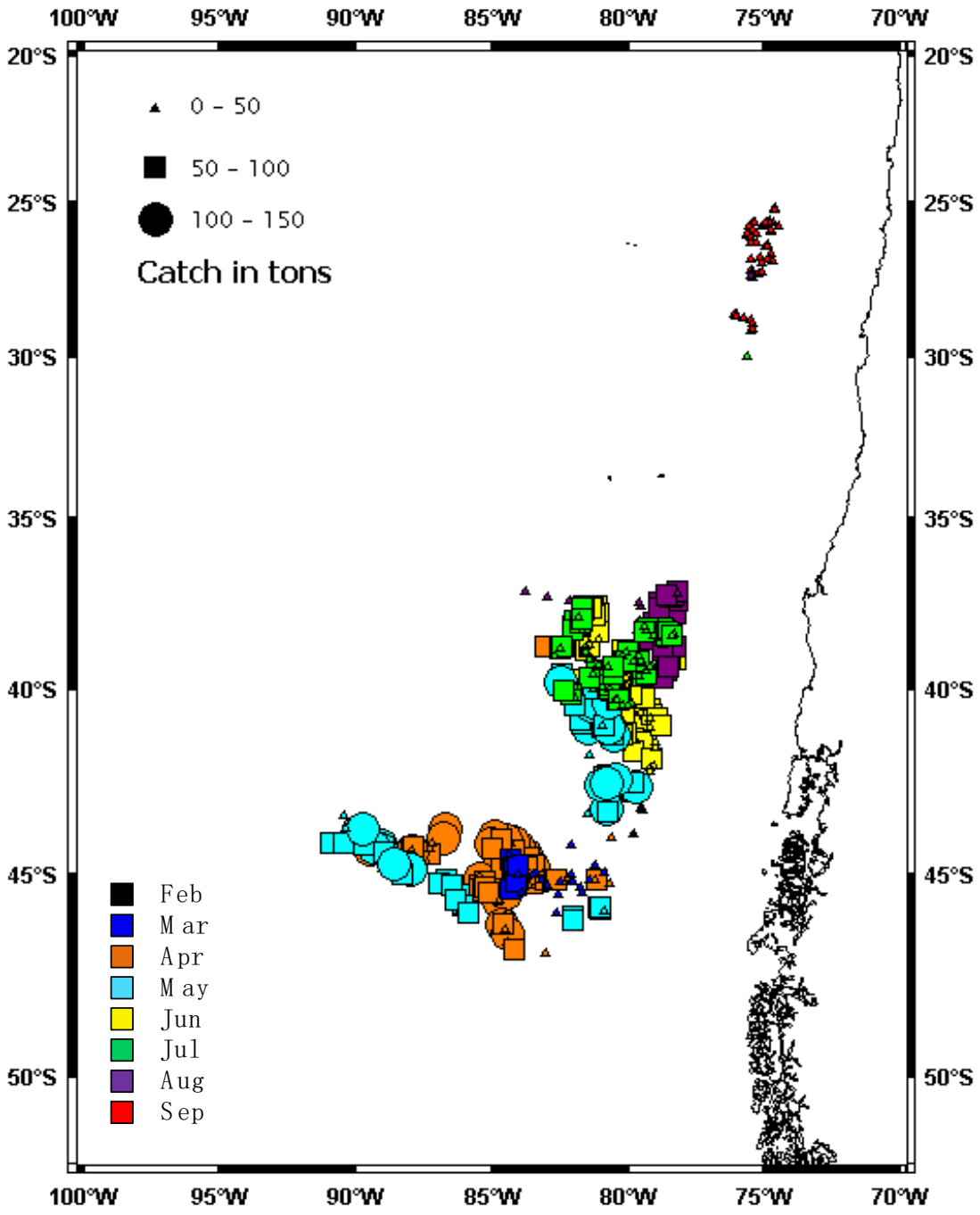


Figure 6. Monthly catch distributions by the Chinese fleets in SPRFMO area in 2015.

3 *Fisheries Data Collection and Research Activities*

Two types of fisheries data are collected for jack mackerel, the logbook data and scientific onboard observed data. Catch data collection were carried out in 2000, in which the Chinese trawlers began to fish jack mackerel in the South East Pacific. The Chinese trawlers were requested to supply the fishing log books and report the monthly catch statistics. Fisheries data from the log books include names of trawlers,

start and end locations and time (date and UTC time) of each tow, catch of jack mackerel and other by-catch species etc. In 2017, a total of 294 recorders of tow-by-tow information were collected.

Observer data collected are usual biological information such as fork length, weight, sex, maturity stage etc. One observer was sent to sea and work on KAI YU on 19 July and stayed on board until October 23. A total of 28 fishing days and 50 tows were observed, and the coverage rate was 17.0%.

4 *Biological Sampling and Length Composition of Catches*

The observer sampled jack mackerel in the catch and measured fork length and sex. Information such as operating location and time, by-catch species of each observed tow were also recorded. During the observed fishing days, a total of 1350 jack mackerel were sampled and measured.

Fork length data were collected from 19 July to 13 September 2017, but most of jack mackerel individuals were observed during August-September (Table 3), in which KAI YU fished in the northern area, the nursing area of young jack mackerel. Thus the dominant size was 15-20 cm, followed by 24-28 cm and 34-37 cm (Figure 7). Compared with the historic length composion, it can be seen that the length distribution was different from year to year, the main reasons is related to where and when the jack mackerel were sampled. The trawlers fish large jack mackerel in the southern fishing area before August in recent years, afterwards they move to the northern fishing area to target younger jack mackerel. For example, length composition in 2014 and 2015 derived from jack mackerel samples caught during April-July in the waters off central-southern Chile, so the small fish was disappear from catch. In 2016, the sampling area and time covered the whole fishing area and season, so the percentage of younger age jack mackerel was higher than 2014 and 2015 but lower than 2017 (Figure 7).

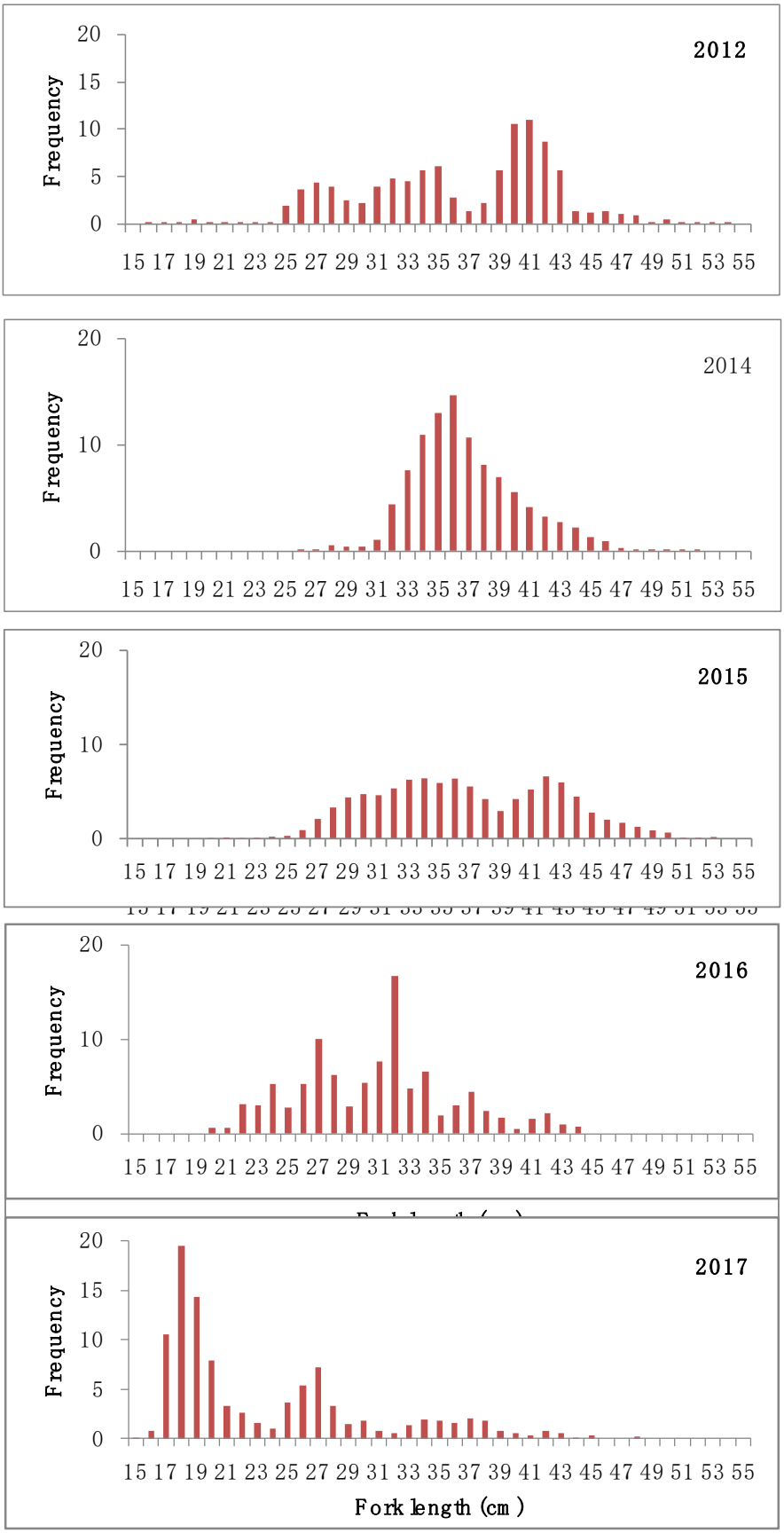


Figure 7 Fork length frequencies of jack mackerel sampled in 2012-2017

5 *Ecosystem Approach Considerations*

The observer inspected whether the trawlers installed the bird scaring lines when operating. In 2017, all the Chinese vessels were equipped bird scaring lines (Figure 8a and b). Sea birds were wandering around the stern when the trawlers were operating, but no birds were found in the net and no collisions were observed.

Figure 8a. Bird scaring lines attached to KAI YU

Figure 8b Bird scaring lines attached to KAI FU HAO

6 *Observer Implementation Reports*

China National Data Center for Distant-water Fisheries took the full responsibility for fishery data collection and national observer programme in 2015. China Distant-water Fishing Observer Programme is financed by the government, and organized by Shanghai Ocean University's College of Marine Science structurally. The programme concentrates on placing observers on pelagic trawlers and concerned about collecting data for science.

Trainers of China Distant-water Fishing Observer Programme are from the highly qualified personal teaching at the College of Marine Science at the Shanghai Ocean University. These trainers have been observers in the past and also have other qualifications of expertise. Observers employed in this programme require at least high school pass as a minimum to be eligible. An observer was choose and received special training at Shanghai Ocean University before placed on KAI YU in 2017. The training courses include skills on data collection, safety on the sea, management measures and so on.

The observer embarked on KAI YU from July 19 to October 23 and a total of 28 fishing days were observed which covered about 17.0% of the total fishing days and met the 10% observer coverage requirement of CMM 4.01. Based on the CMM4.02 about data standards, the observer collected catch and effort data, biological data and other relevant information. No seabirds, mammals, reptiles and other species of concern were caught and observed during the fishing operation.

7 *Summaries*

The number of Chinses pelagic trawlers remained unchanged at two in 2017. The total of catch was 17,133 tons including 16,586 tons of jack mackerel and 538 of tons chub mackerel. Jack mackerel catches and fishing days, as well as trawling hours were decreased sharply compared to 2015 and 2016 because of the shortening fishing seasons, however, the nominal and standardized CPUE increased significantly. Nominal CPUE of 2017 was 11.2 tons per hour, peaked during the last ten years. The special and temporal distribution mode did not change fundamentally in recently years. A scientific observer was sent to the sea and was boarded on July 19 and stared his work until October 23. A total of 28 fishing days were observed and the coverage rate was about 17.0%.

Table 4 Fork length frequency data of Jack Mackerel in 2017

Date	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450	460	470
19-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	12	6	7	10	6	2	1	1	0	1	0	0	0	0	0
20-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	3	2	3	7	5	9	3	1	2	4	4	0	0	0	0	0
22-Jul	0	0	0	0	0	0	0	0	0	0	1	3	2	3	4	2	2	4	6	5	1	3	3	1	2	1	3	1	1	1	0	0	1
23-Jul	0	0	0	0	0	0	0	0	0	0	0	5	1	1	4	1	1	2	5	7	3	5	3	3	2	1	2	3	0	0	0	0	1
6-Aug	1	13	16	10	9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Aug	4	23	18	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Aug	0	4	12	23	9	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Aug	0	13	22	13	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Aug	0	12	17	15	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Aug	0	9	19	15	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Aug	0	14	15	10	5	1	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Aug	0	8	17	11	4	1	2	0	1	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Aug	2	16	16	4	4	3	1	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Aug	0	12	18	10	3	1	1	1	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Aug	0	3	18	10	4	1	0	1	0	2	5	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Aug	0	5	27	9	3	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Aug	0	9	19	8	5	2	2	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Sep	0	0	0	0	0	0	0	0	0	7	6	14	11	5	4	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Sep	0	0	0	0	0	0	0	0	0	5	10	16	9	3	4	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-Sep	0	0	2	5	13	6	4	0	0	5	5	4	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Sep	0	0	6	13	14	8	4	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Sep	0	0	0	0	0	2	1	1	1	2	8	15	6	1	1	0	0	0	2	2	2	2	2	0	0	1	0	0	0	1	0	0	0
8-Sep	0	0	0	0	0	2	3	4	6	5	12	8	4	3	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Sep	0	0	3	0	2	5	4	1	3	3	3	9	6	2	2	0	0	0	2	0	1	1	2	0	0	0	0	0	0	1	0	0	0
10-Sep	0	0	3	10	7	5	4	5	1	2	5	4	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0
11-Sep	0	0	4	8	9	5	3	4	1	4	4	3	1	1	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
13-Sep	0	1	9	15	6	2	3	5	0	1	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**7**	**142**	**261**	**193**	**110**	**45**	**38**	**22**	**14**	**48**	**74**	**99**	**44**	**21**	**25**	**10**	**8**	**12**	**32**	**24**	**22**	**26**	**26**	**9**	**6**	**6**	**9**	**9**	**1**	**4**	**0**	**0**	**2**

References

Li G., Zou X. R., and Zhou Y. Q., 2010. Standardization of catch per unit effort for Chilean Jack Mackerel (*Trachurus murphyi*) from Chinese trawl fleet on the high Seas in the Southeast Pacific Ocean (2001-2010). Tenth SWG meeting of SPRFMO, Port Vila, Vanuatu, 19 - 23 September 2011, Doc. SWG-10-JM-06.