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China's Annual report (Jumbo squid)

China

Annual Report of China to the 2019 SPRFMO Science Committee
Part II: the Squid Jigging Fishery

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Summary

435 Chinese squid jigging vessels were registered to fish in the SPRFMO Convention Area. The number of active fishing vessels varied from 190 (March) to 373 (November). A total of 346 thousand tons of jumbo flying squid were caught in 2018. The number of total fishing vessels, annual catch, total fishing days and nominal CPUE all increased in 2018 compared with 2017. Two onboard observers and one studying vessel were designated to implement the observer program for collecting length composition data and biological information from February 2018 to May 2019.

1 Description of Chinese Squid Jigging Fishery

The Chinese distant-water squid jigging fleet have targeted jumbo flying squid (*Dosidicus gigas*) since 2001 (Chen et al., 2008). The Chinese squid jigging vessels only operate in the high seas of the South East Pacific. In general, small vessels with hand jiggers catch jumbo flying squid all year round, while the big vessels move to the South East Pacific from the southwestern Atlantic to catch jumbo flying in a few months of the year. Recently, a good number of squid-jigging vessels moved to the equator waters from the traditional fishing ground, high seas off Peru.

Twenty-two fishing vessels arrived at the international waters of the South East Pacific in 2001. The number of vessels increased to 119 in 2004 and then declined continuously in the following three years. In recent years, the number of squid jigging vessels has been increasing and reached 435 in 2018, an addition of 79 vessels over the previous year (Table 1).

The number of active fishing vessels tends to change from month to month (even from week to week) in a calendar year. During 2014-2015, the number of active vessels

fluctuated between 105 and 220 monthly. In 2016, the maximum number was 242, which occurred in December. 356 jigging vessels were reported to operate in the Convention Area in 2017, and the monthly maximum number varied from 180 (April) to 327 (November), however, in 2018, it changed from 192 in March to 373 in November.

The annual catch of jumbo flying squid fluctuated greatly in the first few years, and then it continued to grow and reached a higher level in 2014 and 2015, about 320 thousand tons. The annual catch fell to 223 thousand tons in 2016, but it increased over the next two years and peaked in 2018.

2 Catch, Effort and CPUE Summaries

Annual total catches of the Chinese squid jigging fishery in the South East Pacific maintained at a higher level during the period of 2013-2018. Squid catch in 2017 was 296 thousand tons, increased about 70 thousand tons compared to 2016, but still a little bit lower than 2014 and 2015. In 2018, it continued to increase and reached 346 thousand tons.

Fishing effort and CPUE during 2014-2018 are presented in Table 2. Estimated Effort decreased from 65,530 fishing days in 2012 to 57,771 fishing days in 2013, and kept growing in the next years. The estimated fishing days were 85,862 in 2018, up 13% compared to 2017. CPUE was relatively stable and fluctuated between 3.9 and 5.5 ton/day-vessel during 2014-2018.

Table one Number of vessels and annual catch of the Chinese squid jigging fisheries in the South East Pacific during 2012-2017

Year	Number of vessel	Catch in tons
2014	264	325,000
2015	252	323,600
2016	276	223,300
2017	356	296,100
2018	435	346,200

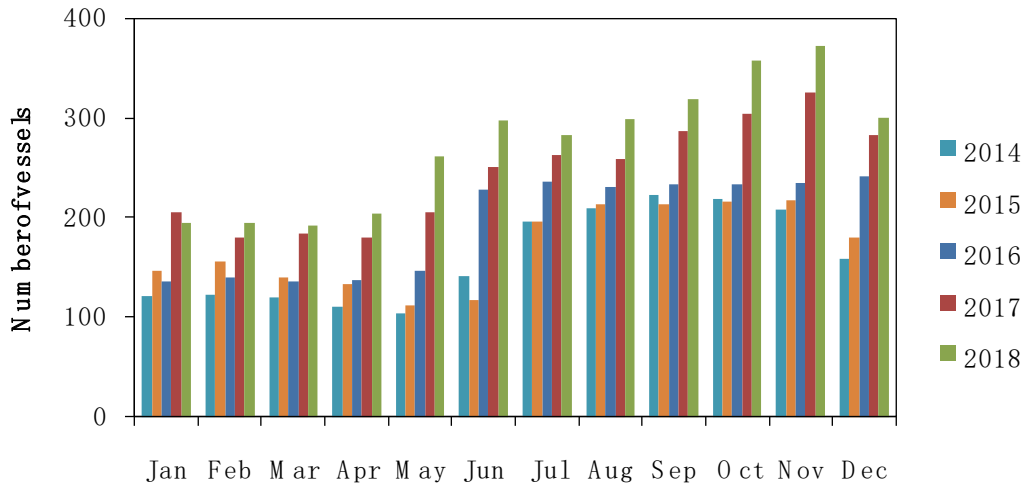


Figure 1 The number of maximum active fishing vessels in different months during 2014-2018

The monthly catches and CPUEs over the period 2014-2018 are shown in Figures 2 and 3, respectively. Monthly catches curves in 2014, 2016 and 2017 showed similar trend that they decreased in the first half-year and increased in the second half of year, however, in 2018, the catch peaked in September and then fell sharply. Monthly catches in 2015 also declined rapidly from August to December. The maximum monthly catches were over 60 thousand tons, appeared in November 2014 and the minimum occurred in May 2016. Catch in the second and third quarter of 2018 showed growth compared to the same period in 2016 and 2017, but fourth-quarter catch was almost at the lowest level. Monthly CPUEs in the previous four years showed U-shape curve and dropped to the lowest value in May, June or July, and then recovered month by month, however, in 2018, the CPUE peaked in February, and had not started moving upward since September, but continued to fall with the catch.

Table 2 Catch, effort and CPUE of the Chinese squid jigging fleet in the past five years

Year	Catch in tons	Fishing days	CPUE(tons/day-vessel)
2014	332,500	58,831	5.5
2015	323,600	60,116	5.4
2016	223,300	62,258	3.6
2017	296,100	75,655	3.9

2018

346,200

85,862

4.0

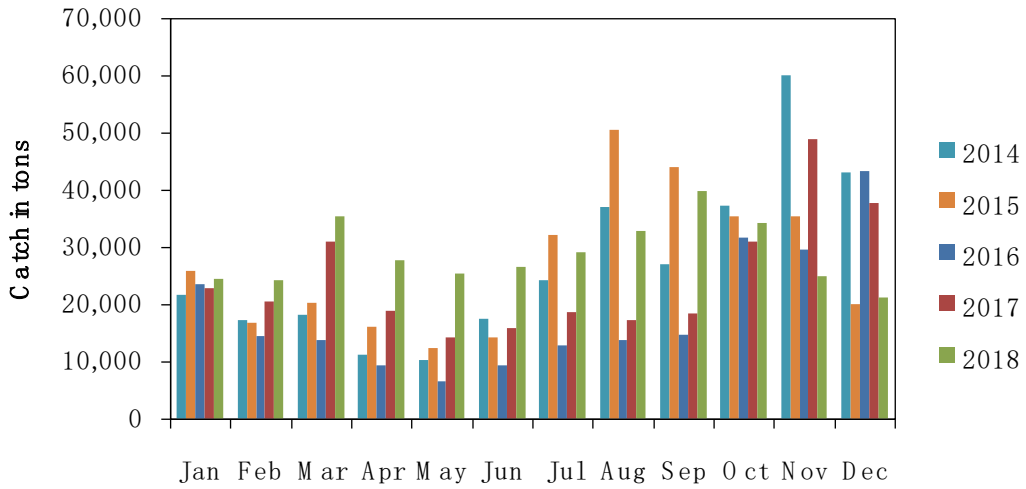


Figure 2 Monthly catches of the Chinese squid jigging vessels during 2014-2018

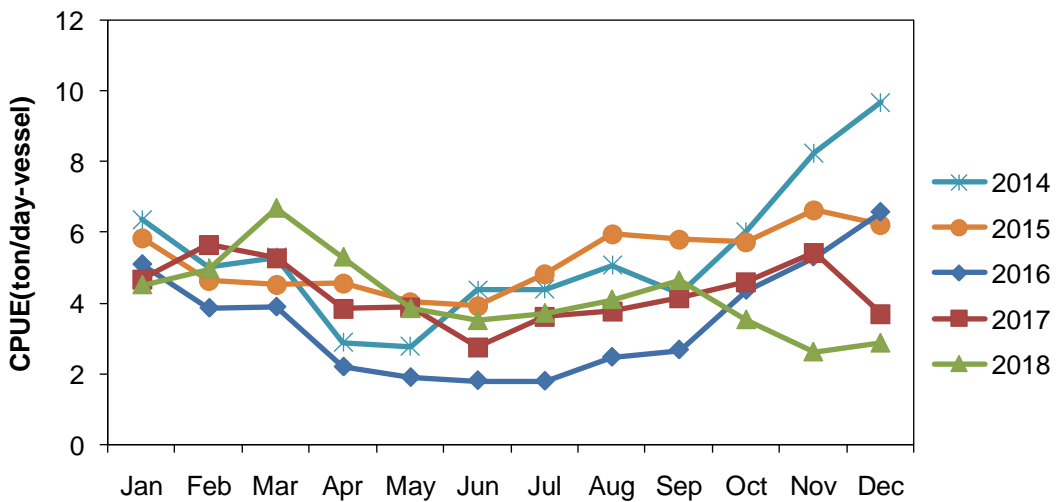


Figure 3 Monthly CPUE of the Chinese squid jigging vessels during 2014-2018

Monthly catch or CPUE distributions based on the received logbook of the Chinese squid jigging vessels are shown in Figure 4. The monthly geographical distributions showed that these fishing vessels operated in the high seas and moved back and forth between high seas off Peru and equator waters in 2017 and 2018. The former was the main fishing grounds for the Chinese squid jigging fleet but been replaced by the latter since 2017. Furthermore, only a few vessels operated in the waters off Chile, which was another important fishing ground. In 2018, the fishing vessels distributed in the high seas off Peru have moved northwards since January and almost all of them constricted in the equatorial waters in February and March (120-110 degrees west). In April, a few vessels reappeared in the southern area. After that, the squid jigging

vessels operated both in the northern and southern waters.

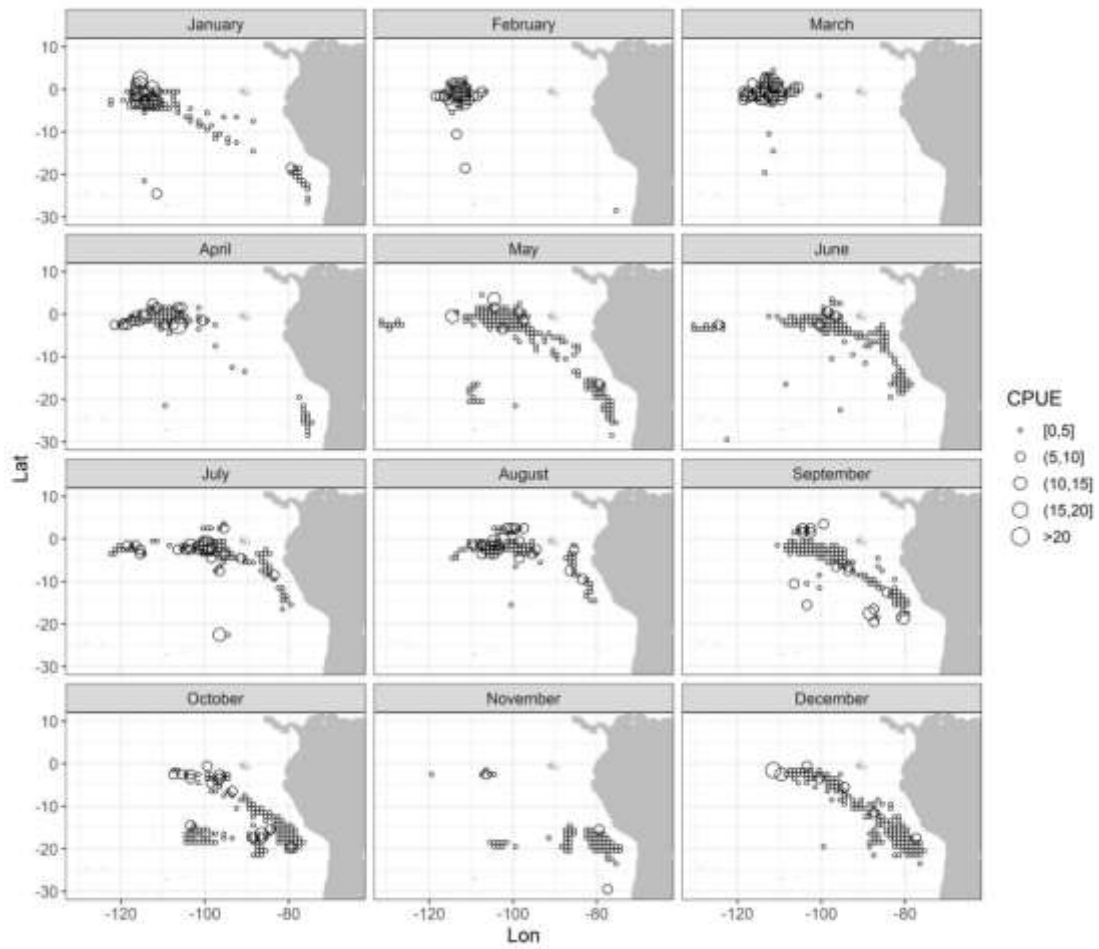
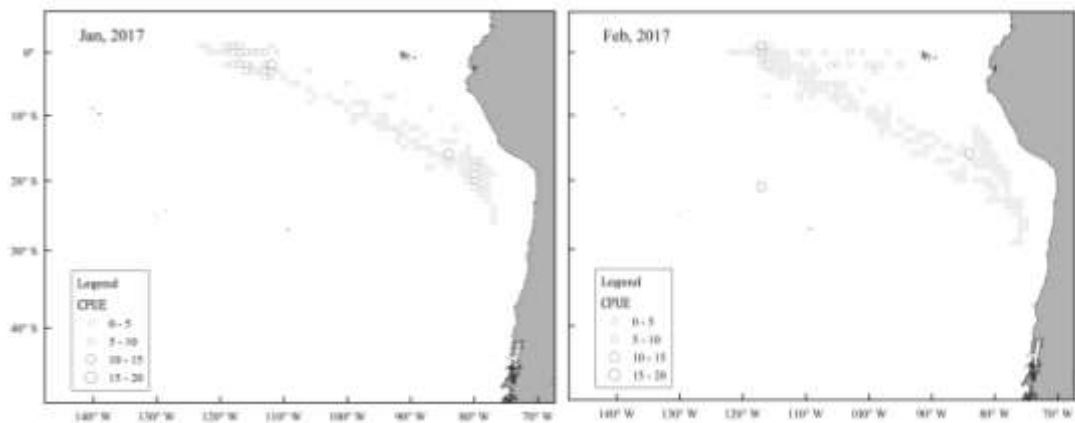
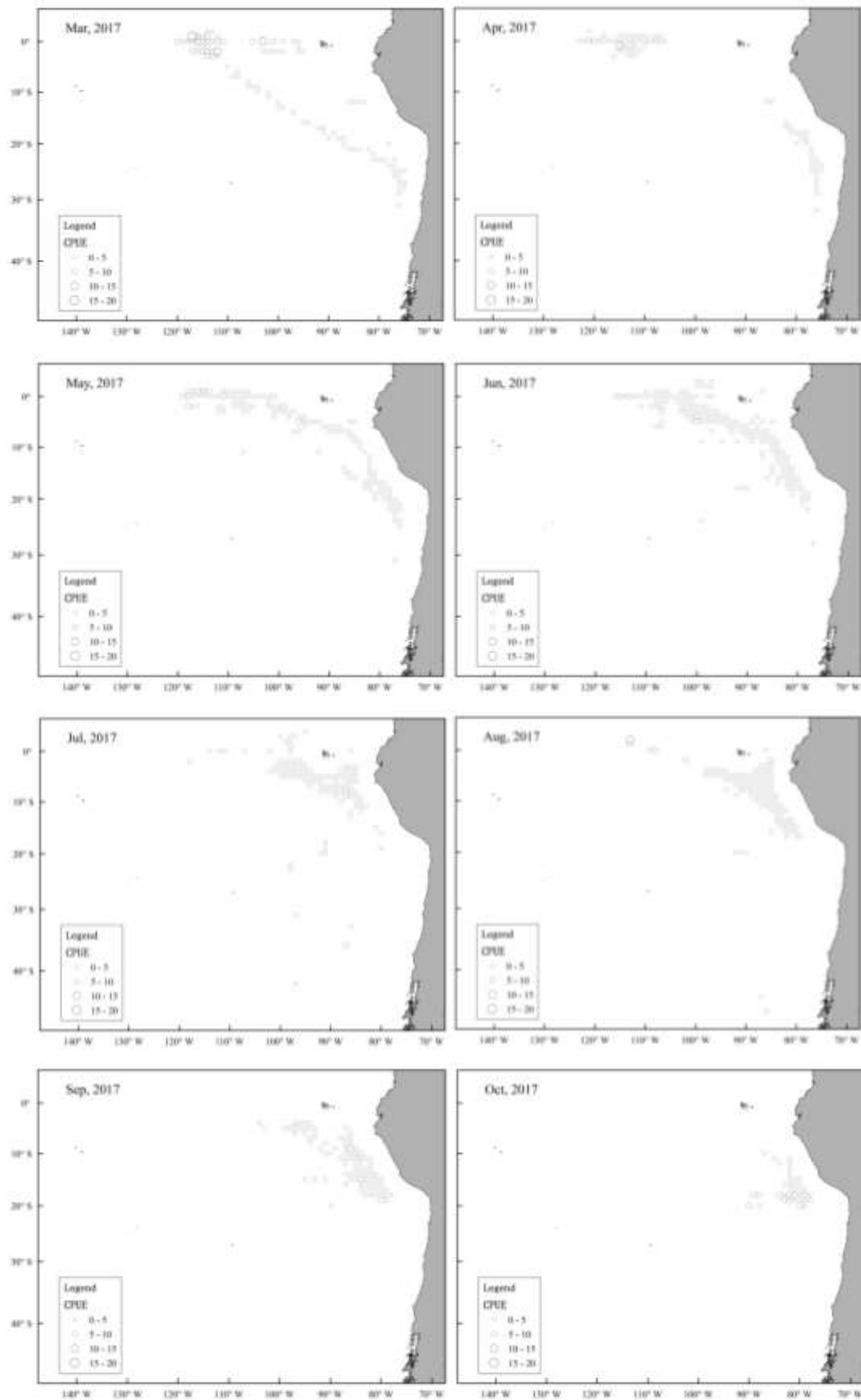


Figure 4 Monthly catch distribution of the Chinese squid jigging fishery in 2018dong





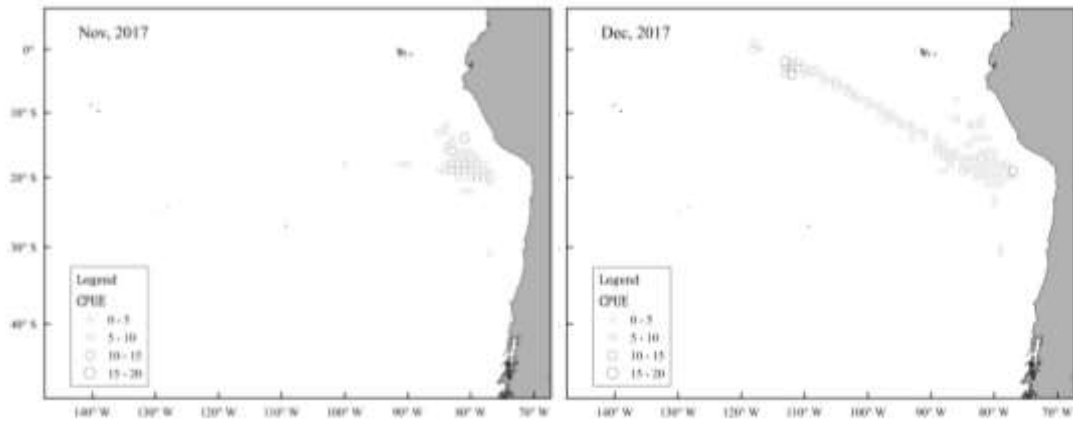


Figure 5 Monthly catch distribution of the Chinese squid jigging fishery during 2017

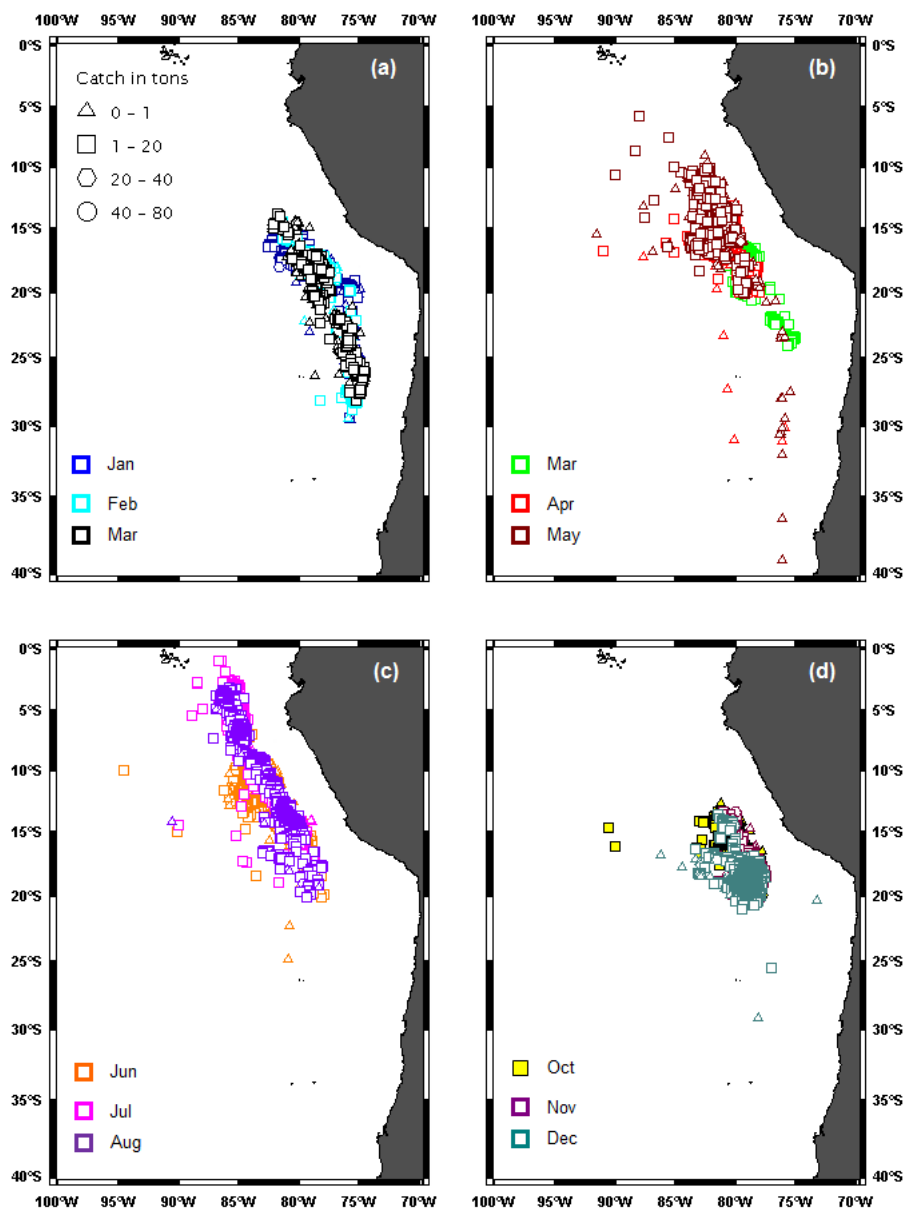


Figure 6 Monthly catch distribution of the Chinese squid jigging fishery during in 2016

3 Fisheries Data Collection

Two types of fishery data are collected for the squid jigging fishery, the catch data, and biological data. The logbook is designed and made by China Distant Water Fisheries Association (CDWFA). Some key information such as the fishing vessel (name, engine power, total light power, etc.) and fishing activities (start and end locations and time, catch and by-catch species of marine mammals, birds and turtles) are all listed in the logbook. Moreover, the fishing companies are requested to report the estimated catch and number of fishing vessels with their status (operating, being repaired, returning or shifting) every week. Since 2015, data collection work has been in charge of the National Data Center for Distant-water Fisheries of China (NDCDF).

71,961 records of daily fishing activity data have been collected by NDCDF in 2018, and 71,479 of them were derived from 371 Chinese squid jigging vessels that operated in the high seas of Southeast Pacific in 2018. The rate of logbook submission continued to increase and 85.2 percent of the fishing vessels submitted their 2018 logbook by June this year.

Biological data and samples were also collected in 2018 by the scientific observer and studying fleet. The observer is requested to record catch data and collect length, sex, maturity, and by-catch information, and monitor transshipment on the sea. The jumbo flying squid was sampled randomly for length measurement at each fishing day. Some specimens were weighed and determined sex and maturity. 20,811 squid were measured by the observer on the sea, and other 1,495 samples were frozen and transported to the laboratory of Shanghai Ocean University for biological examination and genetic research. The task of the studying vessel is to collect length data. Length data collected by the studying vessel covered the whole fishing season and all the two fishing grounds in 2018, and 4,470 squids were measured onboard.

4 Biological Sampling and Length Composition of Catches

In 2018, biological sampling for jumbo flying squid was carried out by the scientific

observer and studying vessel. Two observers worked onboard of “Ningtai 66” and “Ningtai 69” from May 2018 to May 2019, and more than 20,000 individuals of jumbo flying squid were measured for length onboard, among of them 13,040 squids were measured in 2018. Moreover, the observer also sampled 1,495 squids, which were delivered to the lab of SHOU for further measurement, including mantle length, weight, sex, maturity and so on. The hard structures of these samples including statolith, beak, gladius, and lenses of eyes were also extracted, and muscular tissue was applied to genetic study. The fishing vessel “Ningtai 61” was arranged as the studying vessel to collected length information, and a total of 4,300 squids were measured from 272 fishing days during February-December 2018. Another 11 large squids were sent to the lab for scientific examination.

Length frequency of 2018 combined with the observer and studying vessel length measurements was presented in Figure 6. Mantle length ranged from 12 cm to 98 cm, and the dominate size class was 20-30 cm, followed by 75-85 cm (Figure 7). The small squid derived from catch in the northern fishing area around the equatorial waters, the big squid were caught in the high seas off Peru. Compared with the historic length composition, it can be seen that the big-type squid occurred and dominate the catch in the southern fishing area. In the previous year, only a few giant squids were caught by the jigging vessels. The length frequency derived from the observer was similar to that from the studying vessel (Figure 10).

Gonad maturity stage measurements of the small group squid in 2018 are also compared with those of earlier years in Figure 8. The status of sexual maturity squid was very similar in 2015 and 2016, over 60 percent of female, their gonad maturity was at stage I and over half of the male squid were matured with maturity at stage III and IV. In the last two years, more than 90 percent of squid were immature. The ratio of female at maturity stage I was about 33.5 percent and rose to 57.5 percent when the gonad maturity was at stage II in 2018. The ration of maturity of the male squid was 6 percent in 2018, lower than previous years. For the big group that caught in the southern fishing ground, all these squids were matured and most of them were at stage IV, and about 30 percent of theses samples were at stage V, the post-spawning stage (Figure 9).

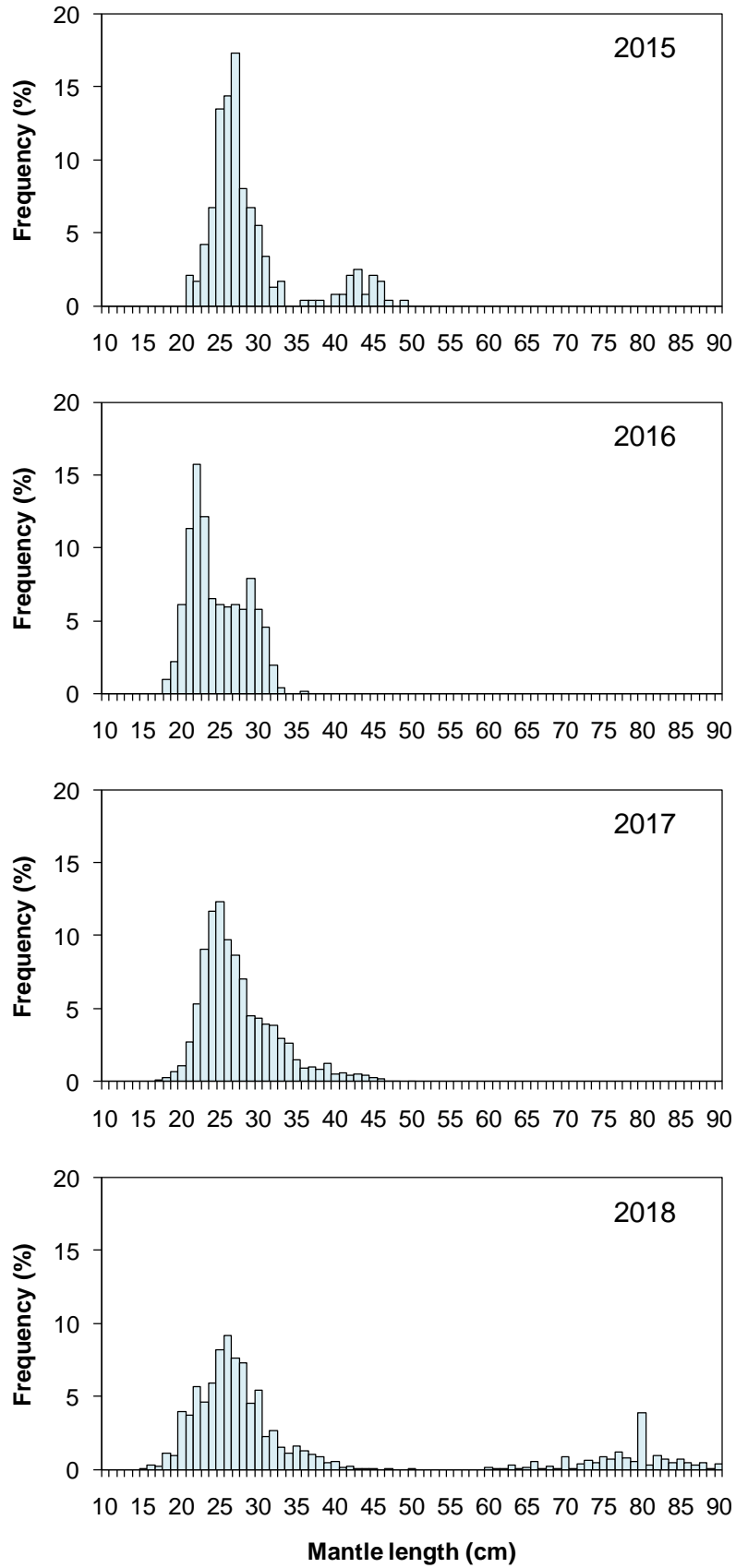


Figure 7 Size frequencies of the jumbo flying squid sampled in the high seas

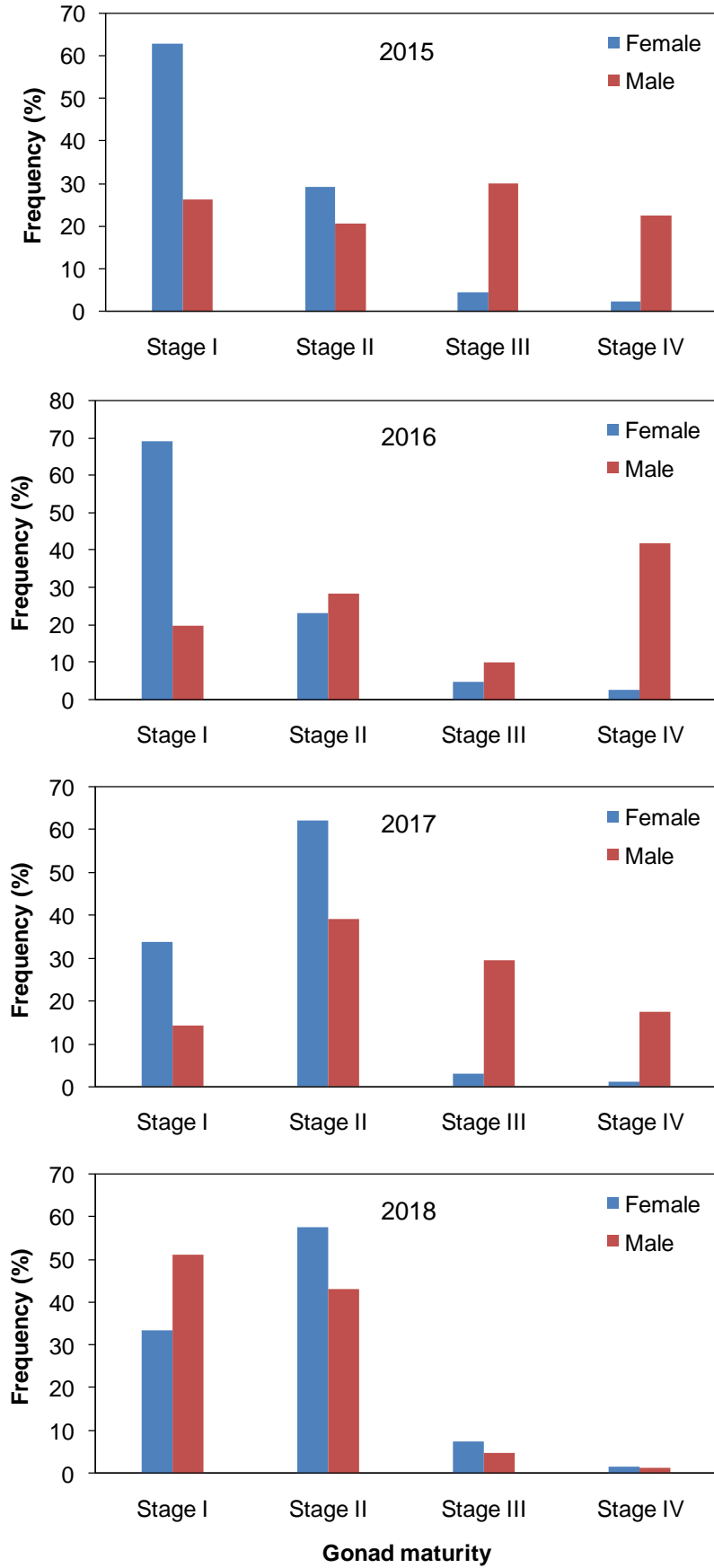


Figure 8 Sexual maturity stages of the small group jumbo flying squid

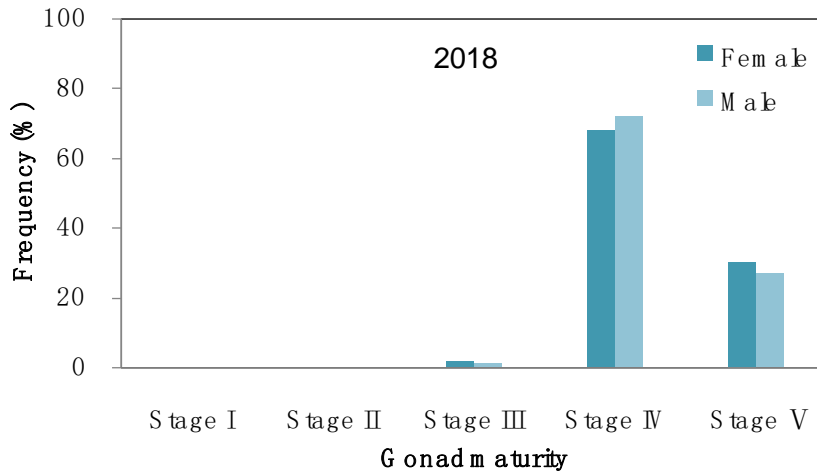


Figure 9 Sexual maturity stages of the big size jumbo flying squid

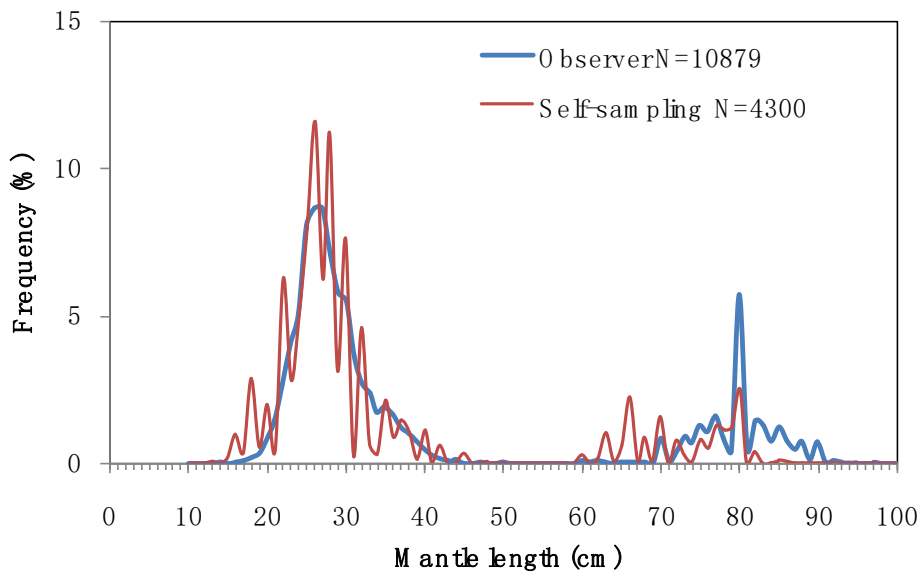


Figure 10 Mantle length distributions derived from the observer and studying vessel

5 Observer Implementation Report

China National Data Center for Distant-water Fisheries is in charge of China Distant-water Fishing Observer Program. The squid jigging fishery was incorporated into the program in 2018. The program is organized by Shanghai Ocean University's College of Marine Science structurally, which are responsible for observer mission onboard squid jigging vessels, studying vessel designation and biological data collection.

Trainers of China Distant-water Fishing Observer Program are from the highly qualified personal teaching at the College of Marine Science at Shanghai Ocean University. These trainers have been observers in the past and also have other qualifications of

expertise. Observers employed in this program are required at least a high school pass as a minimum to be eligible. Two observers were selected and received special training at Shanghai Ocean University for the squid fishery in SPRFMO waters in 2018. The training courses include skills on data collection, safety on the sea, management measures, sea birds identification and so on.

The observer program was designed to collect representative biological data, so the observed time and location shall cover the whole fishing season and fishing ground. For this purpose, the studying vessels were designated to collected length data, other than placing an observer onboard.

In 2018 two observers, one after another, worked on board of “Ningtai 66” and “Ningtai 69”. An observer embarked on “Ningtai 66” on May 14 as planned and but had to interrupt the observing mission at the end of May because of sudden illness. Thus, another observer was arranged to continue performing the observer program. The second observer boarded “Ningtai 66” at the Port of Chimbote on June 19 and reached the northern fishing area to work on June 21. The observer switched to “Ningtai 69” on 22 March 2019 and worked until 17 May 2019. All 322 fishing days were observed, 191 of which were observed in 2018 (Table 3). The observer also collected another 1,145 squids that were bagged with time and location information and delivered to Shanghai Ocean University finally. During the observer mission, 9 transshipments were recorded, the details are listed in Table 4 and 5.

Table 3 Details of the 2018 observer program for the Chinese squid fishery

Trip	Period	Observer/ Studying vessel	Observed vessel	Name	Observation Days
1	1 Feb-31 Dec 2018	Studying vessel		Ningtai 61	272
2	14 May-31 May 2018	Observer	Ningtai 66	Haoyi Xie	15
3	21 Jun 2018- 19 Mar 2019	Observer	Ningtai 66	Baolin Wang	191
4	22 Mar- 17 May 2019	Observer	Ningtai 69	Baolin Wang	131

Table 4 Transshipment operation observed by the observer

Date and time	Position	Species	Product type	No of cartons	Total of product	Observer
2018/7/9 09:30	-101.8 W -01.8 S	GIS	Frozen in 20 kg	5,000	100,000	Baolin Wang
2018/7/23 9:30	-104.4 W -04.8 S	GIS	Frozen in 20 kg	4,000	80,000	Baolin Wang
2018/8/15 9:00	-103.8 W -02.2 S	GIS	Frozen in 20 kg	5,000	100,000	Baolin Wang
2018/9/20 9:00	-102.3 W -01.9 S	GIS	Frozen in 20 kg	5,000	100,000	Baolin Wang
2018/10/16 3:20	-081.9 W -17.3 S	GIS	Frozen in 20 kg	4,000	80,000	Baolin Wang
2019/1/12 9:00	-100.4 W -03.3 S	GIS	Frozen in 20 kg	4,000	80,000	Baolin Wang
2019/2/2 2:00	-107.9 W -02.1 S	GIS	Frozen in 20 kg	3,000	60,000	Baolin Wang
2019/2/19 9:00	-101.3 W -01.7 S	GIS	Frozen in 20 kg	4,000	80,000	Baolin Wang
2019/5/8 9:00	-082.4 W -11.3 S	GIS	Frozen in 20 kg	3,000	60,000	Baolin Wang

The studying vessel, “Ningtai 61”, sampled 12 squids per day on average in 272 fishing days to measure the mantle length in its 2018 fishing season, and a total of 4,300 squids were measured from February 1 to December 31. Sampling area of the studying vessel, as well as the observer, both covered high seas off Ecuador and Peru, the main operating area of the Chinese squid fishery.

The observers collected length composition information from the catch, and some squid were randomly selected to identify sex and maturity; otherwise, the observer collected some extra samples. These samples were transported to the lab of SHOU to measure mantle length, weight, sex, maturity, stomach fullness and so on. The hard structures including statolith, beak, gladius, and lenses of eyes were also extracted for age reading and trace element and isotope testing, and besides, the muscular tissue was applied to genetic study.

Table 5 Information of the unloading fishing vessel and receiving vessel

Date	Fishing vessel	Flag	IMO	Master	Receiving vessel	Flag	IMO	Master
2018/7/9	Ningtai 66	China	41242 0955	Lu Zhou	Wei Shun	Liberia	83126 55	Jinguo Dong
2018/7/23	Ningtai 66	China	41242 0955	Lu Zhou	Wei Shun	Liberia	83126 55	Jinguo Dong
2018/8/15	Ningtai 66	China	41242 0955	Lu Zhou	Poseidon	Liberia	63600 8972	Shanzhong Zhang
2018/9/20	Ningtai 66	China	41242 0955	Lu Zhou	Wei Ning	Liberia	90642 29	Jiafeng Le
2018/10/16	Ningtai 66	China	41242 0955	Lu Zhou	Xin Hang	Panama	75641 87	Liangbo Tang
2019/1/12	Ningtai 66	China	41242 0955	Lu Zhou	Wei Ning	Liberia	90642 29	Jiafeng Le
2019/2/2	Ningtai 66	China	41242 0955	Lu Zhou	Poseidon	Liberia	63600 8972	Shanzhong
2019/2/19	Ningtai 66	China	41242 0955	Lu Zhou	He Shun	Liberia	63600 8972	Jinguo Dong
2019/5/8	Ningtai 69	China	41242 0931	Hejun Yin	Wei Shun	Liberia	83126 55	Hong Chen

References

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