

11th MEETING OF THE SCIENTIFIC COMMITTEE

11 to 16 September 2023, Panama City, Panama

SC11 – Doc29_rev1

Annual Report of the People’s Republic of China to SC11 – Squid

(rev1, 08 September 2023)

People’s Republic of China

Annual Report of China to the 2023 SPRFMO Scientific Committee, the Squid Jigging Fishery

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Summary

In 2022, a total of 462 Chinese squid jigging vessels operated in the Convention Area and caught 509,000 tons of jumbo flying squid. The number of active fishing vessels varied from 226 (April/May) to 417 (December). The number of fishing days reached to 95,390 days and the catch rate was 5.3 tons per fishing day. Five observers and six studying vessels conducted the observer program during the 2021-2022 and 2022-2023 fishing years. A total of 627 fishing days and 23 transshipment activities were observed in 2022, and over 100,000 squids collected by observers and studying vessels were measured.

1 Description of Chinese Squid Jigging Fishery

The Chinese distant-water squid jigging fleet has targeted jumbo flying squid (*Dosidicus gigas*) on the high seas of the South East Pacific since 2001 (Chen et al., 2008). Prior to 2017, Chinese squid jigging vessels primarily operated in the high seas off Peru. Subsequently, the equatorial waters of the East-central Pacific gradually emerged as another important fishing ground, leading to the establishment of the current pattern of back-and-forth movement between these two areas.

Twenty-two fishing vessels arrived in the international waters of the Southeast Pacific in 2001. The number of vessels increased to 119 in 2004 and then declined continuously in the following three years. During the period of 2006-2020, the number of active squid jigging vessels witnessed a consistent increase, reaching its peak at 557 in 2020. However, following that, there was a substantial decline, with the count dropping to 476 in 2021 and further decreasing to 462 in 2022 (Table 1).

Annual total catches of the Chinese squid fishery fluctuated widely in the first few years

in the Southeast Pacific but maintained at a higher level in the last 10 years. During 2018-2022, there has been a general increase in the annual catch, and this trend has been especially noticeable in the last three years. Interestingly, during this period of increasing catch, there has been a simultaneous decline in the number of active fishing vessels (Table 1).

Table 1 Number of vessels and annual catch of the Chinese squid jigging fisheries in the Southeast Pacific during 2018-2022

Year	Number of vessels	Catch in tons
2018	435	346,200
2019	503	305,700
2020	557	358,000
2021	476	422,000
2022	462	509,000

2 Catch, Effort and CPUE Summaries

The catch in 2022 was a record 509,000 tons, a 21 percent increase from 2021. This increase was due to an increase in the number of fishing days, which reflects an increase or stabilization of the fish availability. Although the number of fishing days increased significantly, CPUE still maintained high level in 2022 (Table 2).

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)
2018	346,200	85,862	4.0
2019	305,700	111,343	2.8
2020	358,000	119,306	3.0
2021	422,000	78,120	5.4
2022	509,000	95,390	5.3

Monthly catch presented in Figures 1. The catch was relative higher in January and declined gradually till to June. After that, the catch showed some increase in July and August, but decreased the lowest level, about 18 thousand tons in September. Catch in October increased sharply and continue to grow in November and December.

A total of 462 squid jigging vessels operated in the Convention area in 2022. The number of active fishing vessels varied between 226 to 417 from January to December and the maximum number occurred in December with the minimum occurring in April and May (Fig. 2). From the second quarter to fourth quarter of 2022, the number of active fishing vessels decreased significantly compared with the same period in 2020 and 2021.

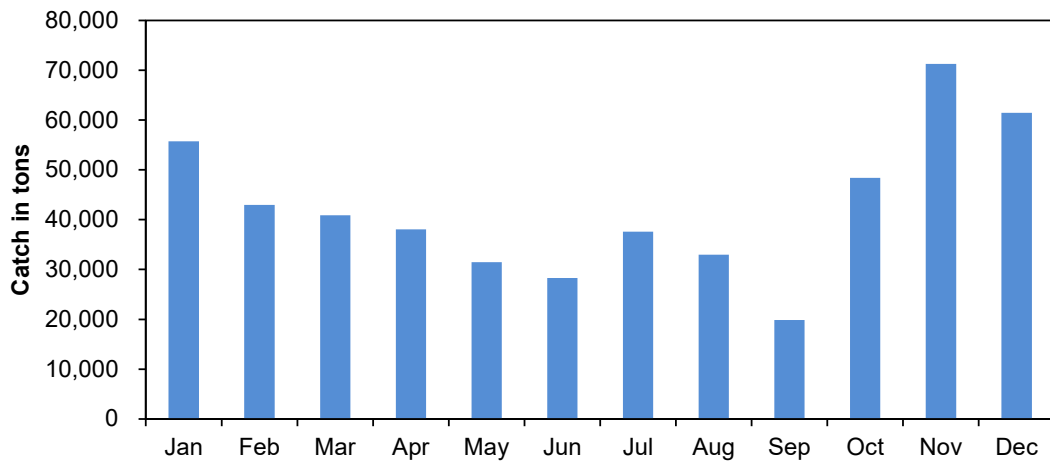


Figure 1 Monthly distribution of catch in 2022

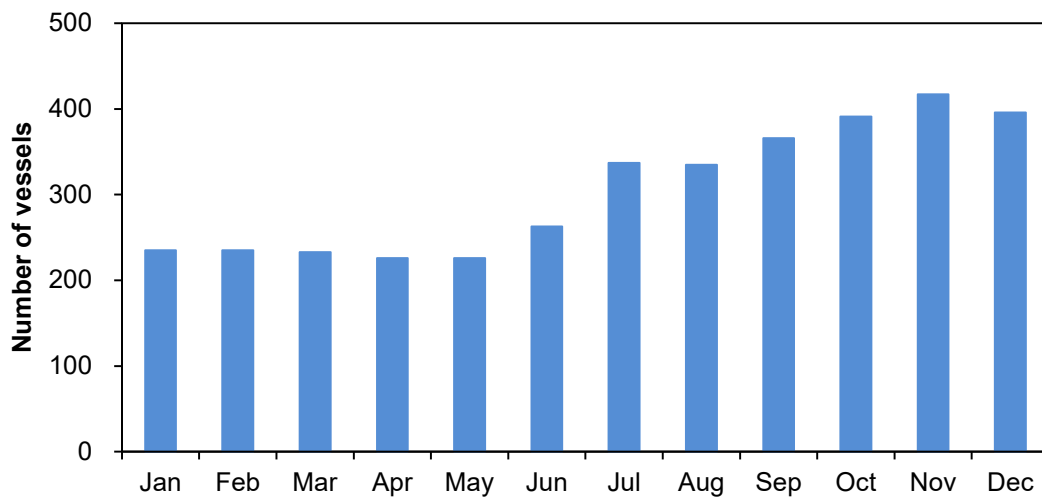


Figure 2 Monthly distribution of the number of active fishing vessels in 2022

Monthly distribution of CPUE presented in Figure 3. With the exception of July and August 2021, the trend in CPUE is consistent with the trend in catch. The highest CPUE occurred in January, then declined until a low in September, followed by a strong increase, and by December CPUE had essentially reached to its January level.

The special distribution for the monthly CPUE distributions in recent years are presented in Figures 4-8. The monthly geographical distribution shows that the fishing vessels make seasonal movements between the high seas off Peru and in the equatorial waters, which are the main fishing grounds for the squid jigging fishery. From January to April 2022, the squid fishing vessels operated mainly on the equator and in the high seas off northern Peru, with a small number of operations starting in May in the high seas off southern Peru, which then also became the main fishing ground. In October and November, the vessels fished in the north and south, respectively. In December, some fishing vessels returned to the equator from the high seas off southern Peru.

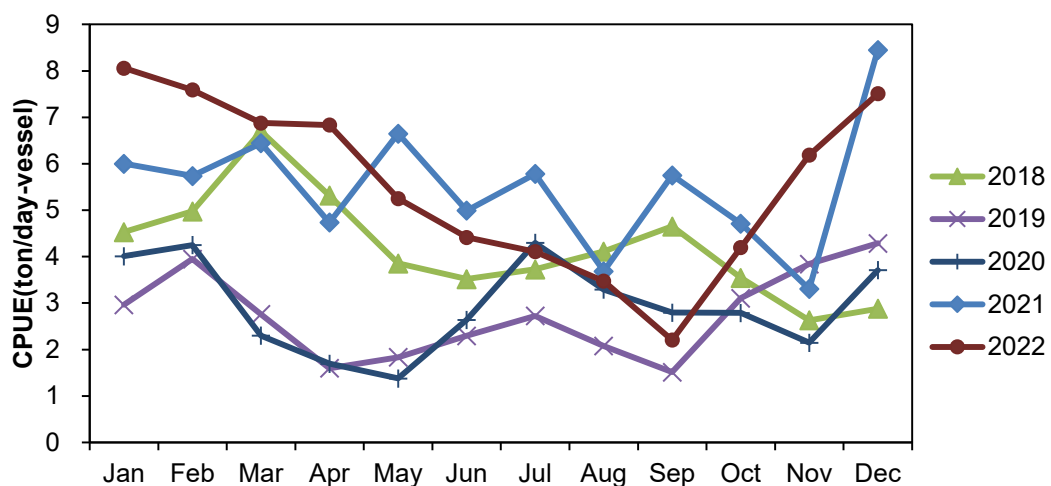


Figure 3 Monthly CPUE during 2018-2022

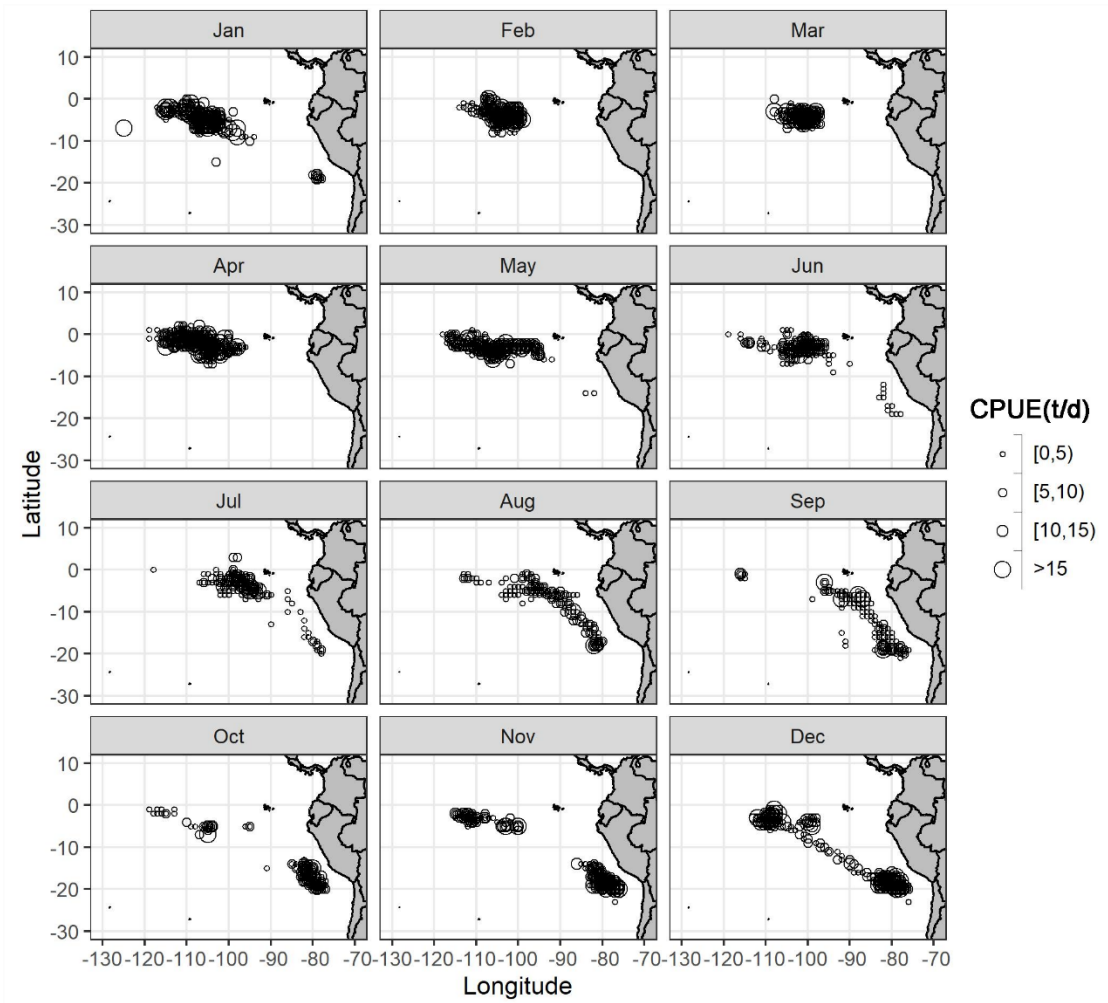


Figure 4 Monthly catch rate distribution of the Chinese squid jigging fishery in 2022

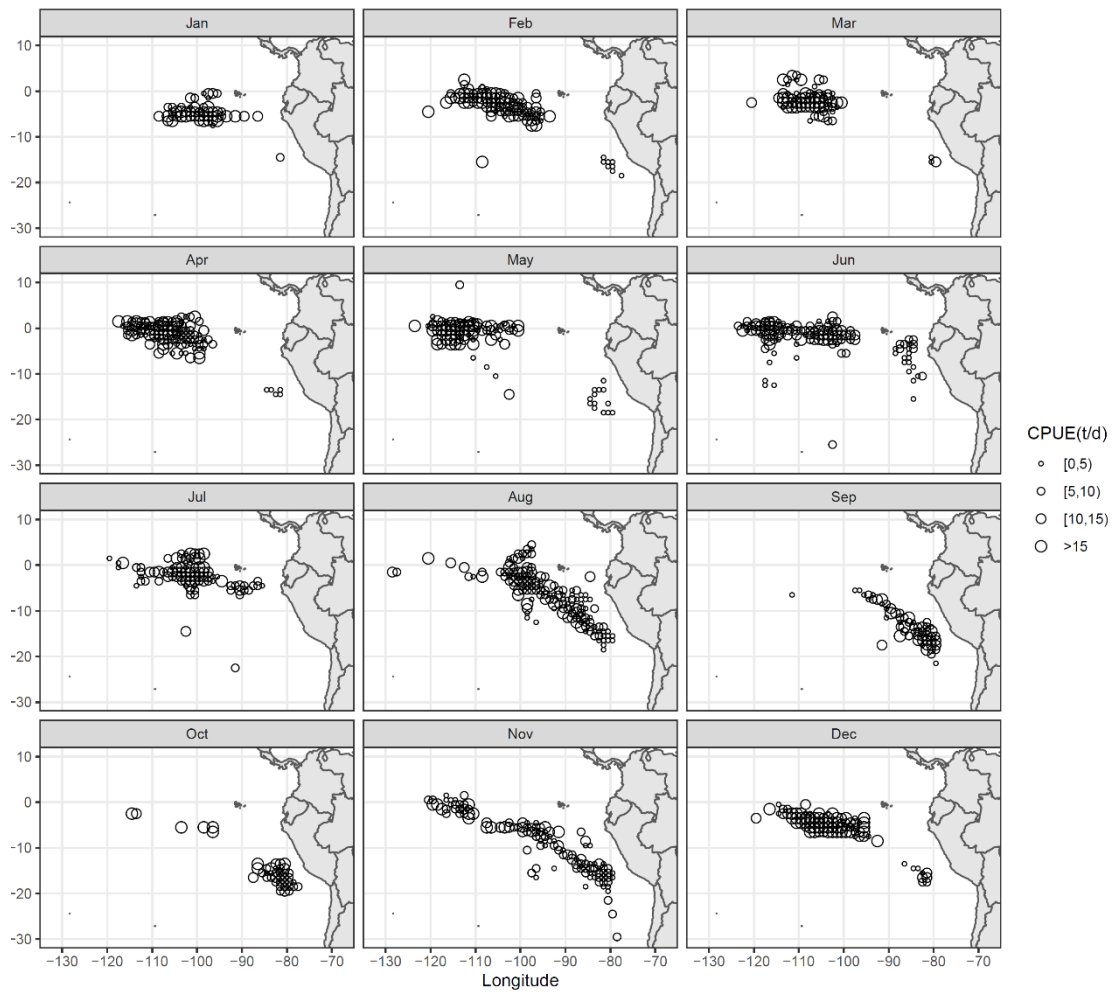


Figure 5 Monthly catch rate distribution of the Chinese squid jigging fishery in 2021

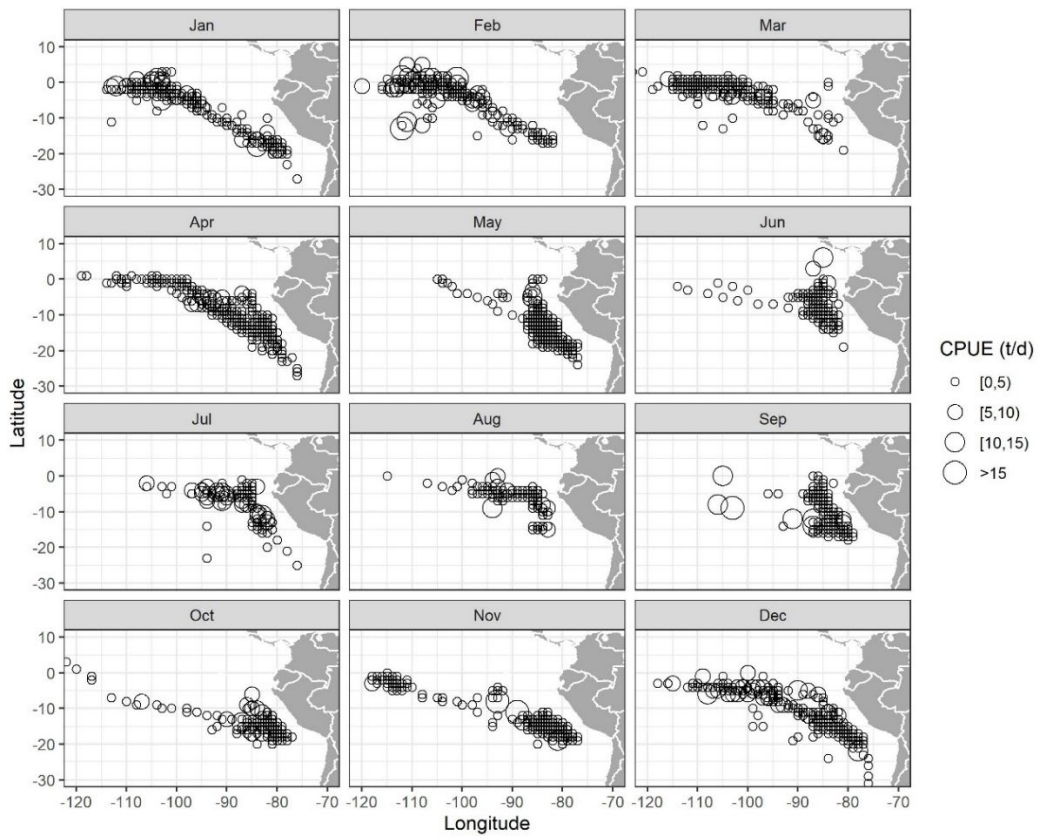


Figure 6 Monthly catch rate distribution of the Chinese squid jigging fishery in 2020

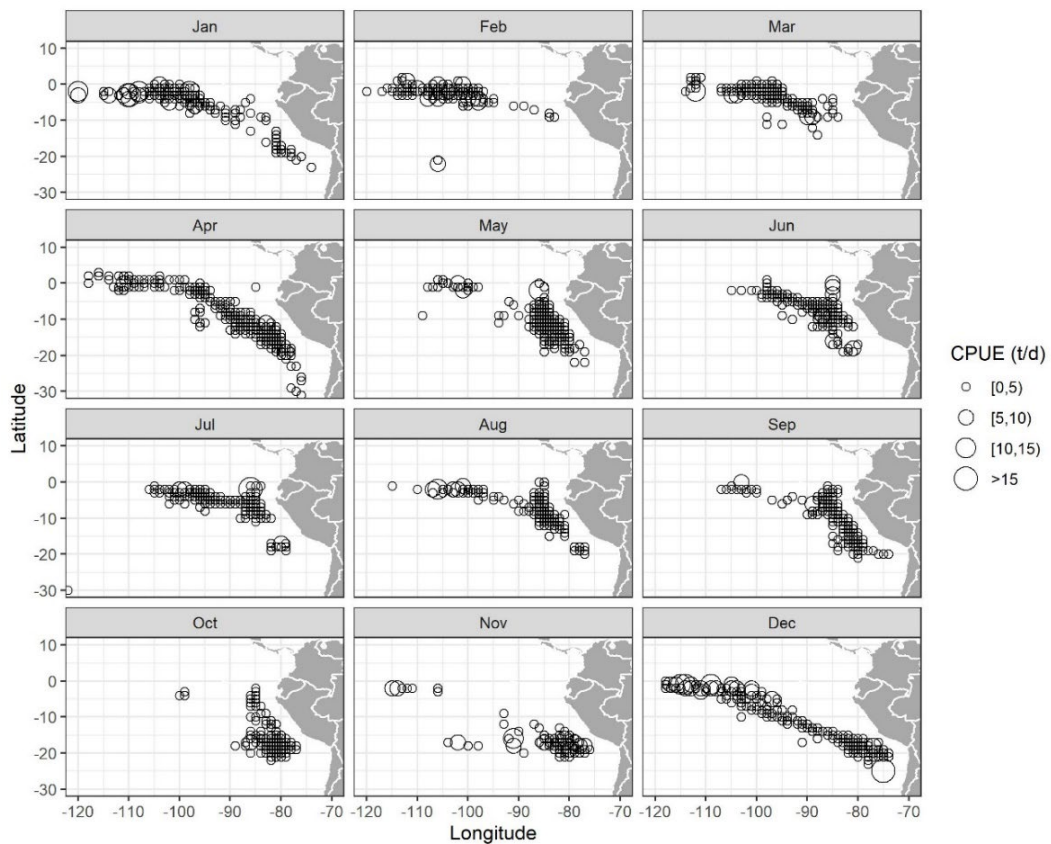


Figure 7 Monthly catch rate distribution of the Chinese squid jigging fishery in 2019

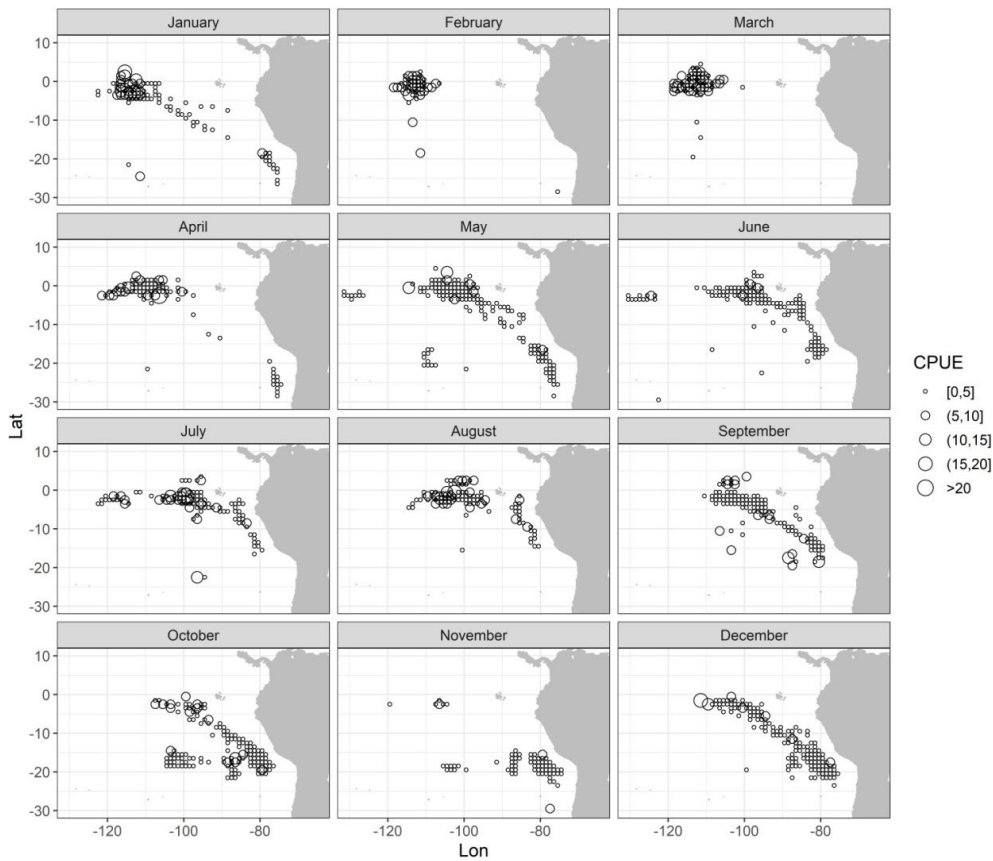


Figure 8 Monthly catch rate distribution of the Chinese squid jigging fishery in 2018

3 Fisheries Data Collection and Research Activities

Two types of fishery data were collected for the squid jigging fishery, the catch data, and biological data. The logbook was designed and made by China Distant Water Fisheries Association. 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, fishing vessels 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 the charge of the National Data Centre for Distant-water Fisheries of China (DCFC). The e-logbook system developed by DCFC has been tested and applied to the squid jiggers gradually in the last two years to improve the quality and efficiency of data collection.

A total of 95,390 daily fishing activity data from all the 462 fishing vessels in 2022 were

collected, checked, and then submitted to the Secretariat this year. Biological data and samples were also collected in 2022 by the scientific observer and studying fleet. Observers are requested to record catch data and collect length, sex, maturity, and by-catch information, and monitor transshipment on the sea. The caught jumbo flying squid were sampled randomly for length measurement each time, in which some individuals were weighed and determined sex and maturity. The studying fleet is requested to measure 30 individuals randomly per day on board and to take random samples (15-20kg) weekly and sent to DCFC for biological measurement.

Five observers worked onboard as well as 7 squid jigging vessels served as the studying fleet to collect biological information in the year of 2022. Huge number of squid were sampled and measured, however there are still a lot of samples waiting to be transformed to the lab for further analysis.

4 Biological Sampling and Length Composition of Catches

A total of 71,509 individuals of jumbo flying squid were measured for length onboard by the observers, and 37% of them were also measured weight and determined sex, maturity stage and stomach fullness. Furthermore, observers took another 1,676 samples for laboratory measurements. The studying vessel are request to measure 30 individuals per fishing day and take random samples (15-20kg) weekly. Studying vessels measured the mantle length of 35,572 squid onboard in total in 2022 and another 833 samples have been measured in the lab.

The length frequency is based on jumbo flying squid sampled or measured in 2022 by observers and studying vessels are presented in Figure 9. Mantle length ranged from 11 cm to 111 cm. There are two length composition modes can be distinguished obviously, 24-29 cm and 76-86 cm. In general, the small phenotype squid is caught in the northern fishing area around the equatorial waters, and the large one is caught in the high seas off Peru; however, some small and immature squid were also appeared in the catch in the south fishing ground.

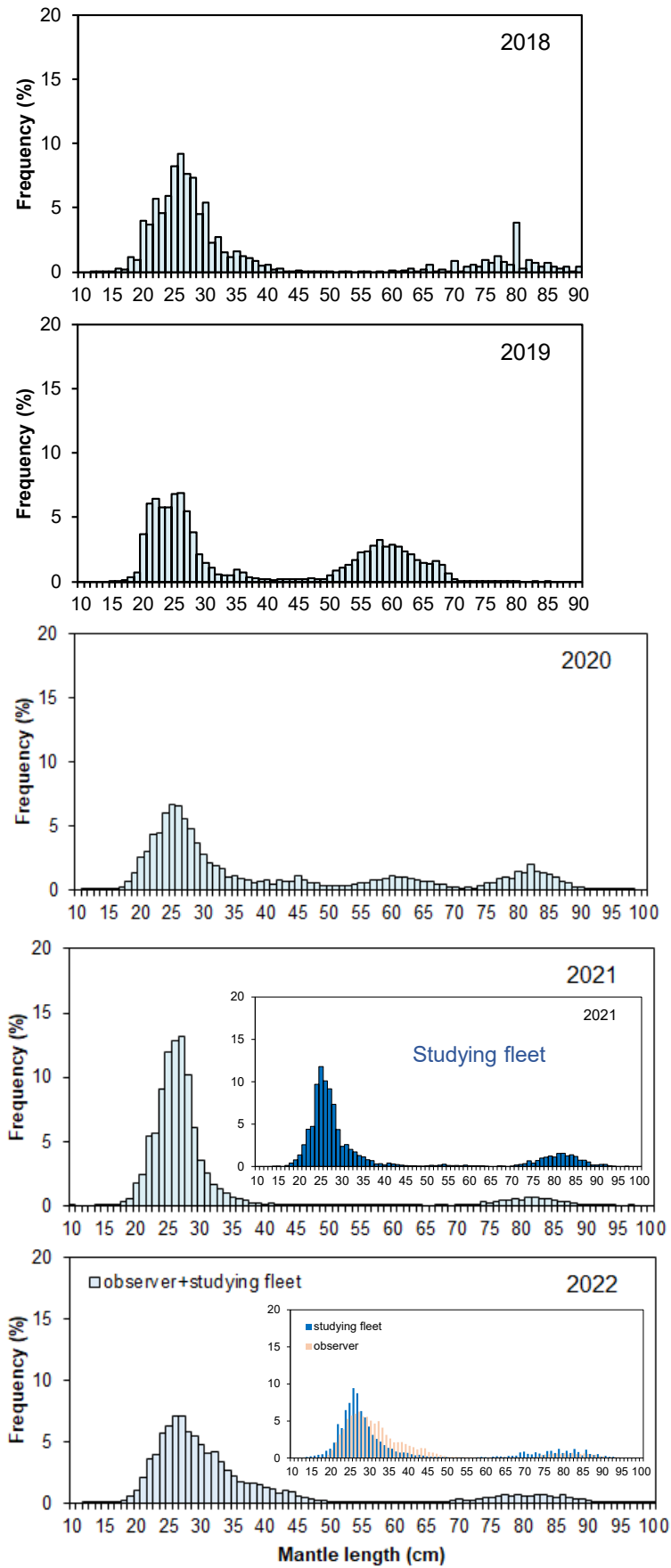


Figure 9 Size frequencies of the jumbo flying squid sampled on the high seas

Sex and maturity information are present in Figure 10 and 11. In the equatorial waters and adjacent area, catches consist mainly of small phenotype with some individuals of medium-sized phenotype. In the equator and adjacent waters, 97 percent of females and 76 percent of males are immature (maturity at the stage 1 and stage 2), and males were more mature than females. However, the average mantle length of males was smaller than that of females. In the high seas of south-central Peru, the proportions of immature females and males were 45% and 10%, respectively, essentially less than 50 cm in length. For the maturing and matured squid, catches consisted of small or (and) medium and large individuals, with 42% of small or (and) medium-sized individuals in the male sample and 27% of small or (and) medium-sized individuals in the female sample. As a result, the average mantle length of mature squid did not exceed 70 centimeters in stage 3, 4 and 5. This finding suggests that the three phenotype groups are mixed in the high seas off south-central Peru.

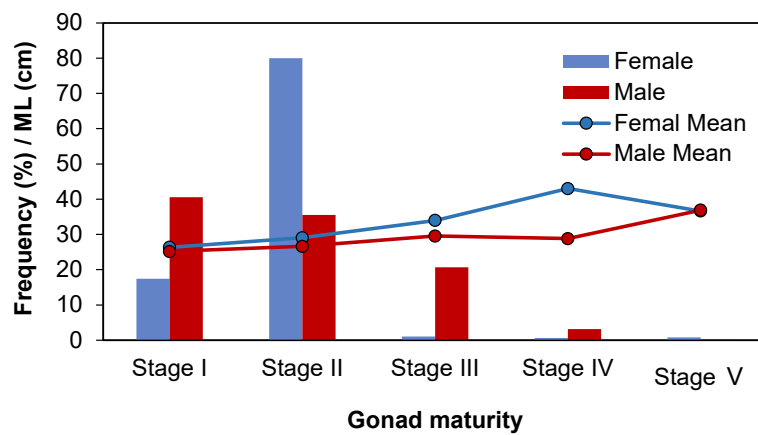


Figure 10 Sexual maturity stages and the mean mantle length for squid that collected around the equatorial waters in 2022 (Jan-Sep, Dec)

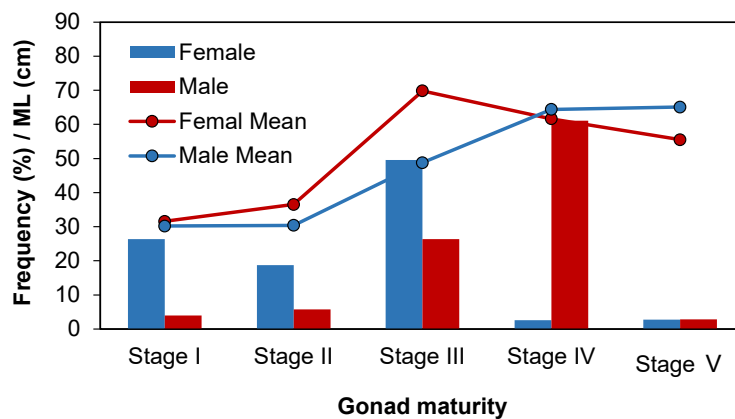


Figure 11 Sexual maturity stages and the mean mantle length for squid that collected around in the high seas off south-central-Peru in 2022 (Sep-Dec)

5 Observer Implementation Report

The observer program was designed to collect representative biological data for jumbo flying squid as well as monitor the fishery. Five observers as well as six studying fleet were designated to perform the observer program in 2022. One observer departed from Zhoushan port in October 2021 and returned to the port in October 2022. The four observers embarked in late July to early August 2022 and returned to Zhoushan harbor in two batches in May and July 2023, respectively. During this period, the five observers spent an average of 10 months at sea, of which a total of 627 active fishing days and 23 transshipment activities were monitored in 2022. More than 100,000 squids were measured by observers and the studying fleet, and there are still thousands of samples waiting to be shipped back to the lab for analysis.

References

Chen X. J., Liu B. L., Chen Y. A review of the development of Chinese distant-water squid jigging fisheries. *Fisheries research*, 2008, 89:211-221.