SPRFMO
South Pacific Regional Fisheries Management Organisation

9th MEETING OF THE SCIENTIFIC COMMITTEE

Held virtually, 27 September to 2 October 2021

SC9-Doc21

Chinese Taipei Annual Report

Chinese Taipei

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Annual Report of Chinese Taipei to the 9th SPRFMO Scientific Committee on the Squid Jigging Fishery in the Southeast Pacific Ocean in 2020

Summary

Jumbo flying squid widely distributes in the eastern Pacific Ocean and has been targeted by Chinese Taipei's squid-jigging fleet since 2002. The number of operating fishing vessels varied from 5 to 29 between 2002 and 2020. 5 vessels involved in the fishery in 2020, producing 2,087 tons of jumbo flying squid. The nominal CPUE was 2.55 t/vessel/day, which was less than that of 2019. The major fishing grounds were located around 13°–20° S, 77°–85° W, while some vessels operated in the equatorial waters (around 0°–3° S, 103°–113° W). Data of logbook, transshipment and landing have been collected entirely and submitted to the Secretariat of SPRFMO. The researches on the stock status and spatial dynamics of jumbo flying squid have been conducted. Using catches by weight category, the monthly length composition of jumbo flying squid was also calculated. The observer program for squid-jigging fishery was initiated in 2018, and one observer was onboard one vessel in June 2021.

1. Description of the Fishery

Jumbo flying squid (*Dosidicus gigas*, also known as Humboldt squid) is a large pelagic squid inhabiting in the eastern Pacific Ocean, distributing across about latitudinal 50 degrees for both north and south hemispheres. Since 2002, this species has been targeted by Chinese Taipei's distant-water squid-jigging fleet in the Southeast Pacific Ocean. During 2002 and 2020, the number of operating vessels varied from 5 to 29 (Figure 1), and 5 vessels participated in the fishery in 2020.

The monthly number of vessels fluctuated inter-annually over the recent five years (during 2016–2020; Figure 2). The monthly operation days in 2020 ranged from 30 to 124 days (Figure 3). The operation days decreased from January to August, while resumed in September and reached the highest in October. In 2020, the main fishing seasons were from January to March and from October to December.

2. Catch, Effort and CPUE Summaries

Annual catch and effort information of Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean is shown in Table 1. The catch was 2,087 tons in 2020, similar to the one in 2019, which was 2,085 tons. The fishing effort (per vessel per day, v-d) was 817 v-d in 2020, higher than that of 2019 (611 v-d). The nominal CPUE was 2.55 t/v/d in 2020, less than that of 2019 (3.41 t/v/d; Figure 4).

The spatial distribution of annual average CPUE (t/v/d) in the Southeast Pacific Ocean from 2016 to 2020 is shown in Figure 5. The major fishing grounds were in the area of 8°–22° S, 75°–90° W, and in the equatorial area of 1° N–8° S, 84°–110° W (Figure 5). Between 2007 and 2010, a number of fishing vessels operated within the EEZ of Peru with the permission of fishing licenses issued by the Peruvian competent authorities.

Since 2011, Chinese Taipei's squid-jigging fleet has only operated in high seas of the Southeast Pacific.

The spatial distributions of catch composition (in commercial weight category) of the squid in 2020 is shown in Figure 6. The catch is mainly comprised of large-sized individuals (non-categorized, usually >3 kg) caught in the waters off southern Peru (outside EEZ). As for the catches in the equatorial waters, small-sized individuals (<1 kg) dominated in the area east to 103° W, while large-sized individuals were the major in the area west to 103° W (Figure 6).

3. Fisheries Data Collection and Research Activities

3.1. Data collection

The captain of Chinese Taipei's squid-jigging fleet shall report the fisheries data via electronic logbook system (e-logbook) on a daily basis.

As for landing and transshipment management, it is required that the operator or the captain of any fishing vessel intending to land or transship should fill in the Landing/Transshipment Notice and submit it to the competent authority for approval. After the completion of landing or transshipment, the operator or the captain are also obligated to submit the Landing/Transshipment Declaration to the competent authority. The competent authority will verify the catches with e-logbook data and other relevant data to ensure that those catches are legal and traceable.

In accordance with its domestic regulations and SPRFMO CMM 02-2021, Chinese Taipei has been collected data of transshipment and landing for jumbo flying squid fishery in the Southeast Pacific Ocean and submitted to the Secretariat of SPRFMO since 2013.

3.2. Research activities

The researches on the stock status and spatial dynamics of jumbo flying squid have been conducted by the scientists of Chinese Taipei, and in recent years, research programs have been carried out on spatial distribution patterns, stock status and population structure of the species. Research shows that the distribution of the squid abundance is high in the coastal waters off northern Peru.

In recent years, large-sized group has dominated the size composition of the squid harvested by Chinese Taipei in October–December. The results suggested that the variation of squid abundance could be explained by the temporal and spatial variables to a degree. It might be resulted from a long-distant migration pattern, which experienced different oceanographic environments during their life cycles, and considerable plasticity in life-history traits for the squid populations. However, a decreasing trend of the squid abundance index since 2005 is noted.

4. Biological Sampling and Length/Age Composition of Catches

4.1. Biological sampling

The samples of jumbo flying squid have been collected in the October–December 2020 (Table 2). A total of 25 squids (11 females and 14 males) were examined. Mantle length (ML) of squid for females and males ranged from 414 to 893 mm and from 485 to 817 mm respectively (Figure 7). Body weight (BW) of squid for females and males ranged from 2,553 to 31,100 g and from 3,158 to 18,900 g respectively.

Average ML of squid for females and males was 732 mm and 645 mm respectively in October, decreased to 551 mm and 501 mm respectively in November, and stayed at 543 mm and 591 mm respectively in December (Figure 8). Average BW of squid for

females and males was 18,900 gram and 10,300 gram respectively in October, decreased to 6,400 gram and 4,560 gram respectively in November, and stayed at 5,200 gram and 7,200 gram respectively in December (Figure 8).

All squids were at their full mature stage (Figure 9). The statolith and a piece of muscle tissue for each squid were preserved for further analysis.

4.2. Length/Age composition of catches

The catch data is categorized by size composition (commercial weight category) into A, <1 kg; B, 1-2 kg; C, 2-3 kg; and D, >3 kg (or miscellaneous).

The category D typically comprises extra-large size individuals (>3 kg), although various size categories of the squid may be included. The data of category D was prepared and stored in a condition of processed products, composing of head, fin and mantle of the squid. The original body weight of category D was calculated by an empirical equation of fraction between head, mantle weight and body weight of the squid.

The annual catch composition of jumbo flying squid during 2016–2020, which was dominated by the large-sized group, is shown in Table 3.

The monthly catch composition in 2020 is shown in Table 4, noting that the large-sized group of the squid mainly appeared in January–February and September–December.

5. Ecosystem Approach considerations

There was no bycatch record in 2020. This may be a result of the employment of the highly selective fishing gear (jigging) by the squid-jigging fleet, typically targeting the squid only.

6. Observer Implementation Reports

The observer programme of Chinese Taipei's squid-jigging fishery is adjusted from the observer programme for the tuna fishery audited by the Western and Central Pacific Fisheries Commission (WCPFC). The National Observer Training Program was expanded in March 2019 to incorporate the training for squid-jigging fisheries, including understanding of domestic regulations and conservation and management measures of regional fisheries management organizations, fishing gears and methods, squid species identification, biological sampling and measurement, bycatch issues and etc. The observer who finishes the training will be eligible to perform duties on squid-jigging vessels as well as longline vessels.

In accordance with the observer coverage requirement specified in SPRFMO CMM 18-2020, Chinese Taipei has deployed one observer on fishing vessel AN SHENG (8874029) in June 2021. The observer will collect scientific data and monitor fishing and transhipment activities under the guidance of SPRFMO CMM 02-2021 and CMM 12-2020.

Table 1. Annual catch and effort information of *Dosidicus gigas* for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean during 2007–2020.

Year	No. of vessels	Fishing effort (vessel-day)	Catch (tons)
2007	13	1,393	14,750
2008	13	2,744	31,161
2009	13	1,403	12,319
2010	20	2,874	29,206
2011	21	3,597	35,418
2012	14	2,211	14,177
2013	9	1,045	7,759
2014	5	474	4,795
2015	9	616	10,072
2016	11	1,880	12,989
2017	13	1,228	7,338
2018	14	1,396	3,848
2019	10	611	2,085
2020	5	817	2,087

Table 2. Summary information of *Dosidicus gigas* samples in the Southeast Pacific in 2020 fishing season.

Month	Latitude (South)	Longitude (West)	Female	Male	Total
Oct-20	14.82 ~ 19.48	80.83 ~ 83.85	2	6	8
Nov-20	15.88 ~ 17.20	81.13 ~ 81.92	3	1	4
Dec-20	16.83 ~ 18.57	79.35 ~ 83.15	6	7	13

Table 3. Annual catch composition (in live weight, tons) of *Dosidicus gigas* for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean during 2016–2020.
(Category: A, <1 kg; B, 1-2 kg; C, 2-3 kg; D, >3 kg or miscellaneous)

Year	A	B	C	D	Total
2016	210	62	23	12694	12989
2017	123	12	6	7197	7338
2018	671	25	49	3104	3848
2019	70	12	237	1767	2085
2020	316	125	67	1579	2087

Table 4. Monthly catch composition (in live weight, tons) of *Dosidicus gigas* for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean in 2020. (Category: A, <1 kg; B, 1-2 kg; C, 2-3 kg; D, >3 kg or miscellaneous)

Month	A	B	C	D	Total
Jan.	2	1	28	289	320
Feb.	49	39	1	127	216
Mar.	21	30	0	33	83
Apr.	14	3	0	9	26
May	18	4	0	8	30
Jun.	35	13	0	5	53
Jul.	62	16	0	26	105
Aug.	28	10	0	34	72
Sep.	4	1	1	117	123
Oct.	1	1	4	339	344
Nov.	50	5	11	282	348
Dec.	33	3	22	309	367

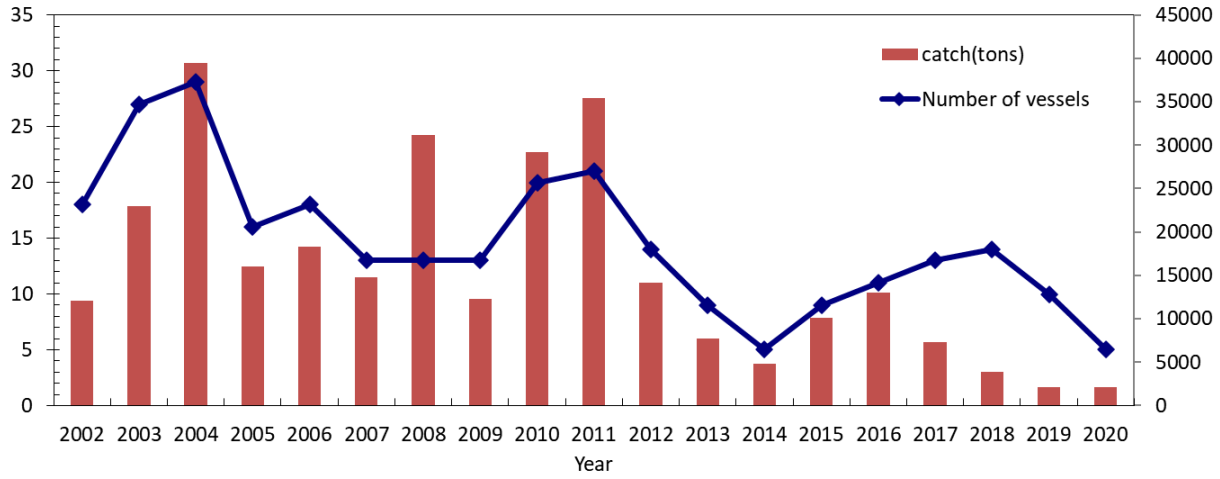

Figure 1. Annual variations in catch and number of vessels for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean during 2002–2020.

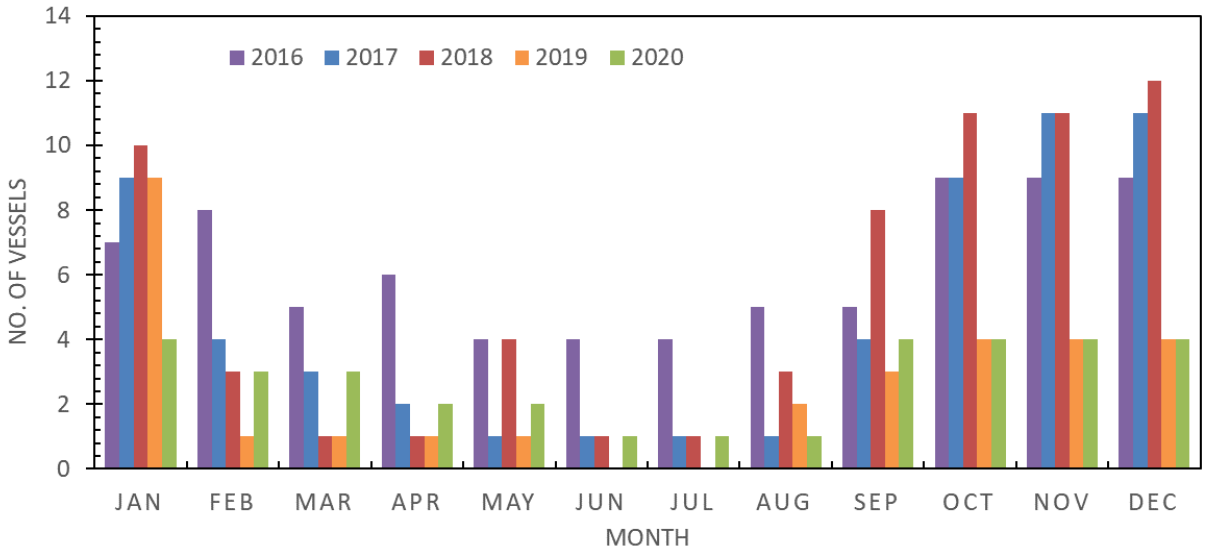

Figure 2. Monthly variations in number of vessels for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean for recent five years (during 2016–2020).

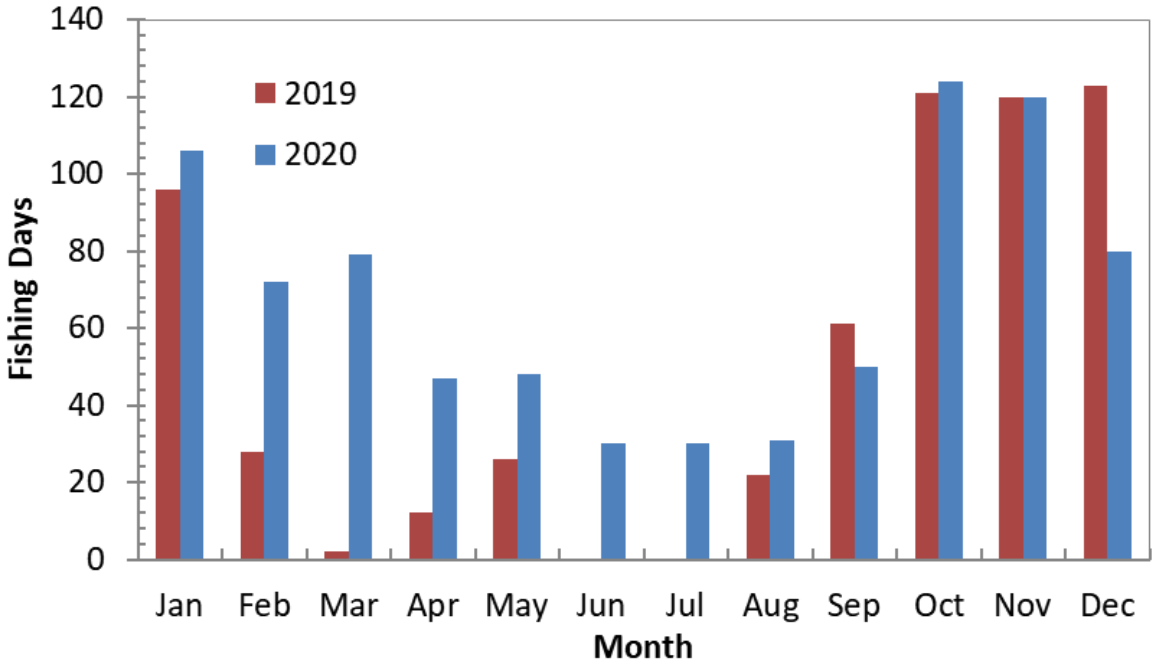

Figure 3. Monthly fishing days deployed by Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean in 2019 and 2020.

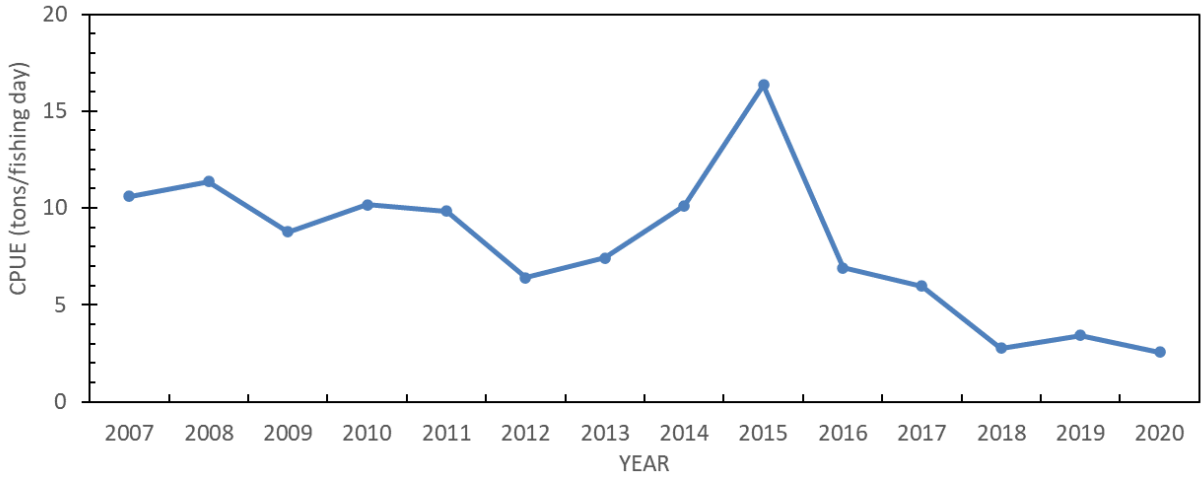

Figure 4. Annual nominal CPUE of *Dosidicus gigas* of Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean during 2007–2020.

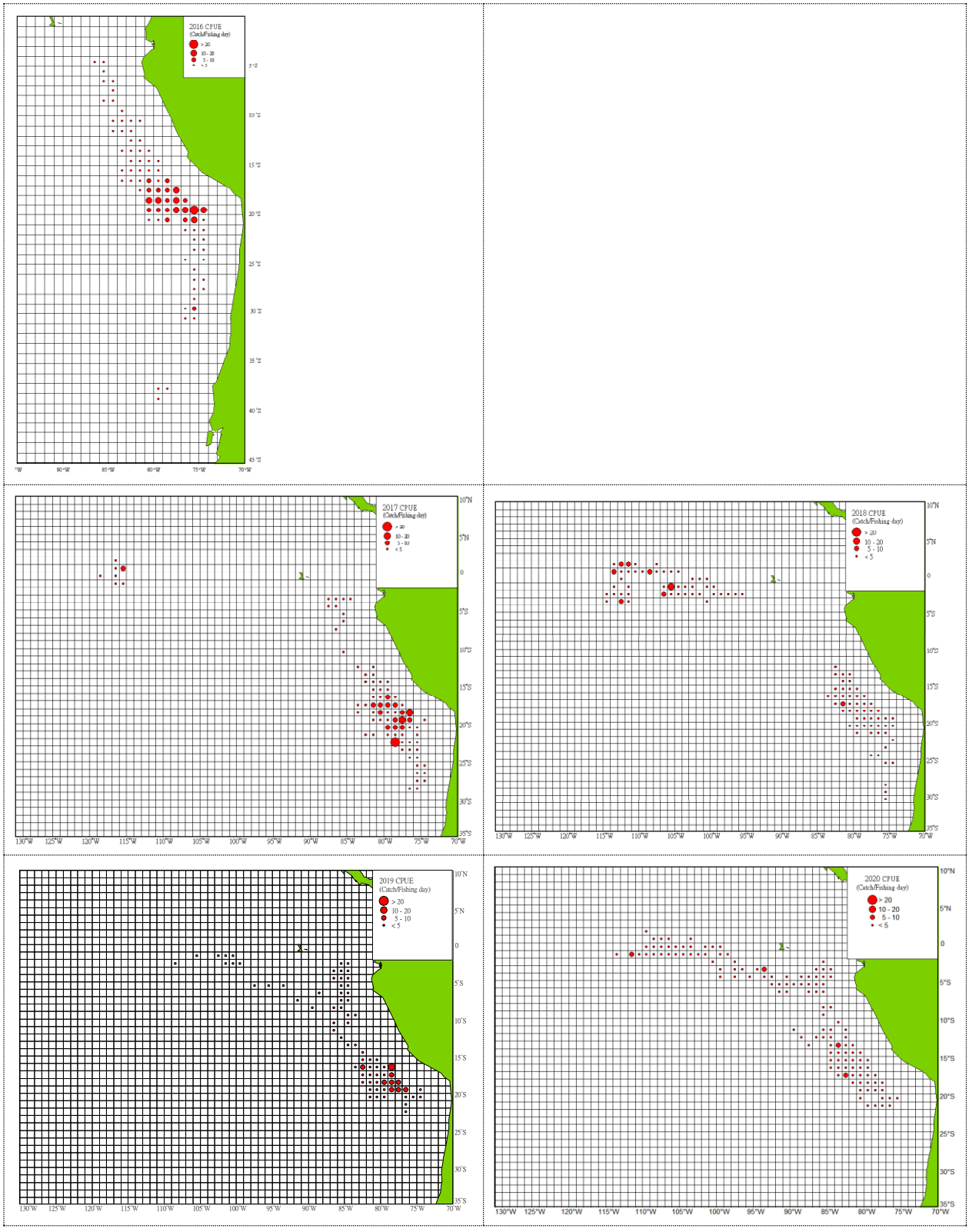

Figure 5. Spatial distributions of annual average CPUE of *Dosidicus gigas* for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean during 2016–2020.

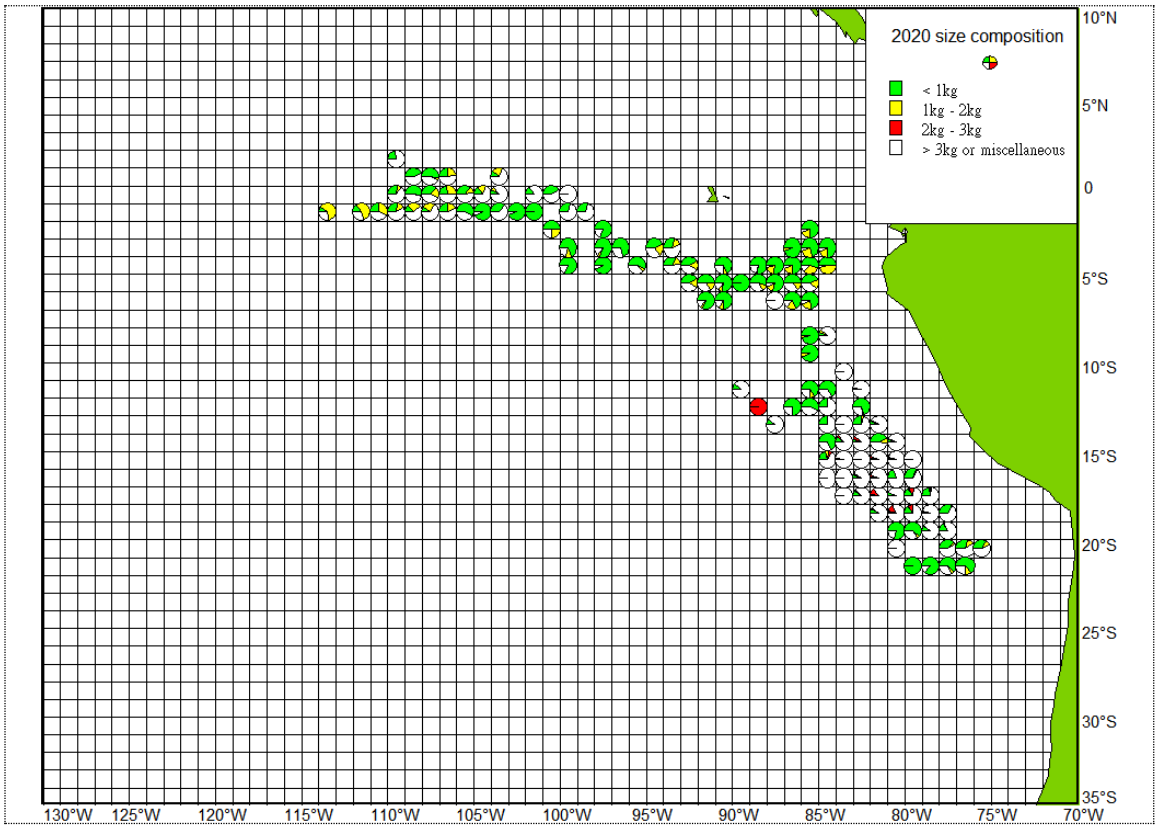

Figure 6. Spatial distributions of catch composition (in live weight) of *Dosidicus gigas* for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean in 2020.

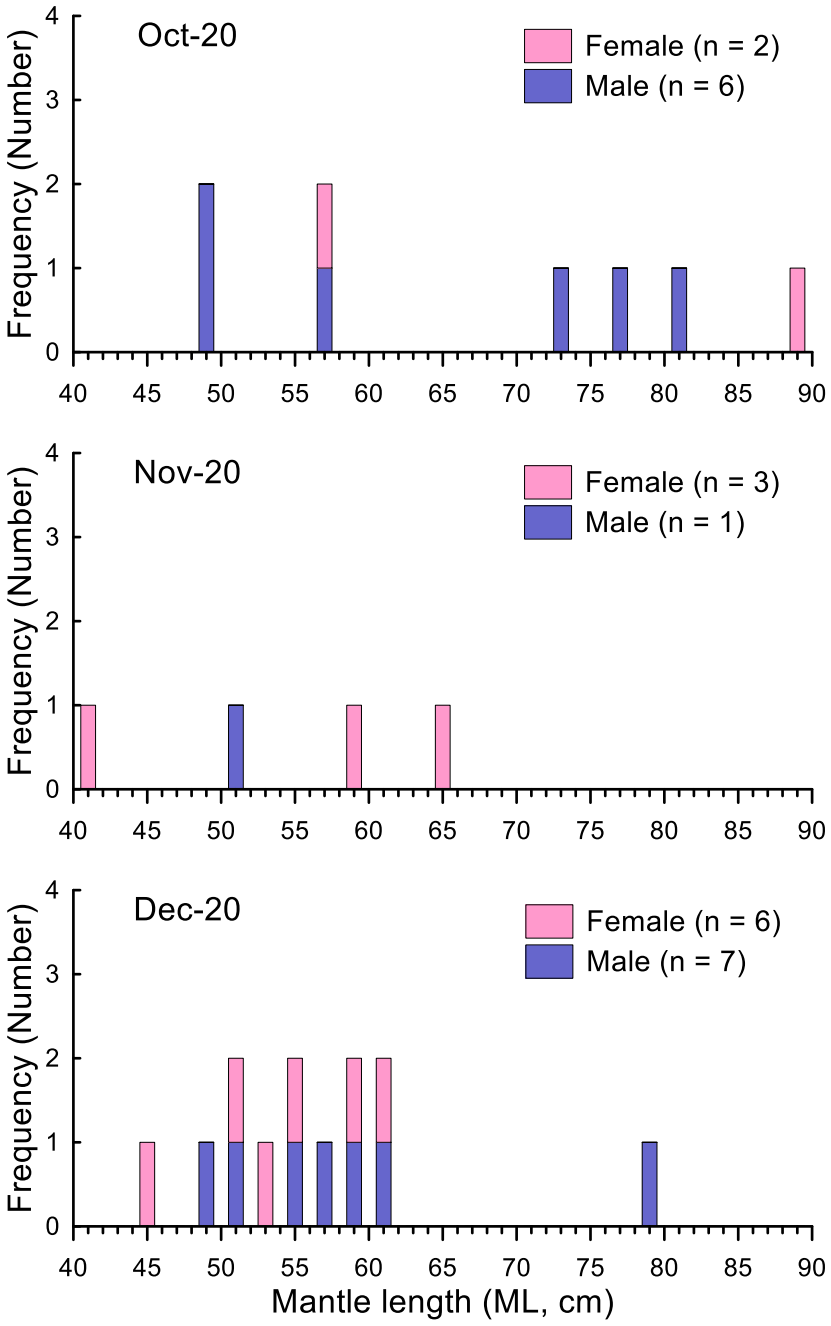

Figure 7. Length frequency distribution for *Dosidicus gigas* samples in the Southeast Pacific in October–December 2020.

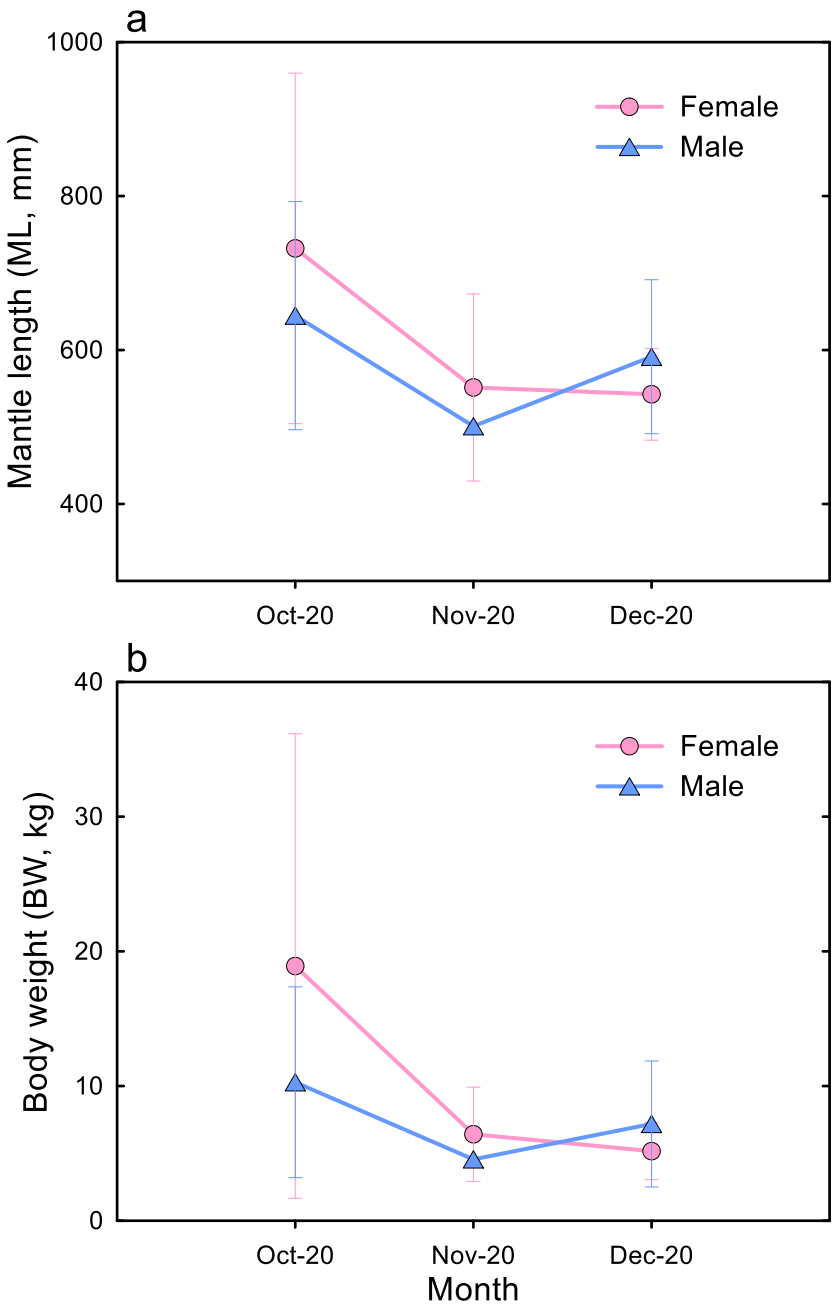

Figure 8. Monthly variation in (a) mantle length (mean and standard deviation) and (b) body weight for *Dosidicus gigas* samples in the Southeast Pacific in October–December 2020.

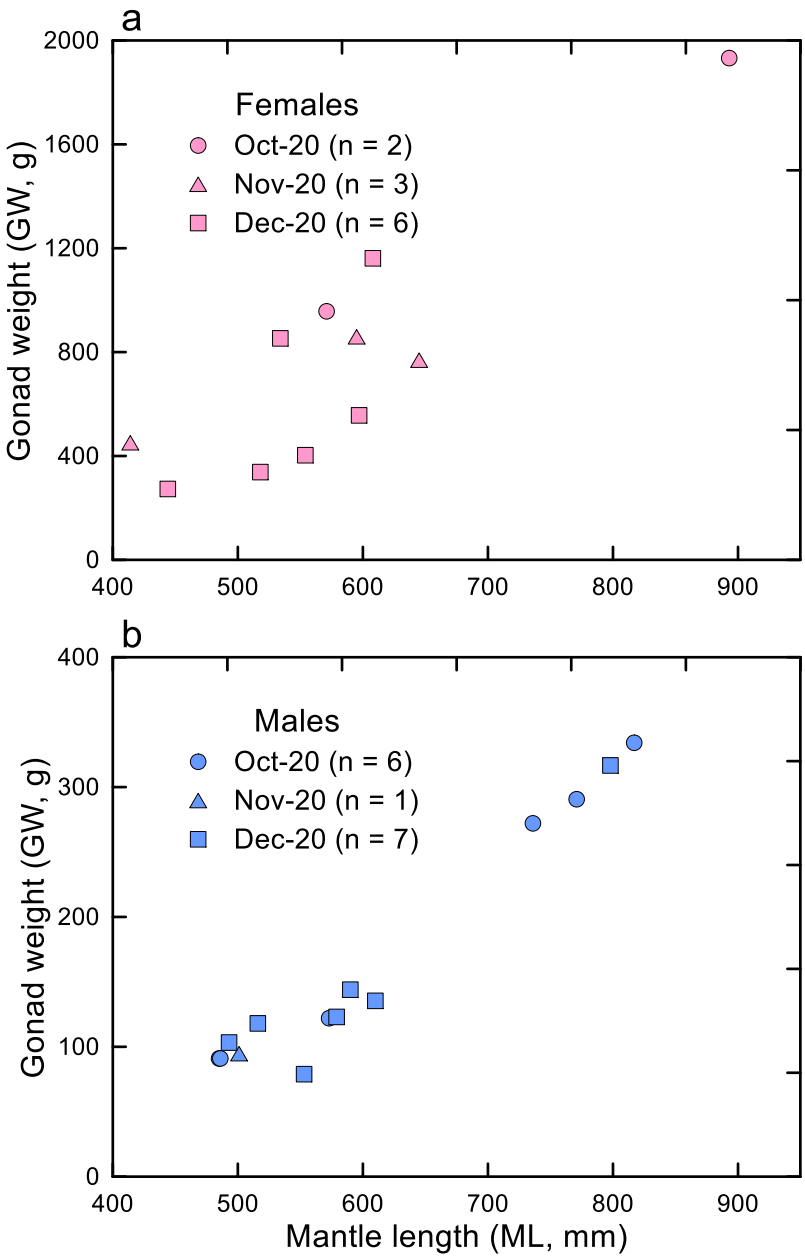

Figure 9. Scatter plot of mantle length and gonad weight for *Dosidicus gigas* samples in the Southeast Pacific in October–December 2020.