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**Chinese Taipei Annual Report**

*Chinese Taipei*

**Annual Report of Chinese Taipei to the 8<sup>th</sup> SPRFMO Scientific  
Committee on the Squid Jigging Fishery in the Southeast Pacific  
Ocean**

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## Summary

Jumbo flying squid widely distributes in the eastern Pacific 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 2019. There were 10 vessels involved in the fishery in 2019, and produced 2,085 tons of jumbo flying squid. The nominal CPUE was 3.41 t/vessel/day in 2019 which was greater than the previous year. The major fishing grounds for the fishing vessels were located around 15°–20°S, 75°–83°W, while some vessels operated in the equatorial waters (around 0°–6°S, 100°–110°W) in 2019. Data of logbook, transshipment and landing of Chinese Taipei's squid-jigging fleet have been collected entirely and submitted to the Secretariat of SPRFMO. Researches on the stock status and spatial dynamics of jumbo flying squid have been conducted. The monthly length composition of jumbo flying squid was calculated from catches by weight category. A biological sampling program has been designed following the protocol of the SPRFMO in 2019. Three squid samples were collected in the 2019 fishing season, which were belonged to large-sized group and in mature stage. No bycatch was recorded for the squid-jigging fleet in 2019 fishing season. The observer program for squid fishery has been developed in 2018 and one observer will be onboard one squid-jigging vessel in 2021 fishing season.

## 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 and its distribution reaches about latitude 50° for both North and South hemispheres. This species has been targeted by Chinese Taipei's distant-water squid-jigging fleet in the Southeast Pacific Ocean since 2002. The number of operating vessels varied from 5 to 29 between 2002 and 2019 (Figure 1). There were 10 vessels involved in the fishery in 2019.

The monthly number of vessels for Chinese Taipei's squid-jigging fleet varied inter-annually for the recent five years (during 2015–2019; Figure 2). The monthly operation days deployed by Chinese Taipei's squid-jigging fleet in 2019 ranged from 0 to 123 days (Figure 3). The operation days decreased from January to May, while increased from August to December. There were no vessel in the fishing ground during June–July in 2019. The main fishing season for Chinese Taipei's squid-jigging fleet was between October and December in 2019.

## 2. Catch, Effort and CPUE Summaries

Annual catch and effort information of Chinese Taipei's squid-jigging fleet in the Southeast Pacific for the recent five years (during 2015–2019) was shown in Table 1. The catch was 2,085 tons in 2019, which was less than that of 2018 (3,848 tons). The fishing effort (per vessel per day, v-d) was 611 v-d in 2019, which also less than that of 2018 (1,396 v-d). The nominal CPUE was 3.41 t/v-d in 2019, which was slightly greater than that of 2018 (2.76 t/v-d; Figure 4).

The spatial distributions of annual average CPUE (t/v-d) of Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean from 2015 to 2019 was shown in Figure 5. The major fishing ground for the fishing vessels was around 12°–29°S, 74°–84°W. There had been a number of fishing vessels operating within the EEZ of Peru between 2007 and 2010 with permission of fishing licenses issued by the competent authority of Peru. However, Chinese Taipei's squid-jigging fleet only operated in the high-sea regions of the Southeast Pacific since 2011. The fishing ground for the fishery located around 15°–20°S, 74°–83°W in 2019, while some vessels

operated in the equatorial waters around 100°–110°W (Figure 5).

The spatial distributions of catch composition (in commercial weight category) of the squid in 2019 was shown in Figure 6. The catches mainly comprised large-sized individuals (non-categorized, usually >3 kg) in the waters off southern Peru (outside EEZ), while the catches mainly comprised small-sized individuals (<1 kg) in the waters off North Peru (outside EEZ) and in the equatorial waters (100°–110°W; Figure 6).

### **3. Fisheries Data Collection and Research Activities**

#### **3.1. Data collection**

All of Chinese Taipei's squid-jigging vessels have been required to maintain fishing logbooks on a daily basis. The items of the logbook include: operation date, location (latitude and longitude), time, catch (by category) and bycatch. All of the logbooks in the fleet had been entirely retrieved in 2019. Furthermore, Chinese Taipei's squid-jigging vessels have been required to equip with the electronic logbook system (e-logbook) on board since 2007. According to the domestic regulation, the fishermen are required to submit their catch information to fishery authority through this system on a daily basis.

The operator or the captain of any fishing vessel intending to land or transship are mandatory to fill in the Landing/Transshipment Notice and submit it to the competent authority for approval. Moreover, after the completion of landing or transshipment, the operator or the captain are mandatory to submit the Landing/Transshipment Declaration to the competent authority. The competent authority verifies the catches with e-logbook data and other relevant data, so as to ensure the catches are legal and traceable.

In accordance with Chinese Taipei's domestic regulations, relevant information of transshipment and landing for jumbo flying squid fishery in the Southeast Pacific Ocean has been collected by the competent authorities and has been submitted to the Secretariat of SPRFMO since 2013 as per CMM 02-2020.

#### **3.2. Research activities**

Researches on the stock status and spatial dynamics of jumbo flying squid have been conducted by the scientists of Chinese Taipei. In recent years, research programs have been carried out on spatial distribution patterns, stock status and population structure of the species. The results showed that the distribution of the squid abundance was high in the coastal waters off northern Peru. The size composition of the squid harvested by Chinese Taipei's fleet has been dominated by large-size group in October–December in recent years.

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 was noted.

#### **4. Biological Sampling and Length/Age Composition of Catches**

##### **4.1. Biological sampling**

Three monthly samples of jumbo flying squid have been collected in the 2019 fishing season (from October to December; [Table 2](#)). The squid samples are belonged to large-sized group (2-5 kg). A total of 24 squids (6 females and 18 males) were examined. Mantle length (ML) of squid ranged from 418 to 514 mm and from 463 to 545 mm for females and males, respectively ([Figure 7](#)).

Body weight (BW) of squid ranged from 2,686 to 5,103 g and from 3,210 to 5,715 g for females and males, respectively. Average ML of squid in October was 491 mm and 516 mm for females and males, respectively, increased to 496 mm and 530 mm for females and males, respectively in November, and decreased to 443 mm and 517 mm for females and males, respectively in December ([Figure 8](#)).

Average BW of squid in October was 4,410 g and 4,485 g for females and males, respectively, increased to 3,895 g and 4,510 mm for females and males, respectively in November, and decreased to 3,671 g and 4,529 g for females and males, respectively in

December (Figure 8). All squids were at mature stage, with a heavy weight in gonad organs (Figure 9). The statoliths and a piece of muscle tissue for each squid has been preserved for further analysis.

#### 4.2. Length/Age composition of catches

The catch data for Chinese Taipei's jumbo flying squid fishery is separated by size composition (commercial weight category). There are four categories in the items: A, <1 kg; B, 1-2 kg; C, >2-3 kg; and D, >3 kg (or miscellaneous). The category D typically comprise extra-large size individuals (>3 kg), although various size categories of the squid may be included. The category D was prepared and stored in a condition of processed products, which composed of head, fin and mantle of the squid. The original body weight of category D is 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 2015–2019 was shown in Table 3. The catches were dominated by the large-sized group of the squid for the fishery. The monthly catch composition in 2019 was shown in Table 4. The large-sized group of the squid mainly occurred in October–December in 2019 fishing season.

### 5. Ecosystem Approach considerations

There was no bycatch record for the Chinese Taipei's squid-jigging fleet in 2019. This may be a result of performing highly selective fishing gears (jigging) and method by the squid-jigging fleet.

### 6. Observer Implementation Reports

The observer program of Chinese Taipei's jumbo flying squid fishery is modified from the observer program for the tuna fishery which has been accredited by the Western and Central Pacific Fisheries Commission (WCPFC). The National Observer Training Program was updated in March 2019 to incorporate the training for squid fisheries. The training for squid fisheries includes understanding of domestic regulations and conservation and management measures of Regional Fisheries Management

Organizations, fishing gear and method, squid species identification, squid sampling and measurement, bycatch issues and so on. The observer who finished the training is qualified to conduct the duty on squid-jigging vessels as well as longline vessels.

Take into account that the observer coverage requirement of jumbo flying squid fishery specified in CMM 18-2020 and the number of active vessels of Chinese Taipei's squid-jigging fleet in recent years, one observer will be onboard one squid-jigging vessel in the end of 2020 to conduct observation for 2021 fishing season.



Table 1. Annual catch and effort information of *Dosidicus gigas* for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean during 2007–2019.

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

Table 2. Summary information of *Dosidicus gigas* samples in the Southeast Pacific in 2019 fishing season.

Date	Latitude (South)	Longitude (West)	Female	Male	Total
5-Oct-19	16.60	80.98	1	7	8
6-Nov-19	17.50	80.95	2	6	8
6-Dec-19	18.70	78.97	3	5	8

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 2015–2019.

(Category: A, <1 kg; B, 1-2 kg; C, 2-3 kg; D, >3 kg or miscellaneous)

Year	A	B	C	D	Total
2015	33	41	1	9,996	10,072
2016	210	62	23	12,694	12,989
2017	123	12	6	7,197	7,338
2018	671	25	49	3,104	3,848
2019	70	12	237	1,767	2,085

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 2019.

(Category: A, <1 kg; B, 1-2 kg; C, 2-3 kg; D, >3 kg or miscellaneous)

Month	A	B	C	D	Total
Jan.	7	0	6	137	150
Feb.	26	0	0	73	100
Mar.	1	0	0	1	2
Apr.	5	2	0	2	9
May	16	0	0	7	23
Jun.	-	-	-	-	-
Jul.	-	-	-	-	-
Aug.	7	0	0	9	16
Sep.	8	1	8	58	74
Oct.	0	5	67	357	429
Nov.	0	3	79	474	555
Dec.	1	1	77	648	727

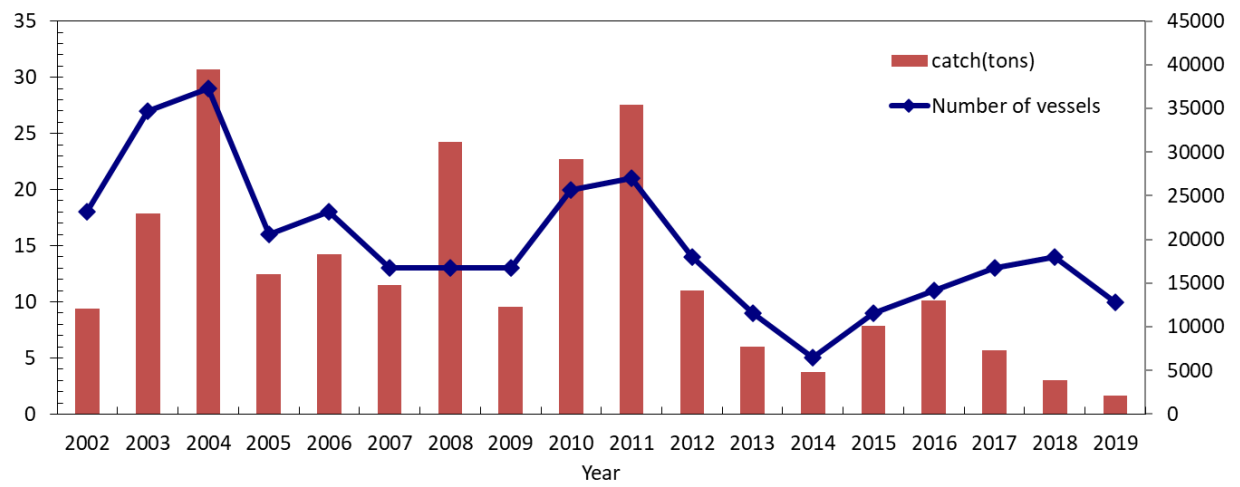


Figure 1. Annual variations in catch and number of vessels for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean during 2002–2019.

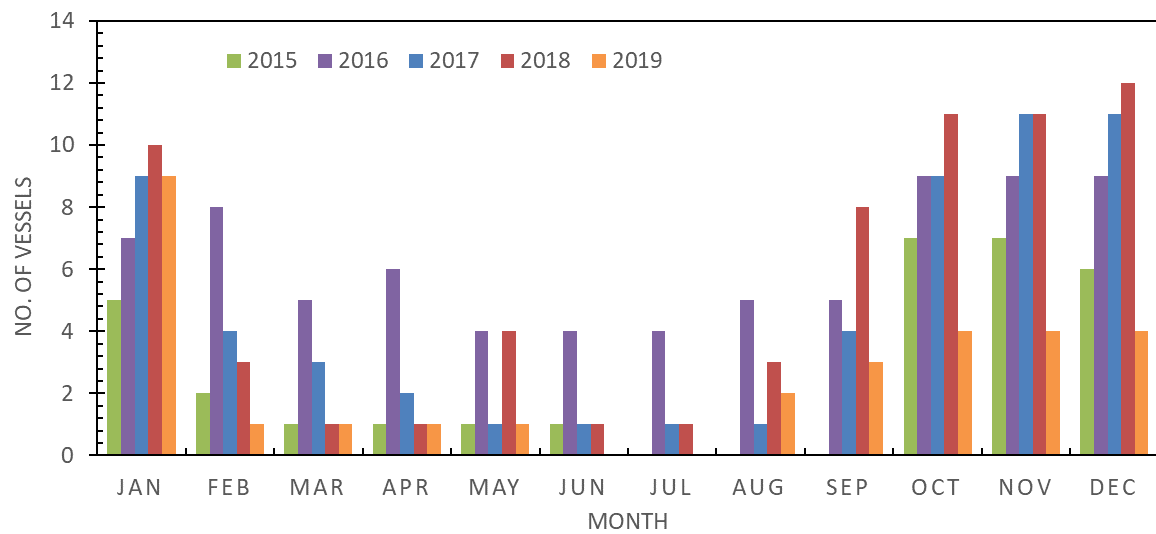


Figure 2. Monthly variations in number of vessels for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean for recent five years (during 2015–2019).

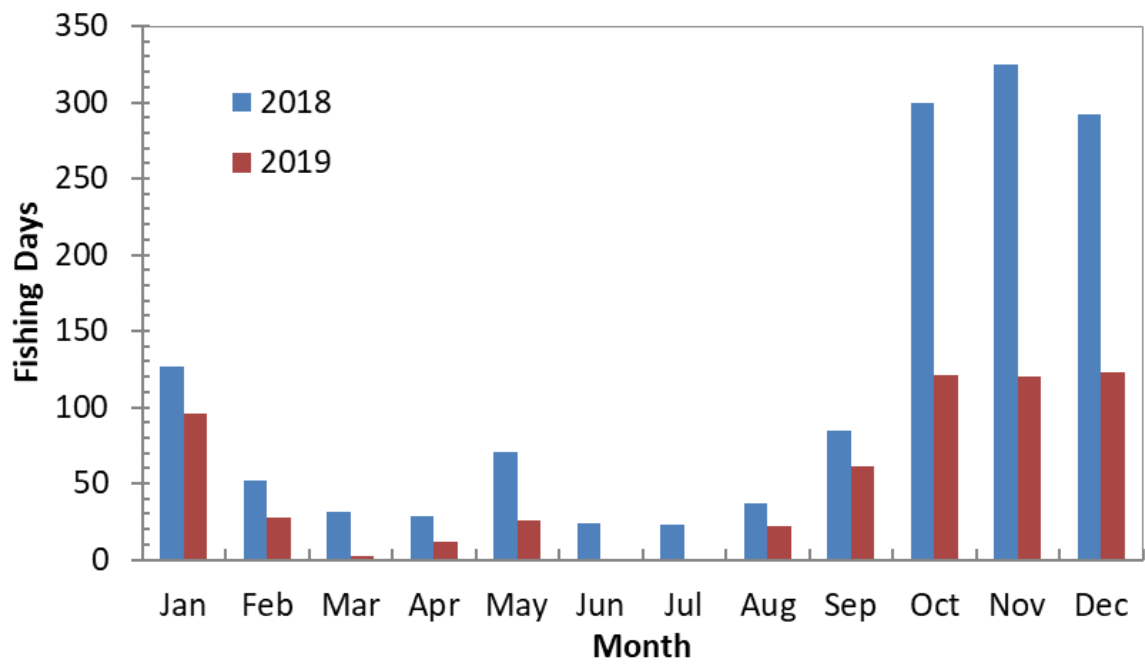


Figure 3. Monthly fishing days deployed by Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean in 2018 and 2019.

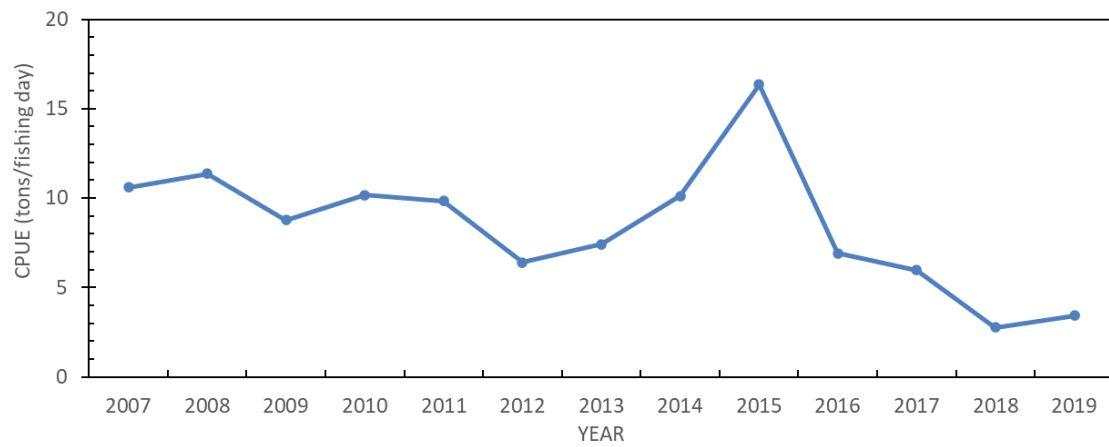


Figure 4. Annual nominal CPUE of *Dosidicus gigas* of Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean during 2007–2019.



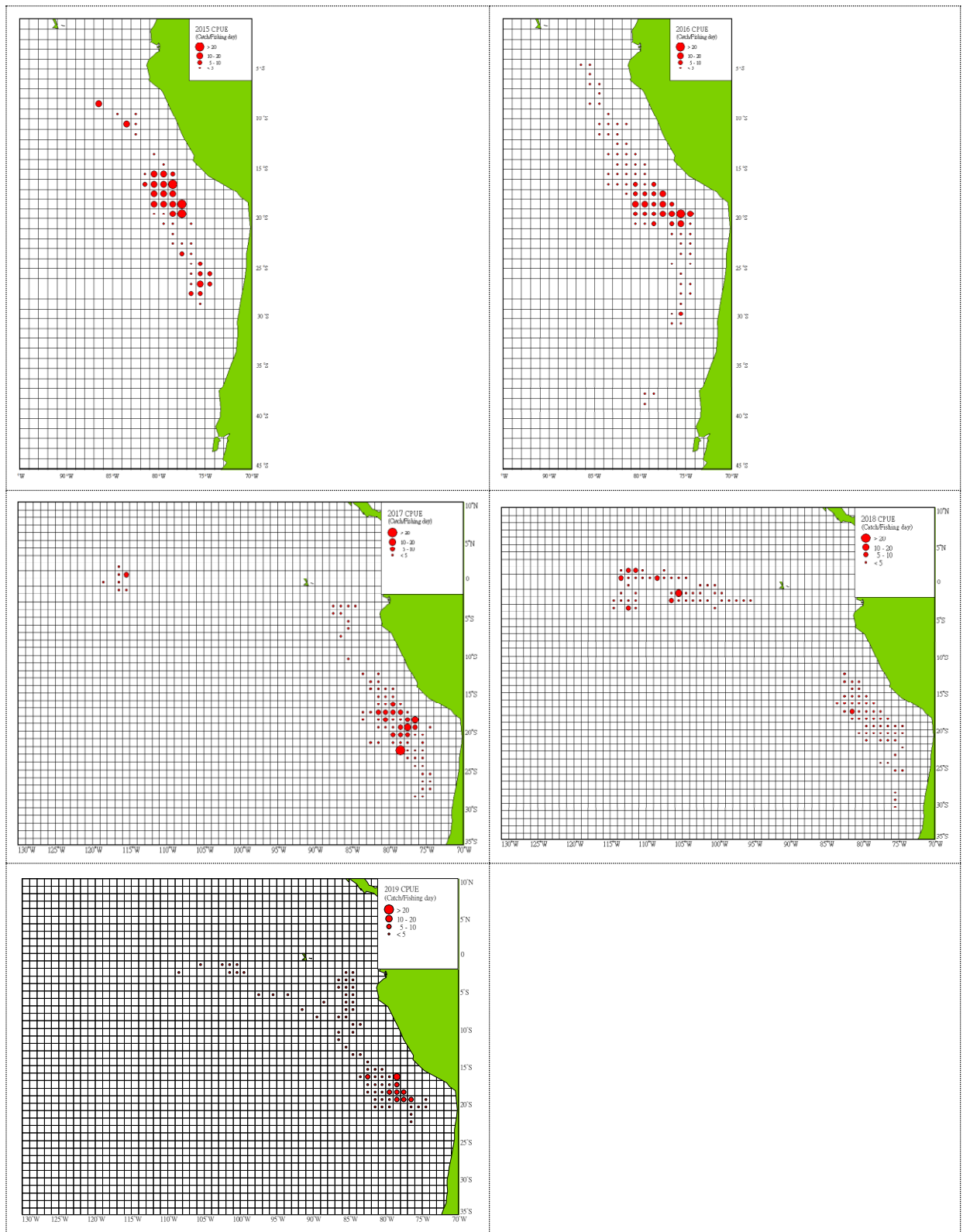


Figure 5. Spatial distributions of annual average CPUE of *Dosidicus gigas* for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean during 2015–2019.

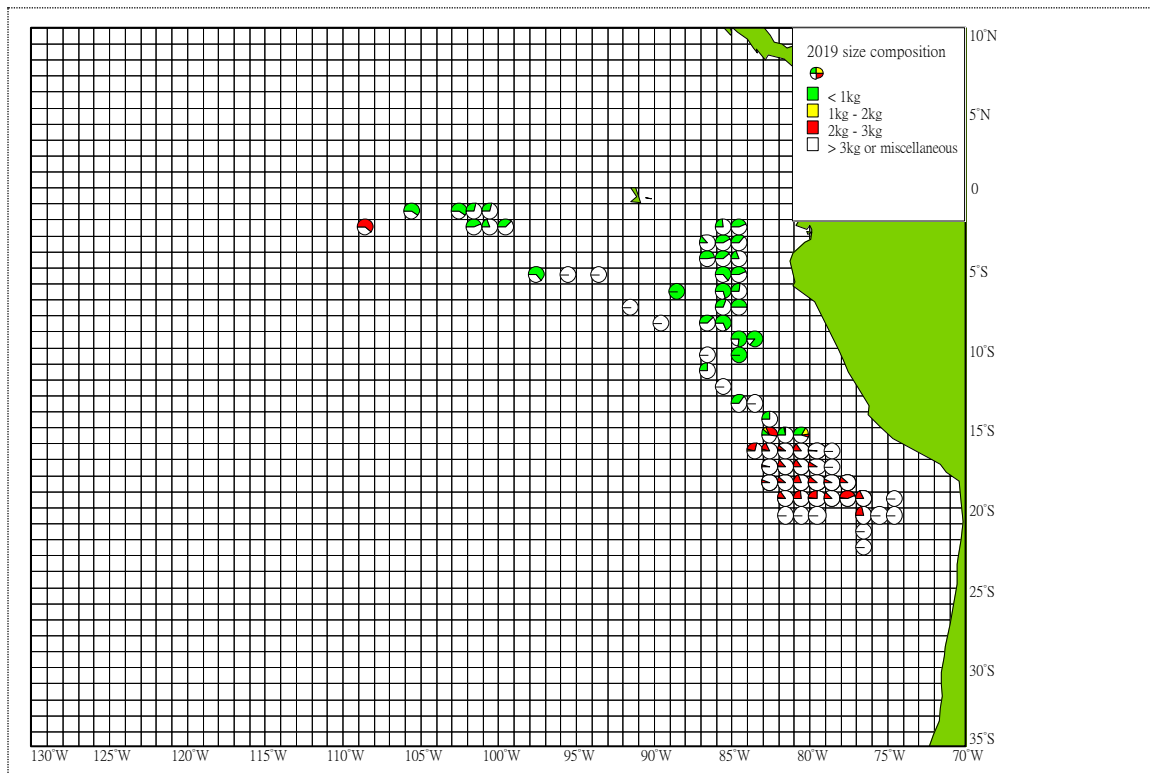


Figure 6. Spatial distributions of catch composition (in live weight) of *Dosidicus gigas* for Chinese Taipei's squid-jigging fleet in the Southeast Pacific Ocean in 2019.

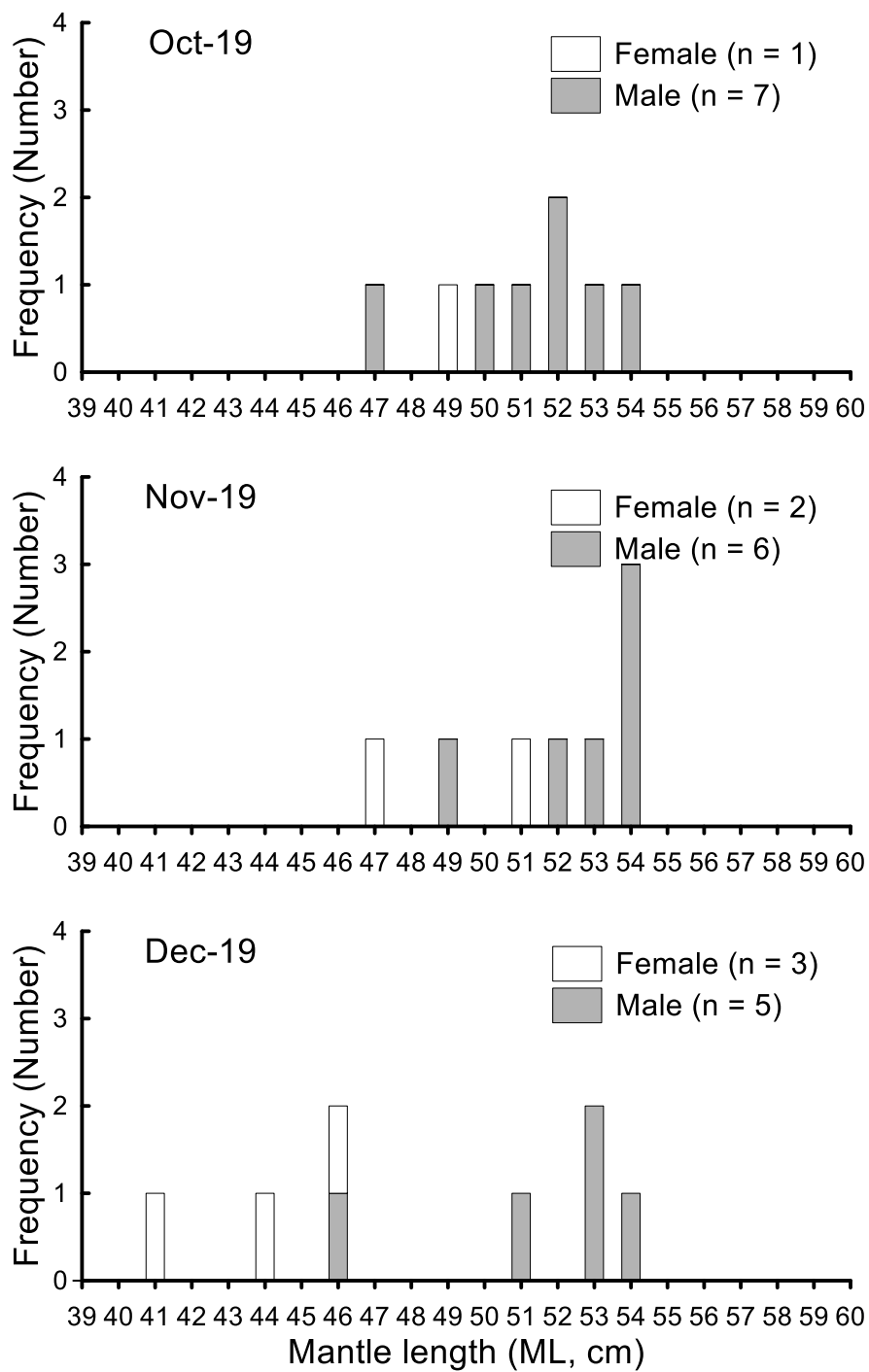


Figure 7. Length frequency distribution for *Dosidicus gigas* samples in the Southeast Pacific in 2019 fishing season.

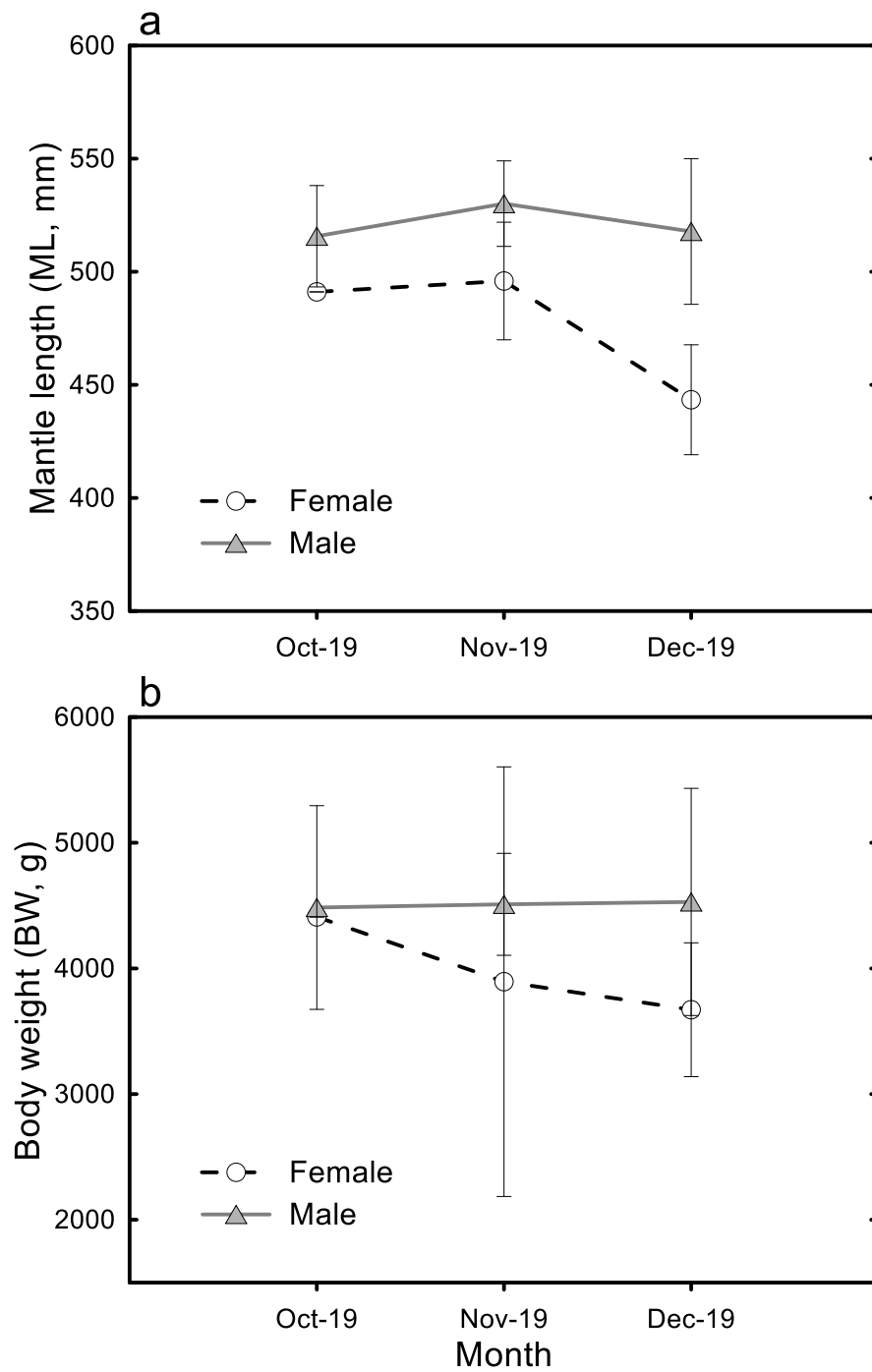


Figure 8. Monthly variation in (a) mantle length (mean and standard deviation) and (b) body weight for *Dosidicus gigas* samples in the Southeast Pacific in 2019 fishing season.

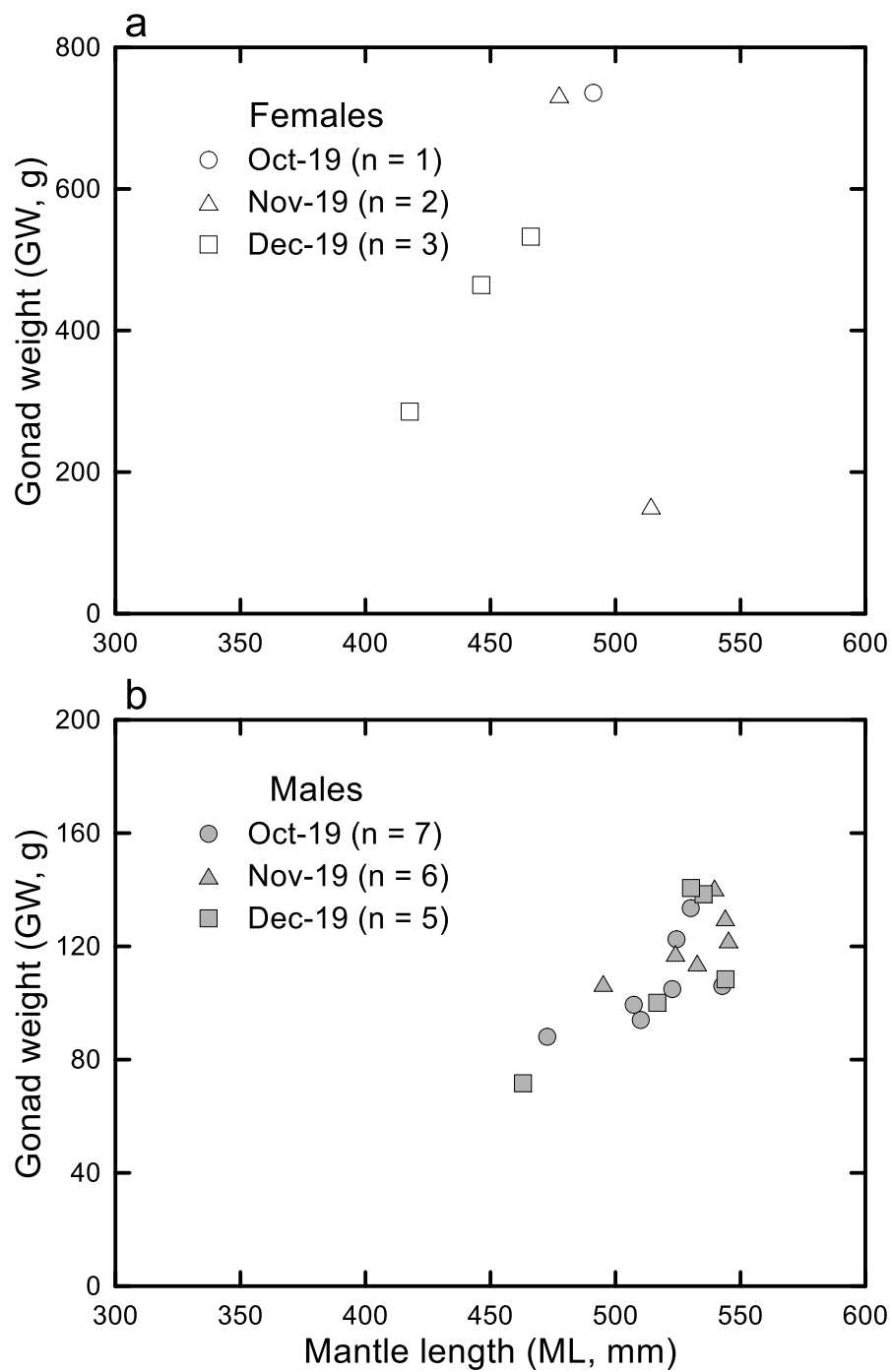


Figure 9. Scatter plot of mantle length and gonad weight for *Dosidicus gigas* samples in the Southeast Pacific in 2019 fishing season.