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Ecuador Annual Report on Jumbo Squid

Ecuador

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INSTITUTO PÚBLICO DE
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PUBLIC INSTITUTE FOR AQUACULTURE AND FISHERIES RESEARCH

2019 ECUADOR NATIONAL REPORT; FISHERIES AND BIOLOGICAL ASPECTS OF GIGANT FLYING SQUID (*Dosidicus gigas*) IN ECUADORIAN WATERS

1. INTRODUCTION

The giant squid (*Dosidicus gigas*) fishery represents in the cephalopod class, the species of greatest commercial and nutritional importance in Ecuadorian waters, the previous (1979, 1992, 1993, 1995) and updated (2013-2014) fishing biological data allowed to know fundamental aspects of the population dynamics of the giant squid (Morales and Pacheco, 2015), which provided the authorities with a commercial vision of the resource to qualify it as a new fishery (Morales and Pacheco, 2015), using passive (precautionary) management, regulated by Agreement No. 080.

Currently (2019, 2020), the resource offers a fishing alternative during closed periods of traditional fisheries, especially in the months of greatest availability (July to October), however, it has shown high instability and variability, which is being considered in fisheries management.

This species is distributed along the continental coast of Ecuador, in front of the provinces of Santa Elena (Gulf of Guayaquil), Manabí (Bahía de Manta) and Esmeraldas (Border with Colombia). According to the historical records of catches obtained from the Exclusive Economic Zone in Ecuador, the main fishing ground is in the southern region of the Puntilla de Santa Elena, the Gulf of Guayaquil and the border with Peru.

This document analyzes the biological and fishing data of the giant squid resource (*Dosidicus gigas*) registered by the Public Institute for Aquaculture and Fisheries Research (formerly the National Fisheries Institute) in the Gulf of Guayaquil during 2019 and historical data, to contribute to the knowledge of the population dynamics of the species and the sustainability of the resource in the region.

2. FISHING ASPECTS

2.1 FISHING EFFORT

In 2019 the giant squid was caught in the Gulf of Guayaquil throughout the year, depending on its availability. The fishing effort was carried out by artisanal vessels established in the ports of Santa Rosa and Anconcito, where there are processing plants for seafood.

The fishing operations were carried out during the night between 6:00 p.m. and 6:00 a.m., when the giant squid rises to surface waters for feeding (Markaida, 2001) or attracted by artificial lights of persuasion. The giant squid was caught mainly during the new moon in the so-called dark.

During the season of less availability of giant squid (January-April / November-December), artisanal fishing vessels direct their effort towards large pelagic fishes using the gillnet and longline, catching yellowfin tuna (*Thunnus albacares*), Skipjack tuna (*Katsuwonus pelamis*), bigeye tuna (*Thunnus obesus*), swordfish (*Xiphias gladius*), blue marlin (*Makaira nigricans*), mahi mahi (*Coryphaena hippurus*), albacore (*Thunnus* spp.), indo-pacific sailfish (*Istiophorus platypterus*), stripped marlin (*Kajikia audax*), among other.

In the months of greatest availability of giant squid (May-October), artisanal vessels diversify their effort to catch this species, in directed fishing near the coast (<40 nm) with hand lines and jigging, other vessels in incidental fishing with surface gillnets, especially between the months of July and October where availability increases. It should be noted that in these times many artisanal vessels carry out multipurpose fishing activities using the surface gillnet and hand lines with manual jars. Incidental catches of giant squid have been recorded with the industrial purse seine and the multipurpose trawl (shrimp / hake) in periods of greater availability (SRP, 2019).

In directed fishing, four to five fishermen participate on board fiberglass vessels of 6.50 to 9.80 meters (m) in length, with one and / or two 75 HP outboard motors on fishing trips lasting one to two days

In incidental fishing, three fishermen participate aboard fiberglass boats of 6.0 to 9.2 m in length, with one and two 75 HP outboard motors on fishing trips lasting between two and three days.

2.2 FISHING ZONES

The main fishing areas for giant squid were distributed in the southern region of Puntilla de Santa Elena (Gulf of Guayaquil) and border with Peru between 02 ° and 03 ° 25´ South Latitude and 84 ° West Longitude, registering a higher concentration southwest of the Gulf of Guayaquil (Figure 1), mainly in areas with sea surface temperature (SST) between 19.5 ° and 22.5 ° C (Earth, 2019).

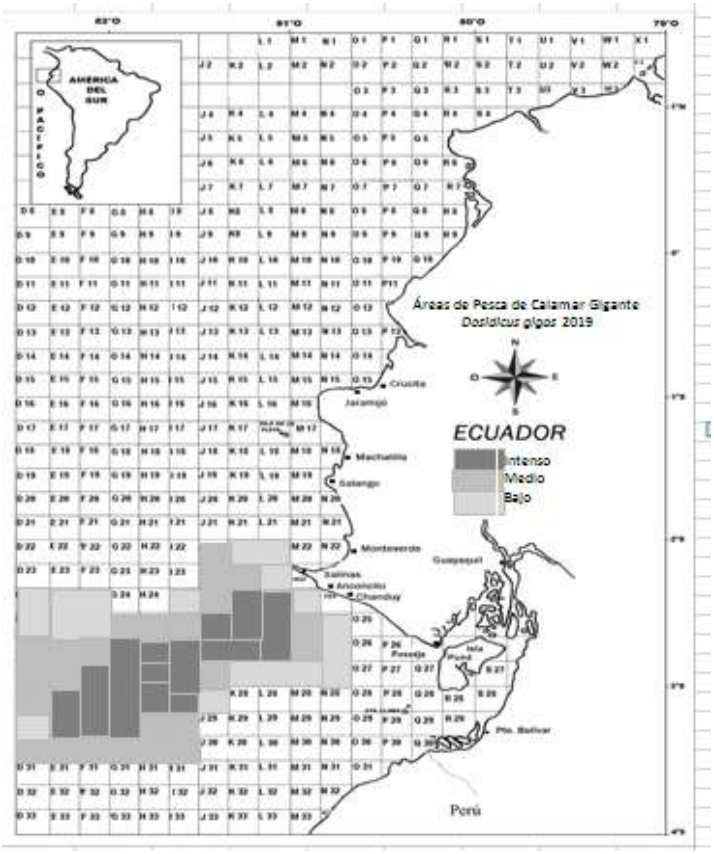

Figure 1. Spatial distribution of catches of *Dosidicus gigas* in the Gulf of Guayaquil, during 2019.

2.3 LANDINGS

In 2014, a total landing of 18,139.8 t of giant squid was estimated in 10 ports on the Ecuadorian coast. The higher largest landings were recorded in the ports of Esmeraldas (13.7%), Manta (19.3%), and Santa Rosa (16.0%). The percentages of landings by fishing season were: 13.1% low season (January-April), 33.3% medium season (May-June / November-December); 53.6% high season (July-October) (Table 1).

Table 1. Landings (t) of giant squid in continental coastal waters, during 2014

Monthly landing (t) of giant squid during 2014												Total
Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
272.1	453.5	634.9	816.3	1179.1	1541.9	2086.1	2811.6	2630.2	2267.5	1904.7	1541.9	18139.8

Between 2015 and 2018, no data were recorded due to external factors, which prevented the continuous monitoring of the fishery for this species. As of 2019, follow-up studies are resumed, making it possible to determine that there is a resident population within the Gulf of Guayaquil.

The estimated landings in the fishing ports of Santa Rosa and Anconcito (province of Santa Elena) were 1,389 t (79.4%) and 361.1 t (20.6%), respectively (Table 2).

Table 2. Landings (t) of giant squid in Santa Rosa and Anconcito, during 2019.

Ports	Monthly landing (t) of giant squid during 2019												Total
	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
Sta. Rosa	15.0	50.0	25.0	90.0	200.0	110.0	130.0	300.0	190.0	214.0	45.0	20.0	1389.0
Anconcito	3.9	13.0	6.5	23.4	52.0	28.6	33.8	78.0	49.4	55.6	11.7	5.2	361.1
Total	18.9	63.0	31.5	113.4	252.0	138.6	163.8	378.0	239.4	269.6	56.7	25.2	1750.1

3. BIOLOGICAL ASPECTS

3.1 MANTO LENGTH STRUCTURE

A total of 4,455 female and 912 males were analyzed, with a range of sizes that fluctuated between 14 and 50 cm of mantle length (ML) for combined sexes, coming from incidental fishing with gillnet and directed fishing with manual jigging, caught within and outside the Gulf of Guayaquil.

In the mantle length (ML) frequency distribution, the presence of two groups of size classes is denoted: the first group with a mantle length range between 14 and 30 cm ML and a mode of 25 cm ML, and the second group between 31 and 50 cm ML with a mode of 40 cm ML (Figure 2).

44.6% of the analyzed organisms were above the estimated first maturity mantle length (35.54 cm $ML_{50\%}$) (Morales y Pacheco, 2016).

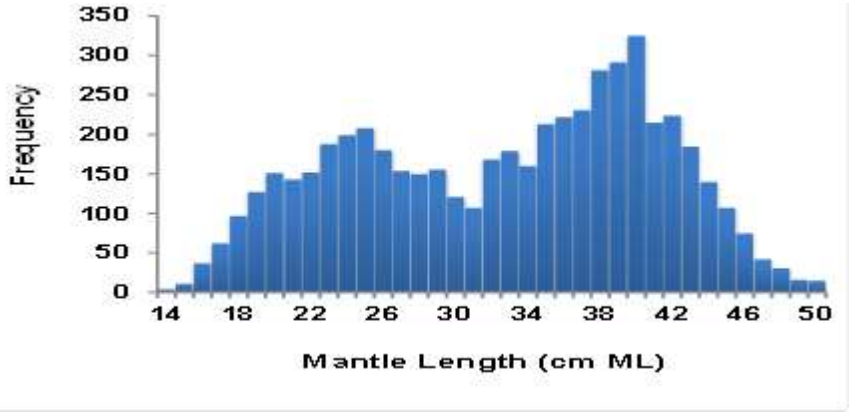

Figure 2. Annual frequency distributions by mantle length (ML), of giant squid recorded in Ecuadorian waters, during 2019.

3.2 SEXUAL MATURITY STAGES

The female organisms (Figure 3) registered 49.6% in stage I (immature), 48.9% stage II (maturing) and 1.5% stage III (mature); It should be noted that stages I and II in females were the most frequent and more numerous than males throughout the year.

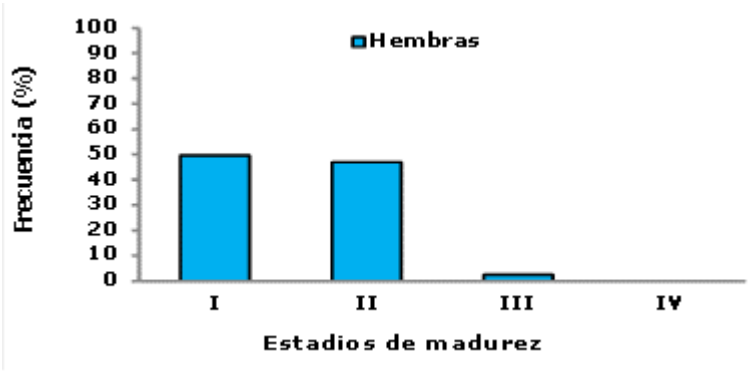

Figure 3. Percentage composition of sexual maturity stages of *D. gigas*

In the analysis per month, the females registered between January and April 19.6% stage I, 76.4% stage II, 4.0% stage III; from May to October 67.7% stage I, 31.9% stage II, 0.4% stage III, and November to December 32.3% stage I, 67.7% stage II.

3.3 MATURITY STAGES BY SIZE CLASSES

A total of 4,470 female organisms were analyzed, which were categorized by size class according to the stage of sexual maturity, that is, small (14-24 cm ML), medium (25-39 cm ML) and large (40 -50 cm ML) (Table 3).

Tabla 3. Gonadal maturity stages by size class of giant squid in 2019

stages	Size class (cm LM)		
	14 - 24	25 - 39	40 - 50
	%	%	%
Stage I	**91.0**	**52.1**	**19.9**
Stage II	**8.7**	**46.6**	**77.2**
Stage III	**0.3**	**1.3**	**2.9**
Stage IV	**0.0**	**0.0**	**0.0**

(cm): Centimeters; (ML): Mantle Length.

The gonadal maturity stages by size class registered a higher proportion of organisms in the immature phase (stage I) and maturing (stage II), and a minimum percentage in the mature phase (stage III), with the absence of organisms in spawning (stage IV), which shows that the Gulf of Guayaquil does not correspond to a special breeding area.

Figures 4, 5 and 6 show the monthly and annual historical distribution of the mantle length frequencies (ML) observed (bars) and estimated (lines), for *Dosidicus gigas* in Ecuadorian waters during 2013 and 2014.

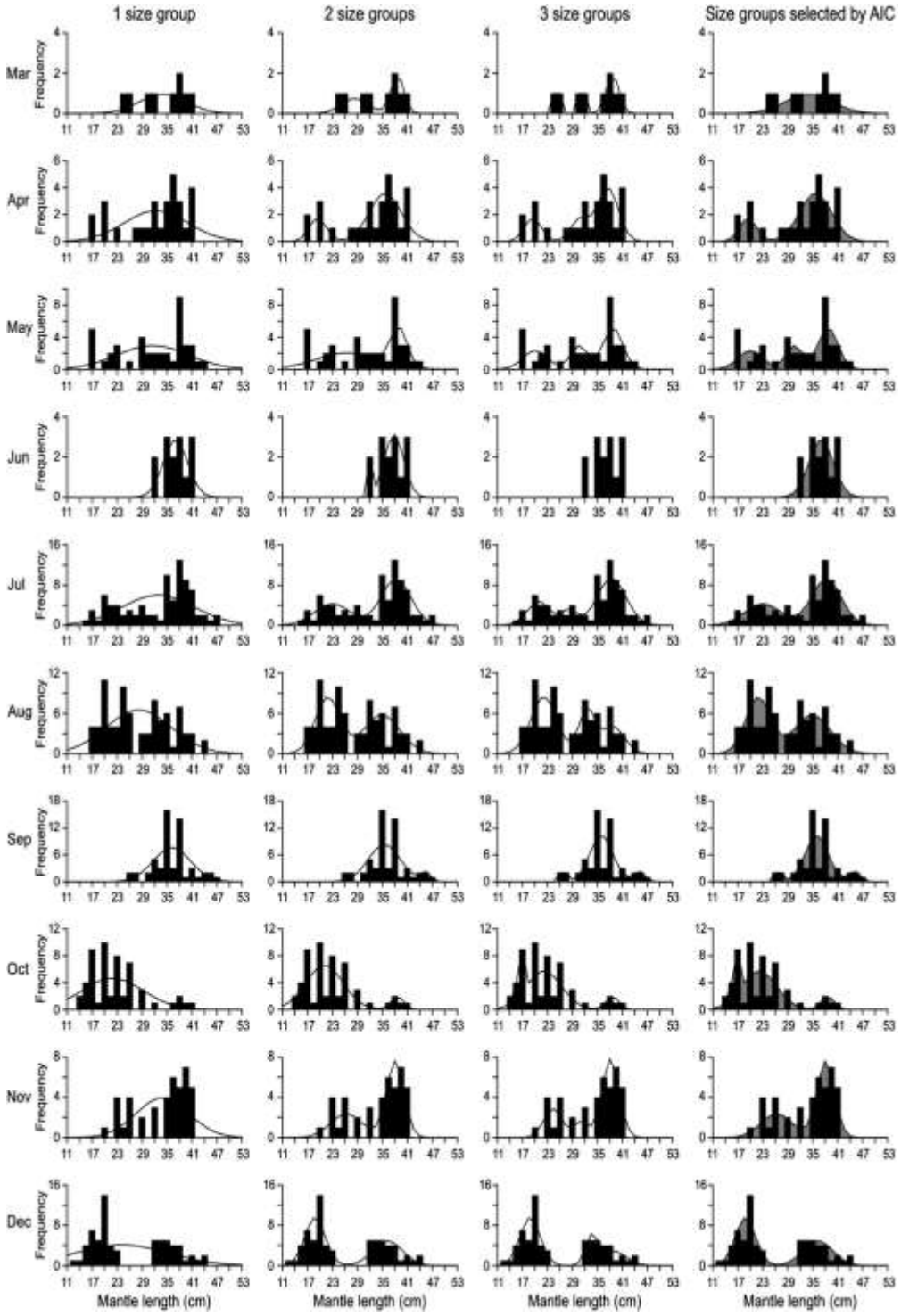

Figure 4. Monthly Frequency distributions by mantle length (ML), of giant squid registered in Ecuadorian waters, during 2013; AIC Akaike Information Criterion.

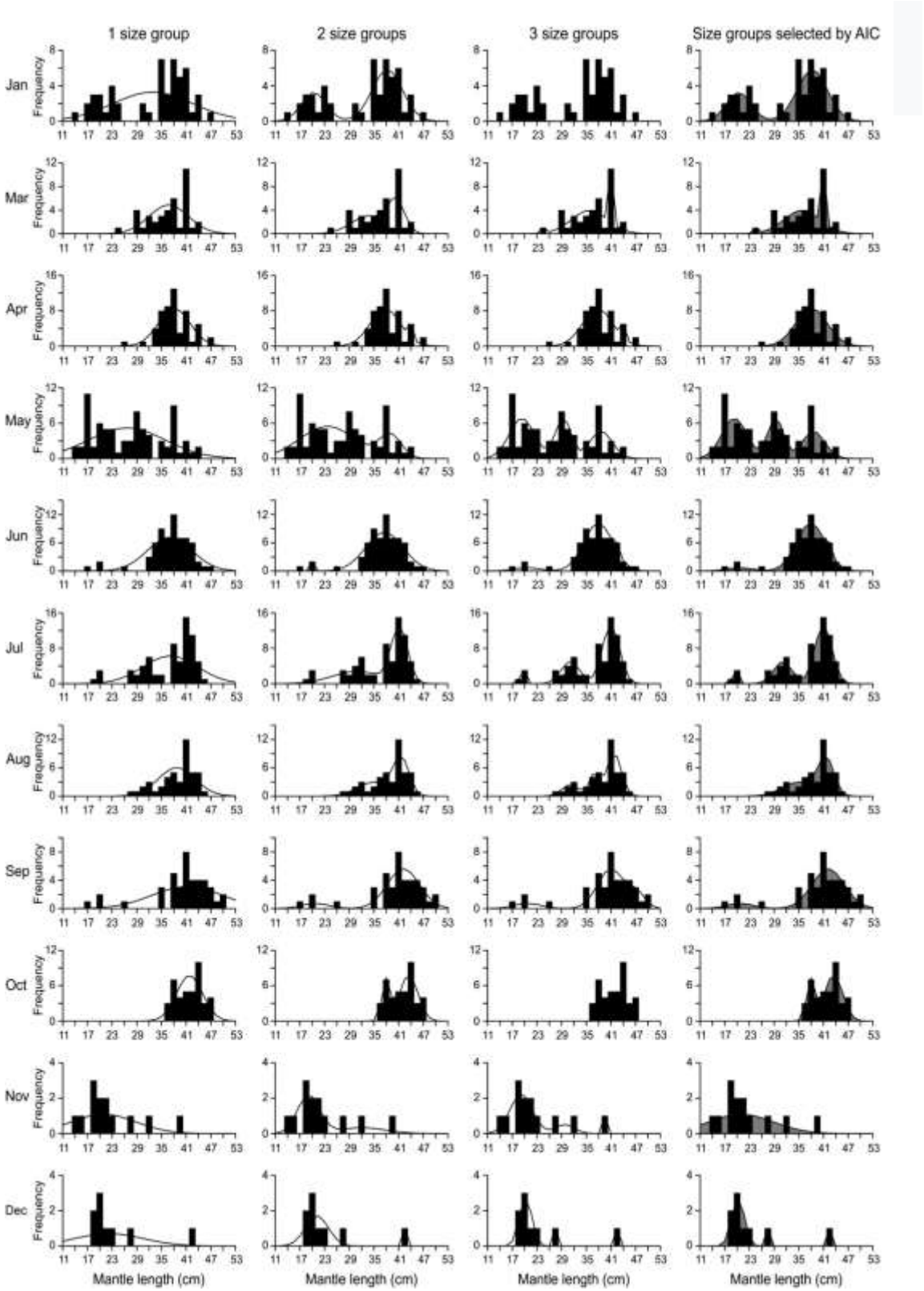

Figure 5. Monthly Frequency distributions by mantle length (ML), of giant squid registered in Ecuadorian waters, during 2014; AIC Akaike Information Criterion.

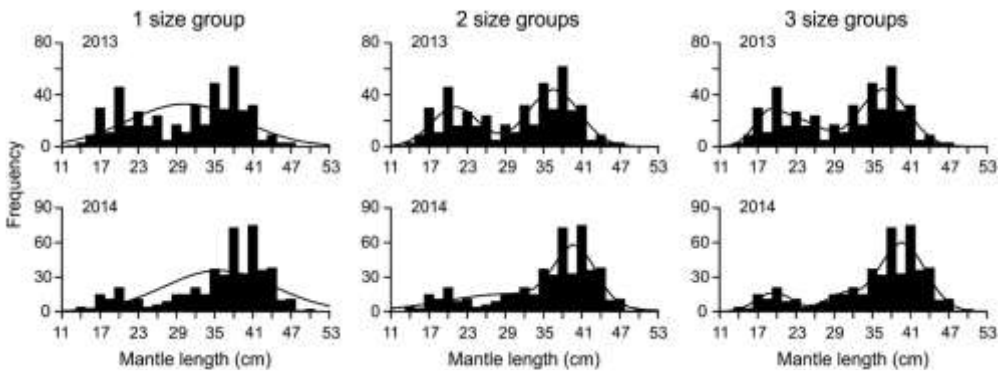

Figure 6. Annual distributions of ML frequency observed (bars) and estimated (lines) for *Dosidicus gigas*, during 2013 and 2014.

4. REFERENCES

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