

**9<sup>th</sup> MEETING OF THE SCIENTIFIC COMMITTEE**

*Held virtually, 27 September to 2 October 2021*

**SC9-Doc19**

**Ecuador Annual Report - Squid**

*Ecuador*

# PUBLIC INSTITUTE FOR AQUACULTURE AND FISHERIES RESEARCH

## 2020 ECUADOR NATIONAL REPORT; FISHERIES AND BIOLOGICAL ASPECTS OF GIGANT FLYING SQUID (*Dosidicus gigas*) IN ECUADORIAN WATERS

### 1. INTRODUCCIÓN

The giant squid (*Dosidicus gigas*) represents in the cephalopod class, the species of greatest commercial and nutritional importance in Ecuadorian waters. Previous and current fishing biological data have made it possible to improve the knowledge of the population dynamics of the giant squid in Ecuadorian waters (Morales and Pacheco, 2016) and regulate the fishing effort through the application of Ministerial Agreement No. 0127-A.

This species is seasonally distributed in Ecuadorian waters. Temporary changes in the availability of the resource are determined by the Humboldt Current System. The incursion of cold waters from Humboldt to the coastal areas of Ecuador, promote changes in the spatial and temporal distribution of giant squid (Morales and Pacheco, 2016), generating the low fishing season between the months of January and April; medium between May-June and November-December and high between July and October, however, the species has shown high variability, which is being considered in fisheries management.

This document presents biological and fishery data of the giant squid (*Dosidicus gigas*) registered by the Public Institute for Aquaculture and Fisheries Research (formerly the National Institute of Fisheries) in the Gulf of Guayaquil during 2020, 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 2020 the giant squid was caught in the Gulf of Guayaquil in directed fishing with hand lines and jars and incidental fishing with surface gillnets, according to the availability of the resource. The fishing effort was carried out by artisanal vessels established in the fishing ports of Santa Rosa and Anconcito, where there are processing plants for seafood.



In directed fishing, operations were carried out during the night between 18:00 p.m. and 06:00 a.m., when the giant squid rise to surface waters to feed (Markaida, 2001) in some cases, and attracted by artificial persuasive lights or in the so-called dark (new moon), in other cases.

In the season of lesser availability of giant squid, artisanal fishing vessels direct the fishing effort to catch large pelagic fish such as yellowfin tuna (*Thunnus albacares*), skipjack tuna (*Katsuwonus pelamis*), bigeye tuna or big eye (*Thunnus obesus*), swordfish (*Xiphias gladius*), white weevil (*Makaira nigricans*), dorado (*Coryphaena hippurus*), albacore (*Thunnus* spp.), Pennant weevil (*Istiophorus platypterus*), weevil weevil (*Kajikia audax*), among others. These species were caught with the longline, using as bait the giant squid obtained in directed fishing, it was also caught as bycatch with gillnet.

In the season with the highest availability of giant squid, artisanal vessels diversified their fishing effort, some vessels carried out (directed) fishing operations near the coast (<40 nm), while others carried out multipurpose fishing activities using the gillnet surface and hand lines with jigging in oceanic waters (> 40 nm), especially in October when the availability of the resource increased, where incidental catch of giant squid was recorded in the industrial purse seine and the multipurpose trawl (SRP, 2020).

## 2.2 FISHING ZONES

The main fishing areas for giant squid during 2020 were distributed in the southern region of Puntilla de Santa Elena (Gulf of Guayaquil) and the border with Peru between 02° and 03° 25' South Latitude and 84° West Longitude, registering a greater concentration in the southwest of the Gulf of Guayaquil (Figure 1), mainly in areas with sea surface temperature (SST) between 19.5° and 22.5° C (Earth, 2020) (Figure 1).



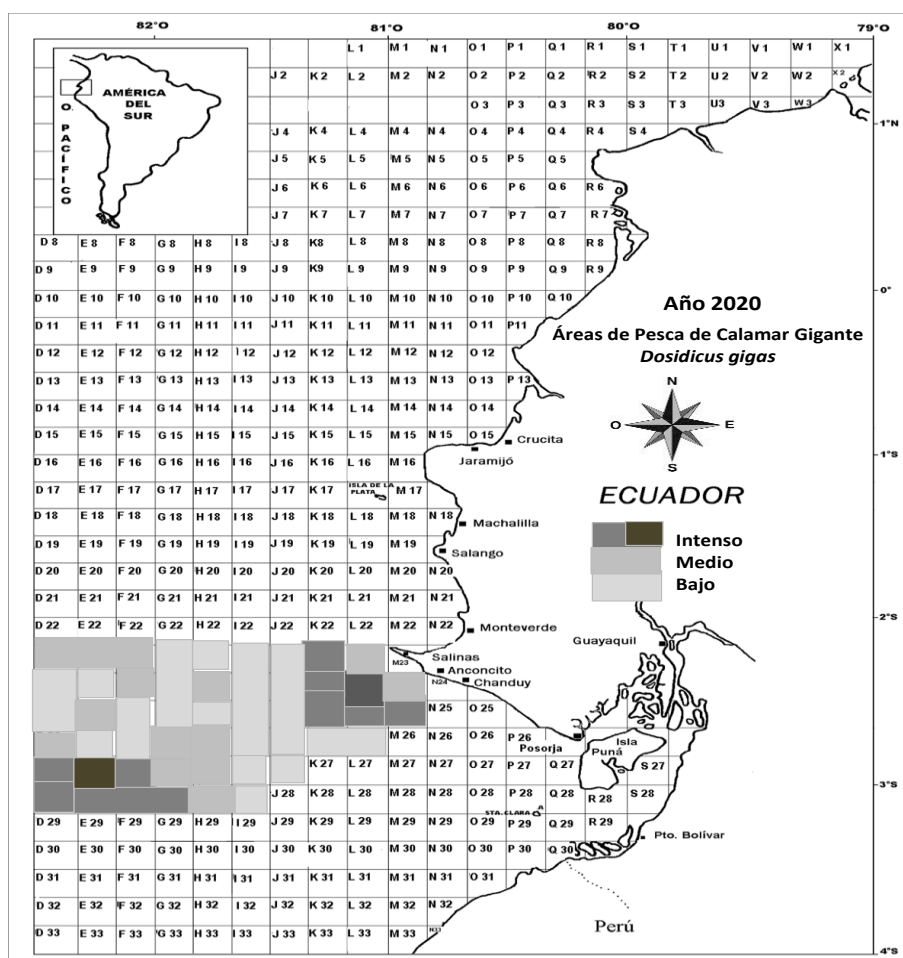


Figure 1. Spatial distribution of catches of *Dosidicus gigas* in the Gulf of Guayaquil, during 2020.

## 2.3 LANDINGS

In 2020, a total landing of 230.3 t was registered in the fishing ports of Santa Rosa and Anconito during the five months of sampling carried out in the low (January, February), medium (November, December) and high (October) seasons, the Percentages of landings by fishing season were: low 31.7%, medium 16.4% and high 51.9% (Table 1).

Table 1. Monthly landing (t) of giant squid in the fishing ports of Santa Rosa and Anconito in 2020

Year	Landing (t) monthly of giant squid												Total
	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
2020	42.5	30.5	(-)	(-)	(-)	(-)	(-)	(-)	(-)	119.5	26.5	11.3	230.3
2019	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

(-) Data not available due to Covid-19

## 3. BIOLOGICAL ASPECTS



### 3.1 MANTO LENGTH STRUCTURE

1 462 female and male organisms were analyzed with a range of sizes that fluctuated between 13 and 50 cm of mantle length (ML) for combined sexes, coming from incidental catch with gillnets and directed catch with manual jigs, caught inside and outside the Gulf of Guayaquil.

In the mantle length (ML) frequency distribution, the presence of two groups of length classes is shown: the first group with a mantle length range between 13 and 33 cm ML and a mode of 23 cm ML, and the second group between 34 and 50 cm ML with a mode of 40 cm ML (Figure 2). The 39.8% of the total organisms were above the estimated first maturity mantle length (35.54 cm  $LM_{50\%}$ ) (Morales and Pacheco, 2016).

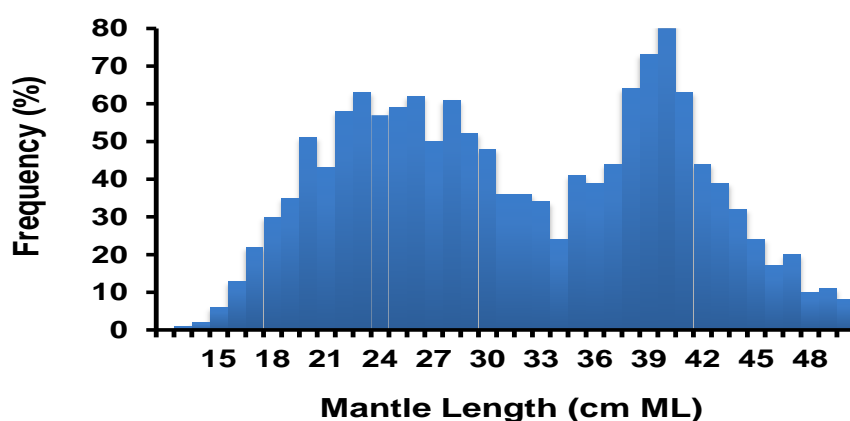
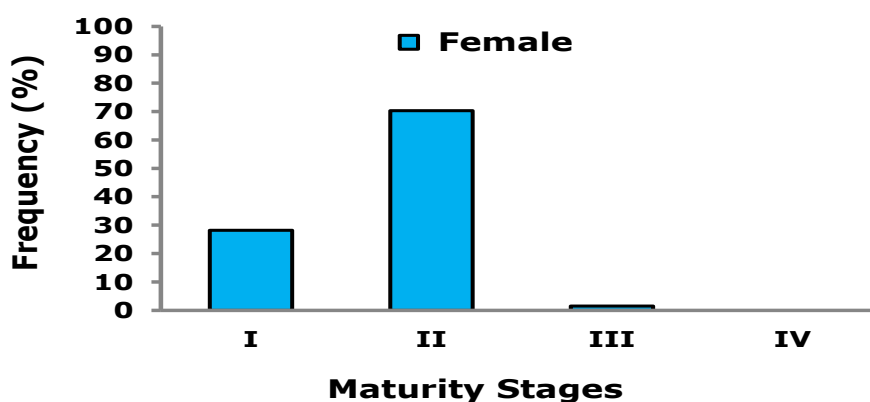


Figure 2.

Annual frequency distributions by mantle length (ML), of giant squid recorded in Ecuadorian waters, during 2020.

### 3.2 SEXUAL MATURITY STAGES

To determine the maturity stages, the Nesis scale (1983) was used. The female organisms analyzed (1 182) registered 28.2% in stage I (immature), 70.3% stage II (maturing) and 1.5% stage III (mature) (Figure 3 Table 2). It should be noted that in the sampling period, females were more frequent and more numerous than males throughout the year.



**Figure 3.** Percentage composition of the stages of sexual maturity of *Dosidicus gigas*, during 2020.

### 3.3 MATURITY STAGES BY SIZE CLASSES

A total of 1 182 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 2).

**Table 2.** Number of female organisms by size class and maturity stages 2020

Stages	12 - 24 cm LM	25 - 39 cm LM	40 - 50 cm LM	> a 51 cm LM
	Nro.	Nro.	Nro.	Nro.
Stage I	286	44	3	0
Stage II	14	557	260	0
Stage III	0	5	13	0
Stage IV	0	0	0	0

## 4. DISCUSSION AND CONCLUSION

The artisanal vessels belonging to the fishing ports of Santa Rosa and Anconcito, carried out directed fishing and incidental fishing operations inside and outside the Gulf of Guayaquil according to the availability of the resource. In the months of January, February and November, December, low catches were registered, because the schools were scattered, while in October, important catches (51.9%) were registered due to the higher concentration of squid in the fishing areas, which were found distributed to the southwest of the Gulf of Guayaquil, mainly in areas with temperatures between 21.5 ° C and 24.5 ° C.

The giant squid was used mostly as bait for the fishing of large pelagic fish meanwhile incidental catch was commercialized in the local processing plants, which indicates that the resource is being well used. However when this species is caught by purse seine

and/or trawl net, small organisms with sizes less than 25 cm in mantle length are captured, due to the small mesh gap used in the headland of these nets, where the target catch is collected.

The mantle length frequency distribution fluctuated between 13 and 50 cm ML for females and males and presents two groups of size class with modes at 23 cm ML and 40 cm ML, respectively. The first group congregated 56% of the organisms with lengths between 13 and 33 cm ML, coming mostly from directed fishing, whose sizes were below the length of the first maturity mantle (35.54 cm ML50%), while the second group gathered 44% of organisms with lengths between 34 and 50 cm ML, whose sizes have mostly reached first maturity and come mainly from bycatch.

In this range of sizes (13 and 50 cm LM), females were more frequent and more numerous than males, registering a state of gonadal maturity in stages I (26.7%) and II (71.8%), which would reveal that the maturity stages recorded in the fishing areas do not correspond to spawning periods in the Gulf of Guayaquil, concluding that the spawning of giant squid does not occur near the coast, it possibly occurs in oceanic waters.

## 5. REFERENCES

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