

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

*Held virtually, 27 September to 2 October 2021*

**SC9-Doc25**

**Chile Annual Report – Squid**

*Chile*



# **CHILE ANNUAL REPORT**

## **SPRFMO-SCIENTIFIC COMMITTEE**

**Jumbo squid (*Dosidicus gigas*)**

September, 2021.



## 1 DESCRIPTION OF THE FISHERY

### 1.1 Composition of the Fleet.

As of 2020, the target catch of jumbo squid in Chile is made only by the artisanal fleet. However, the industrial fleet has made captures only as by-catch, in the course of this year.

An annual catch quota, which by 2020 accounted for 200000 tons available for extraction jumbo squid is established. However, this measure no longer establishes a target quota for the artisanal and industrial sectors

#### Artisanal Fleet

The fishing activity of the artisanal fleet during 2020 managed to land 53,967 tons, equivalent to 98.11% of the national total (55,006 tons). This activity had the participation of 2,079 vessels of dimensions equal to or less than 18 meters in length (Table 1). The largest fishing operation was carried out by those vessels of dimensions equal to or less than 12 meters in length, whose participation corresponded to 94.52%, equivalent to 1965 vessels. At the same time, this type of vessel landed 96.44% of the total landings made by the artisanal fleet.

Among the fishing gear used during 2020 by the artisanal fleet, there are purse seine, gillnet, spinel, jig, among others. However, the objective fishing of this resource is carried out only with jigging by this fleet. Thus, 2,055 vessels, equivalent to 98.85% of the total operating in this fleet, landed 99.70% of the tons caught on this resource in 2020. On the other hand, purse seine fishing and other gear only represented 0.30% of landings totals made.

When observing the 2006-2020 period, it is identified that as of 2011 the number of vessels operating on jumbo squid has exceeded 1,000, with 2012 being the year that registered the highest number. However, the increase in the participation of vessels has not meant a considerable increase in landings (Table 1).

Table 1: Artisanal fleet composed of vessels equal to or less than 18 meters in length, which operated in Chile to capture *Dosidicus gigas* in the period 2006-2020.

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
N° Boats (≤18m)	788	688	708	613	706	1880	2180	1540	1747	1419	1657	2102	2056	1066	2079
landing (t)	24330	8329	13544	5114	6604	13870	11495	9722	12539	10424	14157	11535	11057	1730	5396
	7	9	4	0	9	8	5	4	6	2	6	1	6	8	7

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## Industrial Fleet

Unlike previous years, during 2020 the fishing activity of the industrial fleet was mainly carried out as an accompanying fauna, landing a total of 1039 tons corresponding to 1.89% of the total landing made in Chile during this year (55,006 tons).

The industrial landings of jumbo squid had the participation of 35 vessels, of which 19 landed more than 3 tons per fishing trip (Table 2). Of these vessels, only one carried out target fishing on jumbo squid, representing 5.26% of the vessels that operated on this resource, landing more than 3 tons. Therefore, 94.74% of the vessels that operated in 2020 did so with jumbo squid landings as by-catch in the operation on other fisheries

Of the 18 vessels with jumbo squid landings as accompanying fauna, 15 corresponded to vessels that operated with purse seine (78.95%) and 3 (15.79%) with mid-water trawl.

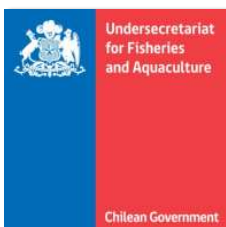
Regarding the total tons landed and their relationship with the fishing gear used during 2020, 60.90% correspond to catches made with mid-water trawling, 37.91% to purse seine and only 1.19% of landings correspond to jigging.

During the 2006-2020 period there is a decrease in the number of industrial vessels that have operated annually and landed more than 3 tons of *Dosidicus gigas*. The years 2010 and 2014 stand out as those in which the most tons were landed. During 2020, the landings of the industrial fleet mainly corresponded to captures as companion fauna, therefore, the numbers of vessels indicated in Table 2 respond to this characteristic. Situation very different from that observed in previous years where the indicated number corresponds to the vessels that carried out target fishing on jumbo squid.

Table 2: Industrial fleet with landings greater than 3 tons per trip, which operated in Chile to capture *Dosidicus gigas* in the 2006-2020 period..

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
N° Ships	59	60	73	41	83	86	57	32	35	32	18	19	12	15	19
Total Landing (t)*	7332	40427	8557	3405	134379	24787	30010	9047	51206	39446	39338	39130	35351	40666	1039

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## 1.2 Catches, Seasonality of Catches, Fishing Grounds and By-catch.

### 1.2.1 Catches

Since 2012 there has been an annual catch quota for jumbo squid in Chile, which in 2020 corresponded to 200,000 tons.

During the 2012-2020 period, jumbo squid landings showed a stable trend until 2018, since in 2019, the artisanal fleet could not capture this resource due to its low availability in the fishing grounds of this fleet. However, the industrial fleet landed the total assigned quota (Figure 1). A different scenario is observed during 2020, the year in which the industrial fleet only reached a landing of 1,039 tons, while the artisanal fleet contributed 53,967 tons.

In the last 2 years, the trend regarding the quantity landed has remained at similar values. However, these values are well below the landings recorded in previous years.

2016 stands out as the year in which the artisanal fleet landed the highest number of tons in this period 2012-2020. On the other hand, the total catches have been made in the Exclusive Economic Zone (EEZ) of the Chilean maritime territory.

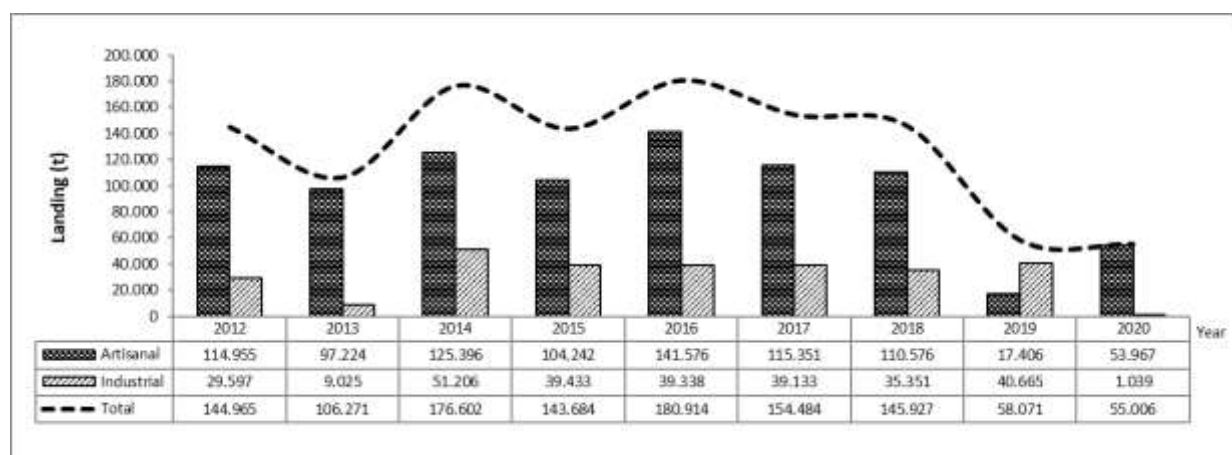


Figure 1.- Tons landed of *D. gigas* in the period 2012-2020, by the artisanal and industrial fleet (Source: SERNAPESCA)..

### 1.2.2 Seasonality of catches during 2012-2020

In general, catches are mainly concentrated during the first 8 months of the year, with a decrease in extractive activity from the months of September to October. In this regard, there are monthly seasonal variations that are explained by operational and economic aspects of the fishery (Figure 2). In the particular case of 2020, the fishing activity on jumbo squid was mainly concentrated between February and May. Subsequently, the availability of this resource for fishing activity began to decrease to landing values below those observed in previous years.

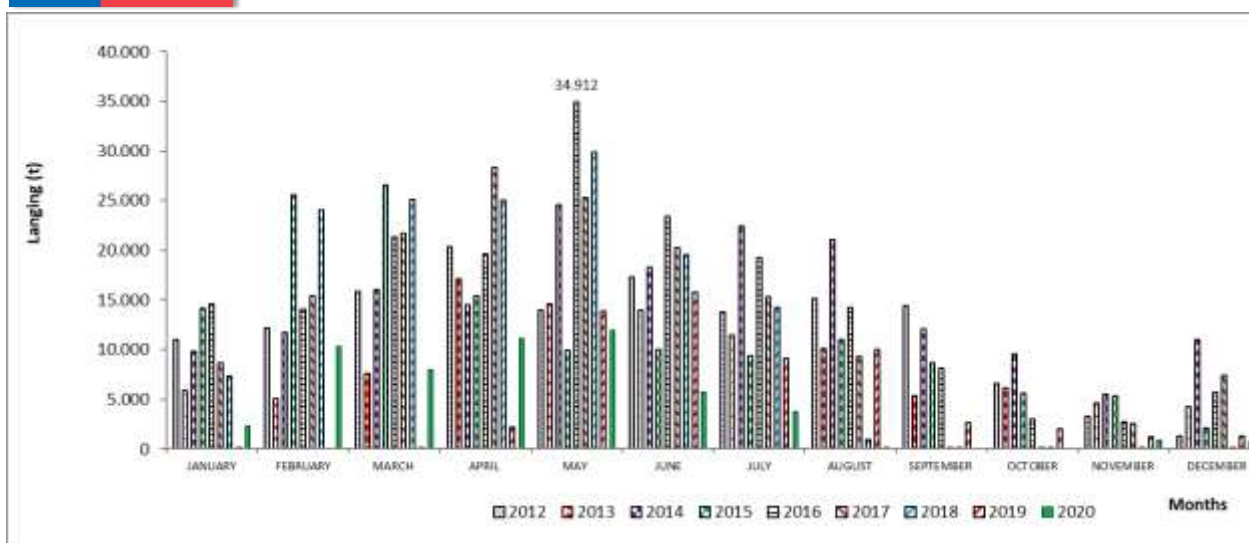


Figure 2. Tons landed of *D. gigas* in the 2012-2020 period, distributed monthly (Source: SERNAPESCA).

### 1.2.3 Spatial Distribution of Catches

During 2020, the geographical distribution of the sets of the industrial fleet that operated on jumbo squid were geographically distributed between 31°24'S and 39°00'S, (Figure 3). However, the largest landings were recorded in the Biobío Region, around 36°00'LS and 37°45'LS.

Regarding the artisanal fleet, it concentrated its operations mainly between 29 ° 21'LS and 38 ° 30'LS (Figure 4). However, the largest landings were recorded between the Biobío Region and the Valparaíso Region.

### 1.2.4 Fishing Grounds and By-catch

#### Artisanal fleet

As in 2019, during 2020 no incidental capture of marine mammals, birds or turtles was observed. This trend is not new, and corresponds to the level of selectivity of the fishing gear, consequently, the presence of accompanying fauna and incidental capture in the cuttlefish fishery by the artisanal fleet is null.

#### Industrial fleet

The development of the extractive activity of this fleet was carried out mainly from jumbo squid catches as by-catch other fisheries. Therefore, the measurement of the interaction and incidental fishing of marine mammals, birds and turtles is not applicable in this case. However, the fisheries where this resource was captured showed low incidental catch.

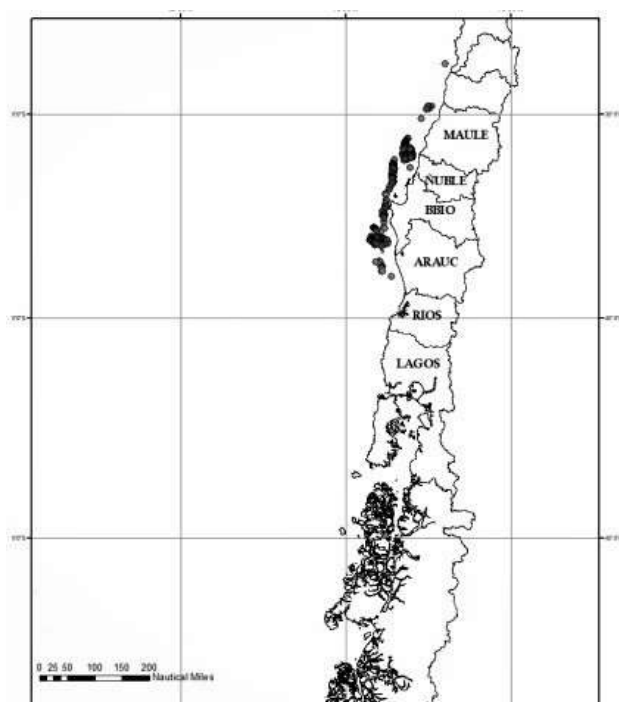


Figure 3.- Spatial distribution of fishing sets with catches of *D. gigas* during 2020 within the industrial fleet (Source: IFOP).



Figure 4.- Spatial distribution of fishing sets with catches of *D. gigas* during 2020 within the artisanal fleet (Source: IFOP).



## 2 EFFORT AND CPUE FOR *Dosidicus gigas* FISHERY

### Industrial Effort

As a consequence of the captures as an accompanying fauna of this resource, during 2020 it was not possible to calculate the effort that would allow continuity of what was obtained until 2019. This situation will be permanent from 2020 on in accordance with current legislation. in Chile.

### Artisanal Effort

The fishing effort recorded for the artisanal fleet in the 2015-2020 period shows constant values between 6 and 8 hours of average fishing in all monitored regions. Similar values stand out for 2020 among all, close to 8 hours of average fishing (Figure 5).

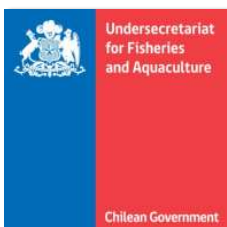


Figure 5.- Average fishing effort per trip, expressed in effective fishing hours, per year and region. Boat fleet. Source: IFOP.

### **Industrial Performance**

As indicated in the item "industrial effort", the fishing performance indicator for the industrial fleet cannot be updated to give continuity to the series of data obtained until 2019, in accordance with current legislation in Chile. However, the necessary internal improvements are being managed to establish an indicator that allows reporting the change in the behavior of the extraction of jumbo squid from this fleet in Chile.





### Artisanal performance

The results of the performance indicator for the artisanal fleet were obtained from the target fishing operation carried out with the jig fishing gear, expressed in kilograms / (fishing hours \* jigging). In this regard, this indicator has shown a negative trend from 2015 to 2020. However, the data obtained in 2020 show a similarity with the trend observed in 2016. Nevertheless, the maximum performance values are similar to those obtained in 2018 (Figure 6).

The lowest values in each annual series corresponded to the summer season, possibly due to a lower availability of jumbo squid on the Chilean coast at that time of year due to the displacement of this resource towards oceanic areas.

It is important to indicate that from the end of 2017 to 2019, the fishing activity of jumbo squid has shown an intermittent behavior, with periods of no activity between September and February of each year, which confirms a possible decrease in the availability or intention of fishing for the resource in the spring-summer period.



Figure 6.- Historical monthly performance, expressed in kilograms / (fishing hours \* jigsaws) per month, year, of the artisanal fleet on jumbo squid as target species, period 2015-2020. Source: IFOP.

### 3 RESEARCH PROGRAMS

The research program for 2020 is mainly composed of projects developed by annual agreement with the Institute for Fisheries Development (IFOP), and complemented by other projects required by the fishing authority, which allow it to support decision-making.



The projects prepared annually by IFOP are:

- **Monitoring of the jumbo squid fishery (*Dosidicus gigas*)**

This study allows the collection of information on the evolution of the main biological and fishing indicators associated with the jumbo squid fishery and its accompanying fauna. The monitoring was concentrated in the main regions of the country where the fishery takes place, which in the particular case of artisanal fishing takes place mainly in the regions of Coquimbo, Valparaíso and Biobío, the latter being the region where almost all of the industrial fishing.

- **Evaluation of the status and possibility of exploitation**

This project aims at providing the Technical Scientific Committee (CCT) with the necessary technical advice, data, background and information necessary for the analysis of status and exploitation possibilities; determining the levels of Biologically Acceptable Catch (CBA) for the following annual extractive season in the jumbo squid fishery.

#### 4 BIOLOGICAL SAMPLING, AND LENGTH AND AGE COMPOSITION OF THE CATCH.

##### 4.1 Biological sampling

The collection of all biological data from the industrial fleet was carried out mainly in the Biobío Region, always through on-board samplings carried out by scientific observers.

Regarding the data collection in the artisanal fleet, this was carried out at the time of disembarkation or on board the ships when it was feasible. Specific biological samplings were carried out in process plants or on land at the time of landing as possible, always by scientific observers.

Tables 3 and 4 show the number of specimens sampled (length and biological) for the industrial and artisanal fleet, respectively.

Table 3.- Number of trips, sets and samples studied from the captures of accompanying fauna of the industrial fleet according to the type of jumbo squid sampling. 2020 season.

Year	Sampling type					
	Length			Biological		
	Fishing trip	Fishing set	Specimens	Fishing trip	Fishing set	Specimens
2020	15	16	558	22	28	708

Source: IFOP



Table 4.- Number of trips, sets and specimens sampled from the artisanal fleet as target fishing, according to the type of sampling in the artisanal jumbo squid fishery. 2020 Season.

Region	Sampling type			
	Length		Biological	
	Fishing trip	Specimens	Fishing trip	Specimens
Coquimbo	14	340		
Valparaíso	43	1256	33	932
Maule	72	2299		
Biobío	49	1970	27	810
Total	178	5865	60	1742

Source IFOP

## 4.2 Length and age composition of catches

### Industrial fleet

When observing the size structures of the jumbo squid catches made by the industrial fleet in the 2014-2020 period, both sexes combined, it is highlighted that the catches have generally been made on specimens with sizes above the reference size (Liu *et al.* 2010). However, during 2019 52% of the monitored specimens were under this measure.

During 2020, specimens fluctuated between 48.5 cm and 90.5 cm LDM, observing 88% of the specimens over the size of sexual maturity (Liu *et al.* 2010). On the other hand, it is not possible to identify a specific mode value, but the highest proportion of specimens registered a BOM of 66.5 cm (Figure 7).

### Artisanal Fleet

The size structure observed for the artisanal fleet during 2020 corresponds to the data obtained in Coquimbo, Valparaíso, Maule and Biobío Regions. In this regard, the size composition in all the sampled regions was made up of large individuals, with 85% of the specimens measured above the reference size (Figure 8). Valparaíso Region stands out, with specimens that fluctuated between 34.5 and 94.5 cm LDM. 96% of the monitored specimens were above the reference size, as well as 62% were between 74.5 cm and 80.5 cm LDM (Figure 8).

On the other hand, the Coquimbo Region registered the smallest specimens fluctuating between 36.5 and 86.5 cm LDM. On the other hand, this was the only region where specimens below the reference size exceeded 10% (Figure 8).

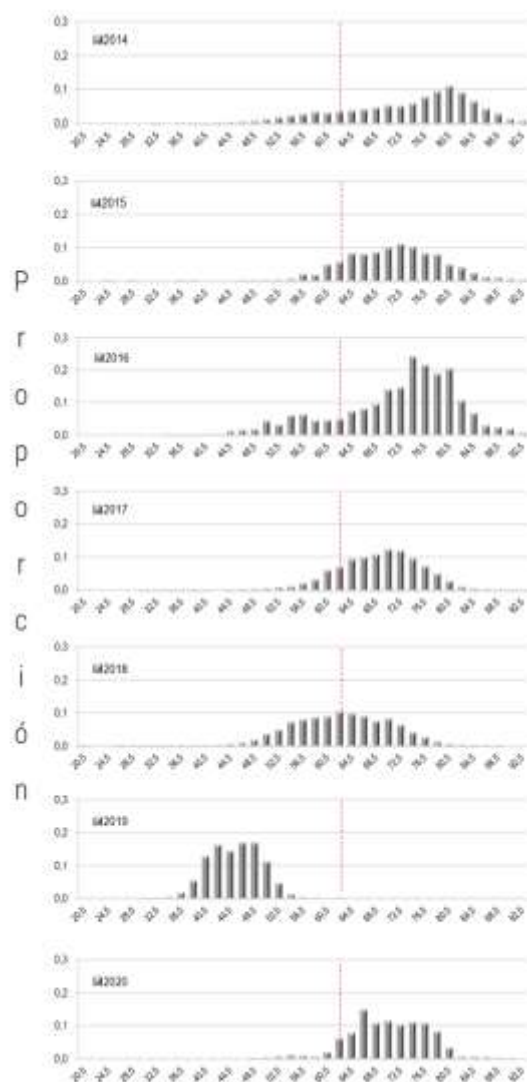


Figure 7.- Annual mantle length composition (cm) in industrial jumbo squid catches (both sexes combined). Vertical red line corresponds to the size of sexual maturity of the females estimated by Liu *et al.* (2010). Seasons 2014-2020. Source: IFOP.

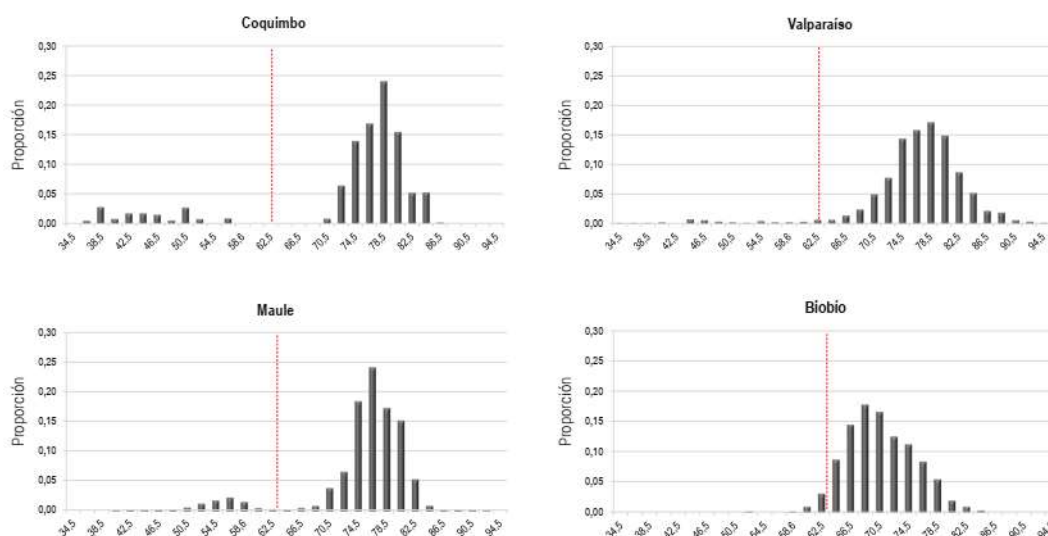


Figure 8-Composition of mantle length (cm) weighted to the artisanal catches of jumbo squid (both sexes combined) by region. Vertical red line corresponds to the length of sexual maturity in females estimated by Liu *et al.* (2010), year 2020. Source: IFOP

## 5. AT-SEA AND PORT SAMPLING PROGRAM

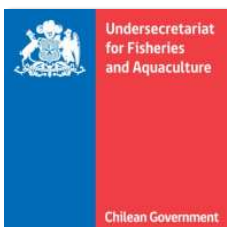
The samplings were carried out with the participation of Scientific Observers (OC) on board and in port, activities that covered the artisanal and industrial sectors.

For the particular case of the industrial fleet, during 2020 no voyage directed to jumbo squid was monitored, since most of the information collected from this fleet was obtained by observers on board in the fishing operations directed at other resources, since the Monitored specimens correspond to accompanying fauna.

For the particular case of the artisanal fleet, it is observed that during 2020 there was a sampling coverage in all the regions of interest for this fishery, reaching a total of 5.09% of total coverage (Table 5).

Table 5.- Number of monitored trips (on land and embarked), total trips and sampling coverage in the artisanal jumbo squid fishery by region

Region	Fishing trip		
	Monitored	Totals	Coverage percentage
Coquimbo	85	1627	5.22
Valparaíso	129	3417	3.78
Maule	324	3218	10.07
Biobío	321	8619	3.72
<b>Total</b>	<b>859</b>	<b>16.881</b>	<b>5.09</b>



## 6. ADMINISTRATIVE MEASURES

### Current Administration Measures

The administrative measures applied to the jumbo squid fishery began in 2012, with the aim of maintaining the sustainability of the fishery for this resource. In this context, the Undersecretary of Fisheries and Aquaculture declared this resource in a state of full exploitation, restricting access. On the other hand, in the same year, an annual global catch quota was established and its fishing was prohibited as a target species for making flour (Table 6).

Table 6.- Main existing administration measures in Chile for jumbo squid.

ADMINISTRATIVE MEASURES	Purpose	Normative
Regimen	Freedom of Fishing Regime and General Access Regime, both assimilated to a state of full exploitation from the Arica and Parinacota Region to the Magallanes Region.	Res. Ex. N° 752/12 Res. Ex. N° 3421/14 Res. Ex. N° 3.974/2019
Access	Suspension of the registration of the resource in the Artisanal Fisheries Registry (RPA), between the regions of Arica and Parinacota to the Region of Magallanes, for having reached the state of full exploitation. Valid until December 31. 2024.	Res. Ex. N° 752/12 Res. Ex. N° 3421/14 Res. Ex. N° 3.974/2019
Annual Global Catch Quota (CGAC)	The CGAC of cuttlefish for the year 2020 is 200,000 tons: Reserve quota for research: 1000 t Reserve quota for by-catch: 4000 t Target quota: 195,000 t	D. Ex. Folio DEXE202000130 MINECON
Fishing gear	It establishes that jumbo squid can only be extracted as a target fish, using jig or hand line as a fishing tackle.	Ley N° 21.134/2019
Other measures	Jumbo squid ( <i>Dosidicus gigas</i> ) is eliminated from the list of hydrobiological resources to be used as raw material in the production of fishmeal.	D.S N° 98/2012