7th MEETING OF THE SCIENTIFIC COMMITTEE

La Havana, Cuba, 7 to 12 October 2019

SC7-Doc30

Chile's Annual report (Jumbo squid)

Chile

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CHILE ANNUAL REPORT

SPRFMO-SCIENTIFIC COMMITTEE

Jumbo squid (*Dosidicus gigas*)

September, 2019.

1 DESCRIPTION OF THE FISHERY

1.1 Composition of the Fleet.

In Chile the jumbo squid fishery has participation of artisanal and industrial vessels. The allocation of the national quota for the industrial sector corresponds to 20% and the remaining 80% is assigned to the artisanal sector.

Artisanal Fleet

During 2018, the total of artisanal vessels that operated on the jumbo squid resource corresponded to 2075 vessels, of dimensions equal to or less than 18 meters in length. Among the vessels with the greatest operation, those less than 12 m in length stand out. This represented 96.15% of the artisanal operation in this resource.

It is important to highlight that 97,055% of the landings made in 2018, corresponded to vessels that used jigging as fishing gear. On the other hand, the fence, as a fishing gear, represented 2.88% of the landings. Therefore, only 0.065% of the landings recorded jumbo squid in other fishing gear

Table 1: Artisanal fleet operating between 2005 and 2018, composed of vessels smaller than 18 meters in length, distributed throughout Chile and authorized to capture *Dosidicus gigas*

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
N° Boats (>18m)	926	788	688	708	613	706	1880	2180	1540	1747	1419	1657	2102	2075
Langing (t)	283420	243307	83299	135444	51140	66049	138708	114955	97224	125396	104242	141576	115351	110576

Source: SERNAPESCA

Industrial Fleet

The industrial landings made during 2018, were mainly executed by vessels that used the mid-water trawl as an extraction method for jumbo squid as the target fishery (91.05%). However, the extraction of this resource with trawl represented 8.90%, as a consequence of the presence of jumbo squid as an accompanying fauna in other fisheries. On the other hand, the operation with purse seining fence and jigging accounted for 0.04% and 0.01% respectively of the extraction in this year.

Table 2 shows the industrial warehouses that register activity, with landings exceeding three tons per tide and capture during the 2005-2018.The last three years correspond to the smallest number of industrial vessels that landed more than 3 tons of *Dosidicus gigas*. This number includes both those that cuttlefish as an objective species, and those that declared it as an accompanying fauna

Table 2.- Industrial fleet that operated from 2005 to 2018, with landings greater than 3 tons per trip. The landing includes the total reported by the industrial fleet.

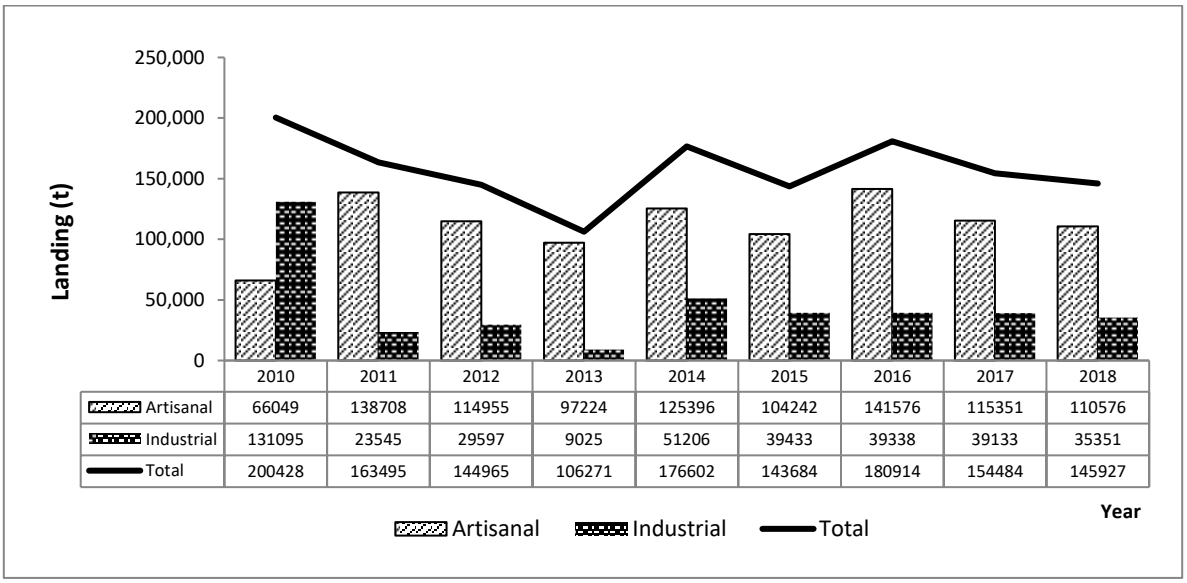
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
N° Ships	104	59	60	73	41	83	86	57	32	35	32	18	19	12
Total Landing (t)	13155	7332	40427	8557	3405	134379	24787	30010	9047	51206	39446	39338	39130	35351

Source: SERNAPESCA

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

1.2.1 Catches

The largest jumbo squid landings in recent years can be identified in 2010, 2014 and 2016 (Figure 1). During 2010 the industrial landings exceed the artisan landings, which allow explaining the high value of the total landings in that year. As of 2011, the artisanal fleet has made more than 70% of the total landing. The 2018 season was characterized, as in 2017, by a decrease in landings made by the artisanal fleet compared to the previous year. On the other hand, the total catches were made in the Exclusive Economic Zone (EEZ) of the Chilean maritime territory.



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Artisanal	66049	138708	114955	97224	125396	104242	141576	115351	110576
Industrial	131095	23545	29597	9025	51206	39433	39338	39133	35351
Total	200428	163495	144965	106271	176602	143684	180914	154484	145927

Figure 1.- Landing by artisanal fishing and industrial fishing. (Source: SERNAPESCA)

1.2.2 **Temporality of catches during 2011-2017**

In general, catches are mainly concentrated during the first 8 months of the year, reducing extractive activity from the months of September October. In this regard, irregular monthly seasonal variations are recorded that are explained by operational and economic aspects of the fishery (Figure 2). In the particular case of 2018, the fishing activity on jumbo squid was mostly concentrated between the months of February and May. Subsequently, the availability of this resource began to decrease from August to landing values well below those observed in previous years.

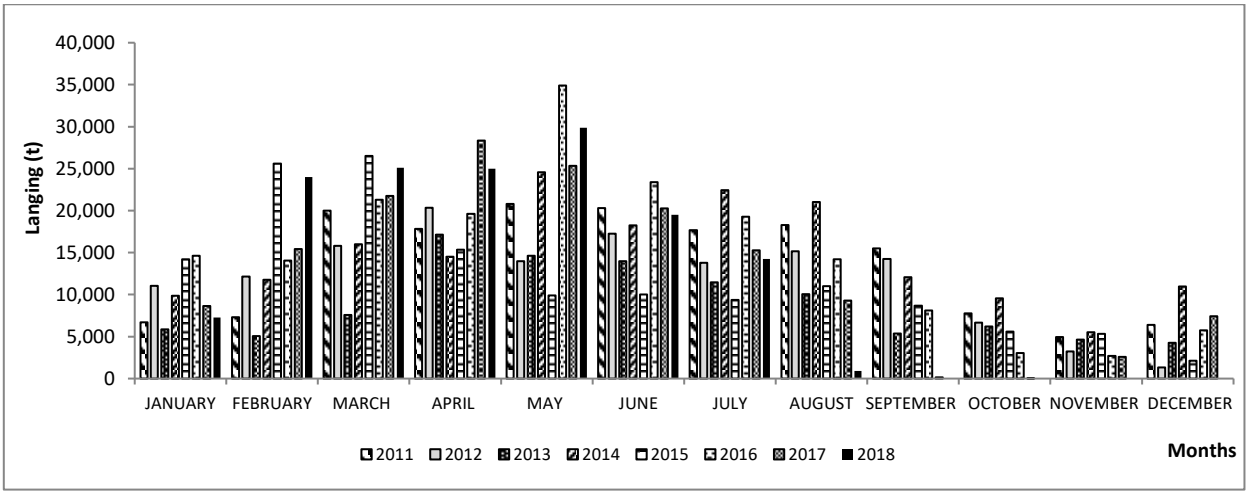


Figure 2. Total monthly landing in tons of *D. gigas*, 2011-2018. (Source: SERNAPESCA)

1.2.2 **Spatial Distribution of Catches**

For the year 2018, the geographical distribution of the sets of the industrial fleet that operates on jumbo squid as a target species and uses mid-water trawl, was geographically distributed between 35 ° 00´LS and 39 ° 00´LS, and between 7.5 and 34.5 miles from the coast, averaging an operation at 28.8 nm from the coast (Figure 3).

In the case of artisanal fishing, it concentrated its operation mainly between 32 ° 00´LS and 38 ° 00´LS, and between 1 and 60 nm (Figure 4).

According to the temporary space distribution of the official landing reported, the Biobío Region showed the largest participation in the country, with 67% of the total landing.

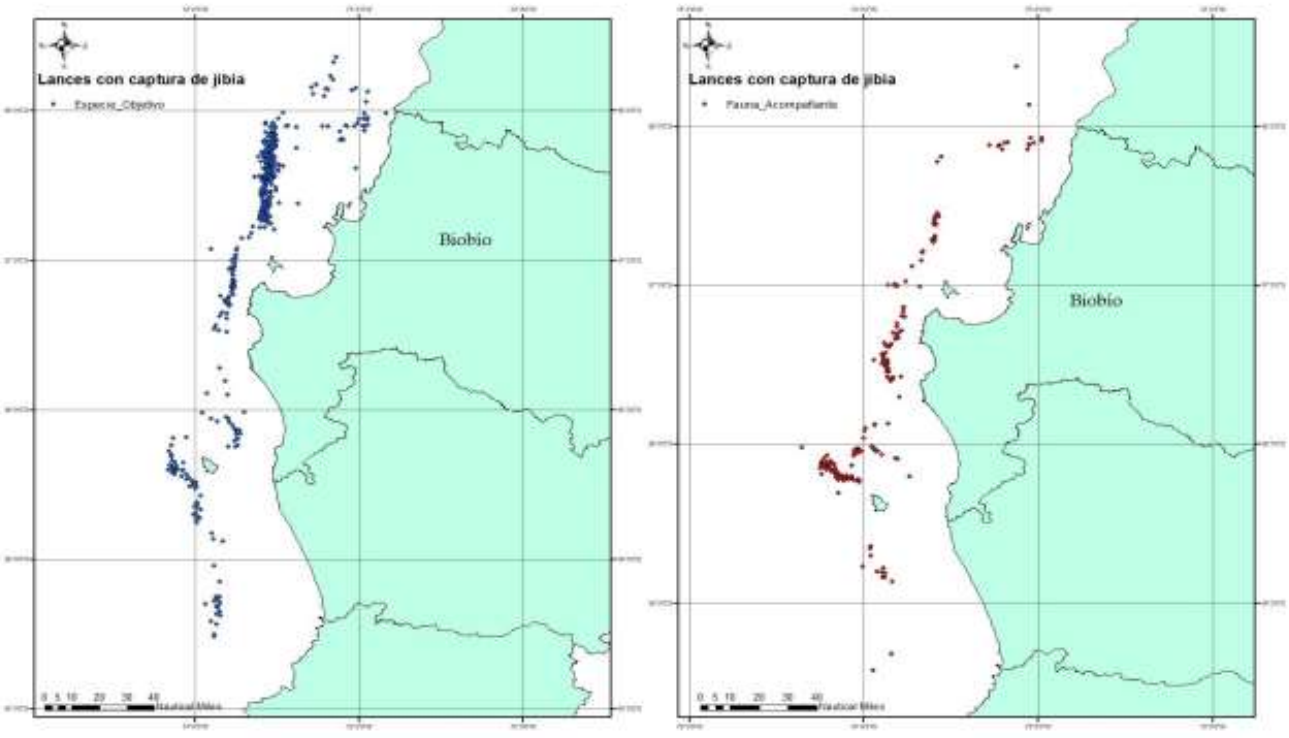


Figure 3.-Spatial distribution of fishing sets with catches of *D. gigas* as an objective resource (left) and as accompanying fauna (right) during 2018 in the industrial fleet, Source: IFOP.

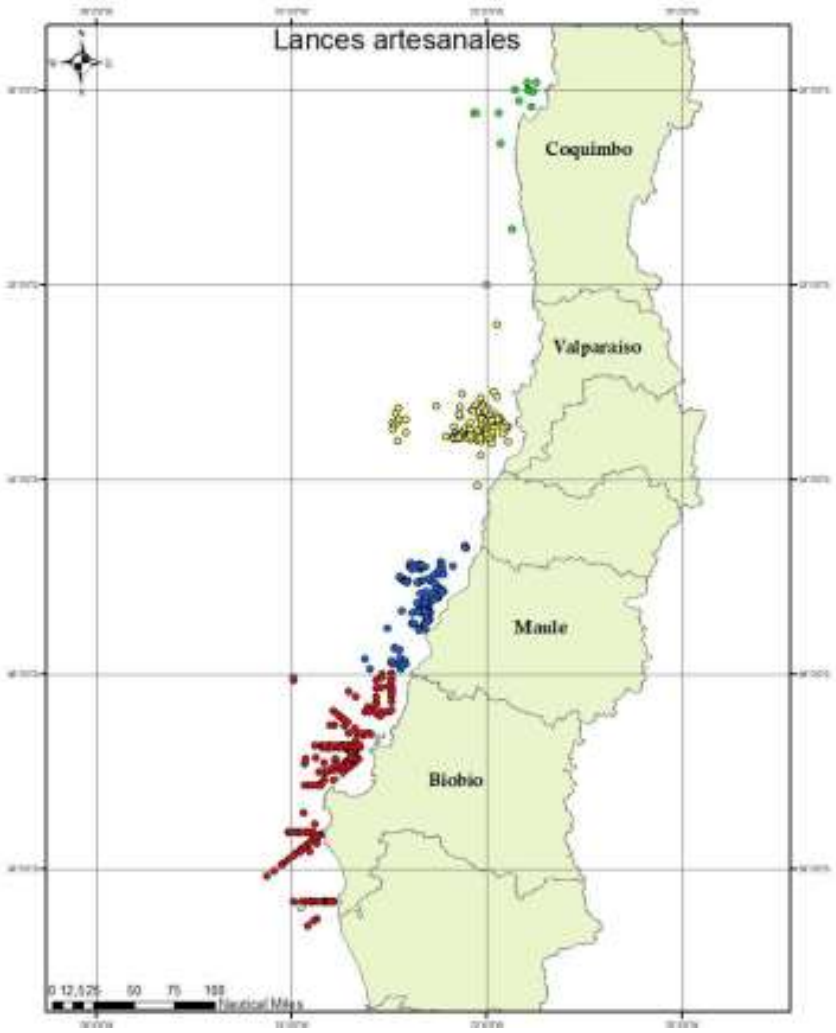


Figure 4.-Geographical distribution of sets with objective capture of jumbo squid of the artisanal fleet between the Coquimbo and Biobío Regions, 2018 season. Source: IFOP

2 EFFORT AND CPUE FOR *Dosidicus gigas* FISHERY

Industrial Effort

The total monthly effort of vessels greater than 18 meters in length (hours of trawl, "horas de arrastre" ha), considering the jumbo squid fishery as the target species during the 2018 season, showed greater fluctuation and a slight trend towards higher values than those registered the previous year .

When analyzing the historical series of the effort of ships with a length greater than 18 meters, it was observed that the high periods corresponded to autumn-winter during 2013-2014. During 2015, fishing effort was observed only in the first quarter, as a result of the early depletion of the quota. For the particular case of 2018, the greatest accumulated effort was recorded during February, which reached 332.14 h.a., a value similar to that determined in April and July, months close to 300 h.a. Finally, there is an important difference between the effort recorded in August 2017 versus August 2018, the latter being the one with the lowest value (Figure 5).

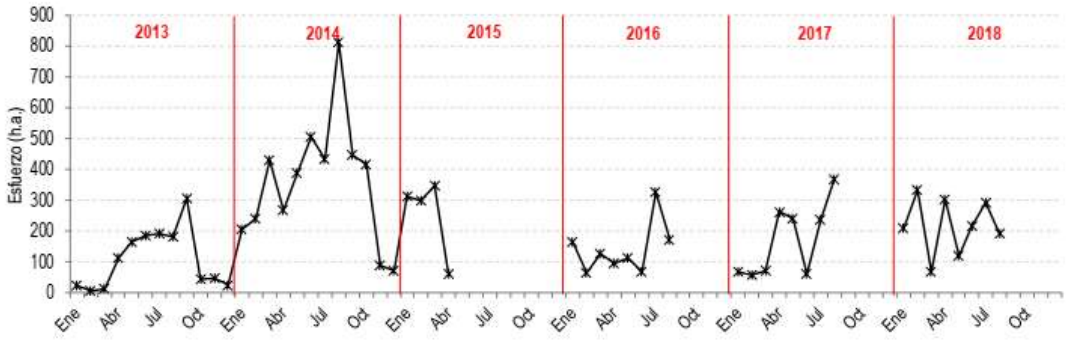


Figure 5- Monthly effort with squid jumbo catches as target species. 2013-2018 periods (Source: IFOP).

Artisanal Effort

In the case of the artisanal sector that operated mainly with pot and with boats less than 12 meters in length, the effort indicator showed an upward trend, in all the regions monitored from 2016 to 2018, the most evident being the effort measured as hours out of port (Figure 6).

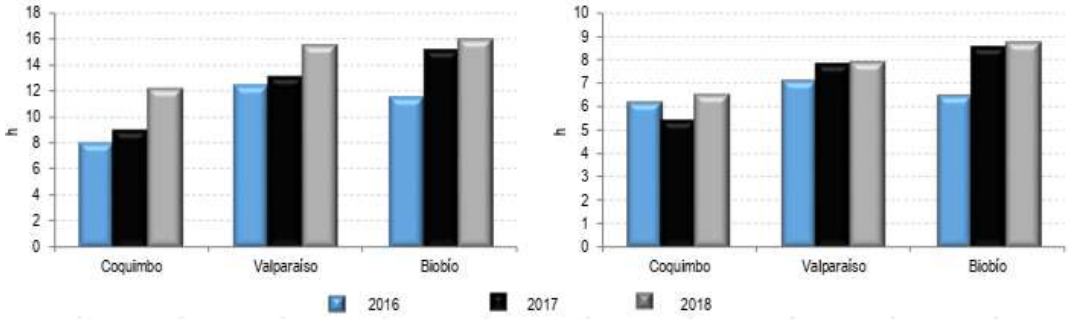


Figure 6.- Annual and regional average travel effort (left figure) and effort expressed in effective annual and regional average fishing hours (Right figure). Source: IFOP.

CPUE Industrial

In industrial vessels, the "viaje con pesca" (vcp) effort unit was replaced by "días fuera de puerto" (dfp), since *D. gigas* fishing trips can last more than one day, so The duration of the trip with fishing is a better estimate of the nominal effort. This modification is not necessary in boats and craft boats because the fishing trip normally lasts one day. These efforts are in units of nominal effort and are not standardized, so fishing performance should not be interpreted as an abundance index. For the latter it is necessary to adjust a statistical model of the CPUE. However, for the evaluation of jumbo squid stock, what is of interest is the variation of the abundance within a year, since the cohorts change per year. Depletion models within a year are based on abundance indices or standardized CPUE.

Figure 7 shows that the industrial CPUE increased to 50 t / dpf in 2015, then shows a decreasing trend reaching 35 t / dfp in 2018. This decrease can be explained by the behavior of the resource (decrease in abundance and / or the size of *D. gigas*) or due to changes in the operation of the fleet (different relative importance of the participation of the different vessels and / or operation restricted to certain months of better caliber, among other causes).

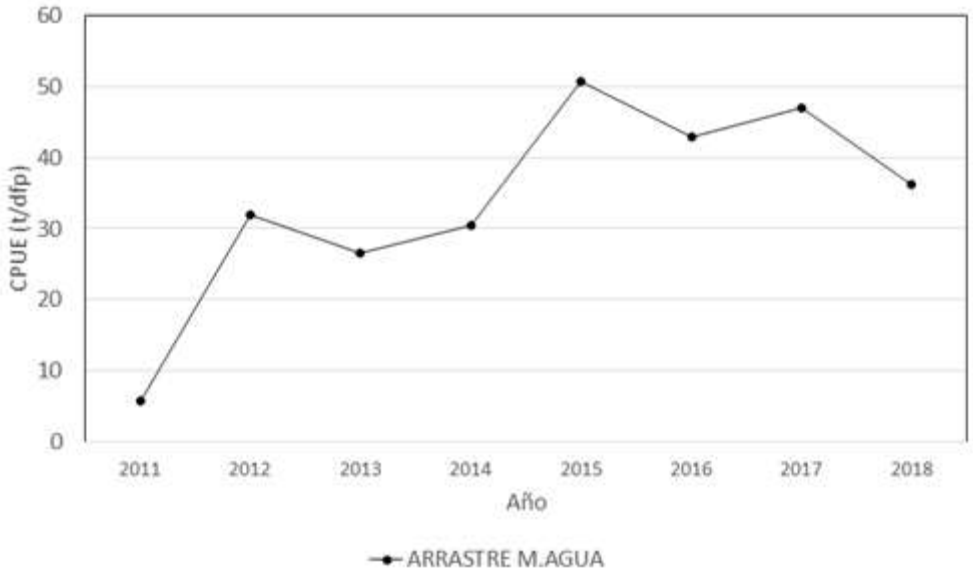


Figure 7- Industrial yields (CPUE (tons / "días fuera de puerto") of jumbo squid with "mid-water trawl (IFOP source)

CPUE Artisanal

The nominal performance (landing / number of trips with fishing) of jumbo squid in the craft operation boats (with line and jigging records, during 2018 increased with respect to 2017, suggesting an increasing trend from its lowest value in the 2012. This increase in CPUE was obtained with a notable reduction in the number of trips with fishing in 2018 (Figure 8).

It is important to indicate that the boat operation corresponds to more than 90% of jumbo squid landings during 2018.

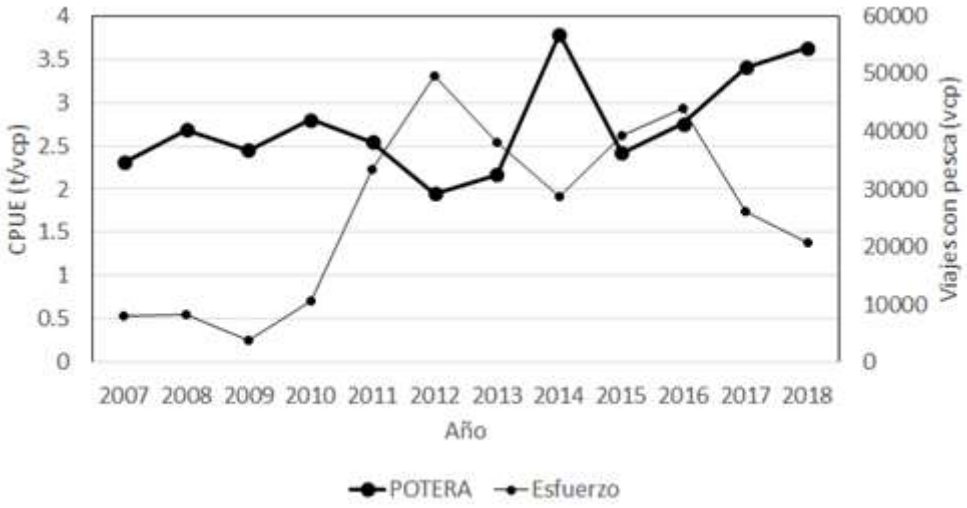


Figure 8.- Yields of jumbo squid of boats, 2007-2017. (Source: IFOP)

By catch of the industrial fleet

The by-catch identified during the fishing season 2018, in the landings of the industrial flora, only accounted for 1.9% of the monitored catches. Among the species of by -catch, *Meluccius gayi gayi* stands out (Table 3).

Table 3. By-catch percentage in set fishing with catch of *D. gigas* as target species, year 2017 (Source: IFOP).

Vernacular Name Chile	Specie	%
Jibia o calamar rojo	*Dosidicus gigas*	98,10
Merluza Común	*Meluccius gayi gayi*	1,70
Merluza de cola	*Macruronus magallanicus*	0,30
Reineta	*Brama australis*	0,01

3 RESEARCH PROGRAMS

The research program for the year 2018 is mainly composed of the projects developed by annual agreement with the Institute of Fisheries Development (IFOP), and complemented by other projects required by the fishing authority, which allow it to support the decision making.

The projects prepared annually by IFOP are:

• **Monitoring of the fishery (*Dosidicus gigas*)**

This study allows the collection of real-time information on the evolution of the main biological and fishing indicators, associated with the jumbo squid fishery and its by catch. The follow-up was concentrated in the main regions of the country where the fishery is developed, which for the particular case of artisanal fishing is mainly developed 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 to provide the Technical Scientific Committee (CCT) with the necessary technical advice, provide the data, background and information necessary for the analysis of the exploitation possibilities and the determination of the Biologically Acceptable Capture (BAC) levels for the following annual extractive season (year 2020) in the jumbo squid fishery.

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

4.1 Biological sampling

The artisanal sampling was carried out when disembarking or boarding the ships when it was feasible. Specific biological sampling was performed in process plants or on land at the time of landing as possible.

Tables 4 and 5 show the number of samples sampled (length and biological) for the industrial and artisanal fleet, respectively.

Table 4. Number of trips, fishing sets and samples sampled according to the type of sampling in the jumbo squid industrial fishery 2018 season.

Year	Type of sampling					
	Length			Biological		
2018	Trips	Fishing sets	Specimens	Trips	Fishing sets	Specimens
	95	213	9013	65	99	2933

Source: IFOP

Table 5.- Number of trips, fishing sets and samples sampled according to the type of sampling in the artisanal fishery of jumbo squid, Season 2018.

Land	Type of sampling			
	Length		Biological	
	Trips	Specimens	Trips	Specimens
Coquimbo	5	50	0	0
Valparaíso	75	2119	31	914
Maule	48	1961	0	0
Biobío	4	122	0	0
Total	**132**	**4252**	**31**	**914**

Source: IFOP

4.2 Length and age composition of catches

When observing the size structures of the jumbo squid catches made by the industrial fleet during 2018, for both sexes combined, it is noted that the specimens were distributed between 20.5 and 88.5 cm LM, where 47% of them were below the reference size (Figure 9) Therefore, the catches made on this resource show a greater presence of smaller specimens, compared to those made in 2017 (Figure 9).

In the case of the artisanal fleet, only the size structures of the Valparaíso and Maule Regions are presented, due to the low number of specimens sampled for the remaining regions. The composition of the carving structures in the Valparaíso Region showed, for both sexes combined, a 99.5% unimodal distribution composed of specimens greater than 63.8 cm in mantle length (LM), whose main fashion was 72.5 cm LM. It is important to indicate that the fashion observed in 2018 corresponds to a relatively lower value than that observed in 2017, which presented a plastic distribution, with a main fashion distributed between 70.5 cm and 74.5 cm (LM), showing that the specimens available for fishing corresponded to smaller individuals. On the other hand, for the Maule Region, the size composition presented a high percentage of smaller specimens, with respect to the reference value (44%), also showing a fashion focused on individuals between 60.5

and 66.5 cm LM, thus observing the same trend as in the Valparaíso Region regarding the availability of smaller individuals for fishing. (Figure 10)

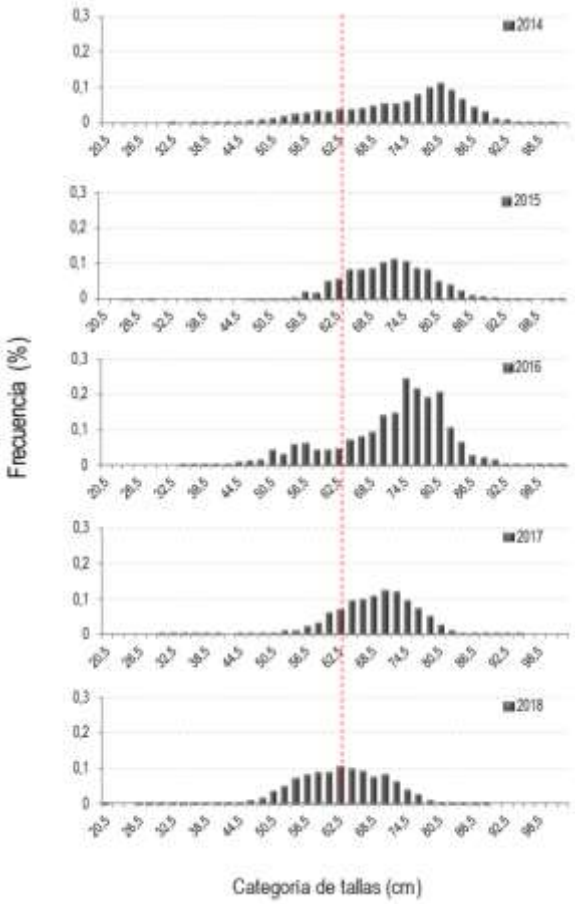


Figure 9-Composition of annual mantle length (cm) in jumbo squid industrial catches (both sexes combined) for an area between 35 ° 30 '- 38 ° 39' S. Vertical red line corresponds to the size of sexual maturity of females estimated by Liu *et al*. (2010) 2014-2018 seasons (Source: IFOP biological samples).

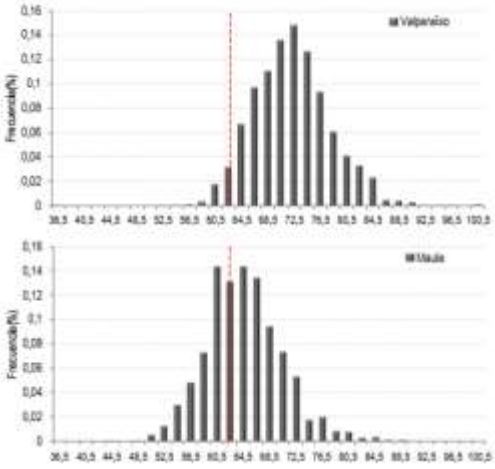


Figure 10.- Composition of mantle length (cm) weighted to artisanal catches (both sexes combined) by region. Vertical red line corresponds to the size of sexual maturity in females estimated by Liu et al. (2010), year 2018 (Source: IFOP).

5. AT-SEA AND PORT SAMPLING PROGRAM

The sampling was carried out with the participation of Scientific Observers (OC) on board and in the port, activities that covered the artisanal and industrial fishing sector. In total, 102 trips were observed for the industrial fleet, of which almost 50% were concentrated in the first months, with 64 fishing trips in the first four-month period. This number of shipments, in terms of coverage, corresponded to 25.5% of trips on trawlers that reported catching cuttlefish. In addition, all the artisanal information collected by the network of scientific observers arranged in the main sampling centers of the south central area, corresponding to the artisanal fleet of the Coquimbo, Valparaíso and Biobío Regions has been considered.

6. ADMINISTRATIVE MEASURES

Current Administration Measures

The administration measures applied to the jumbo squid fishery began in 2012, with the objective of conserving the resource. For this, the Undersecretary of Fisheries and Aquaculture declared it in a state of full exploitation, restricting its access, then establishing an annual global quota and prohibiting its capture as a target species for flour production (Table 6).

Undersecretariat for Fisheries and Aquaculture

Chilean Government

Table 6. Main Administration Measure in Chile for jumbo squid.

Administration Measure	**Purpose**	**Normative**
Regime	Fishing Freedom 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° 752/2012
Access	Suspension of the registration of the resource in the Artisanal Fisheries Registry (RPA), between the Arica and Parinacota regions to Magallanes, for having reached full exploitation status.	Res. Ex. N° N°3421/2014
Annual Global Catch quota (CGAC)	The jumbo squid CGAC for the year 2019 is 200000 tons: Investigation quota: 1000 ton Target quota: 199000 ton Artisanal fleet: 159200 ton Industrial fleet: 39800 ton	D. Ex. N° 527/2018 MINECON
Other measures	*Dosidicus gigas* is eliminated from the payroll of hydrobiological resources to be used as raw material in flour production.	D.S N° 98/2012