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Chile annual report

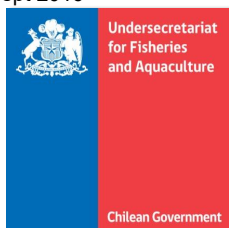
Undersecretariat for Fisheries and Aquaculture



CHILE ANNUAL NATIONAL REPORT

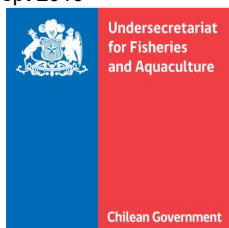
SPRFMO-SCIENTIFIC COMMITTEE

September, 2016.



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JACK MACKEREL FISHERY

1. DESCRIPTION OF THE FISHERY

1.1. Composition of the Fleet.

The industrial purse seine fleet operating on jack mackerel fishery in both the SPFRMO area and Chilean EEZ between January and July 2016 consisted of 71 fishing vessels. This number is lower than in previous years, which is associated to a reduction in the operation of vessels in the northern area off Chile (300-600 Hold capacity) during this year. Regarding the fleet composition, 62% was constituted by vessels with a hold capacity not exceeding 600 m³ which operated mainly in the north area off Chile (**Table I**).

As a result of changes in the resource's distribution, between 2012 and 2014, the jack mackerel fleet operated mainly within the Chilean EEZ. Nevertheless this condition was reversed during 2015, with a 30% of the fleet operating in the SPRFMO Area. This situation was again reversed in 2016 with only 4 vessels operating during the first semester outside the Chilean EEZ. In terms of composition, the fleet operating in 2016 within the SPRFMO area was mainly represented by vessels with hold capacities greater than 1,500 m³ (**Table II**).

Table I. Number of industrial purse seiners catching jack mackerel in the Chilean EEZ and the SPRFMO area (combined) between 2012 and July 2016. Data were assembled by year and hold capacity. (2016* are preliminary data).

Hold capacity (m ³)	2012	2013	2014	2015	2016 (*)
0-300	0	1	0	1	1
300-600	60	60	60	59	43
600-900	8	8	6	6	6
900-1200	6	6	5	3	1
1200-1500	9	8	5	7	6
1500-1800	9	9	8	9	9
1800-2100	5	4	4	4	5
TOTAL	97	96	88	89	71

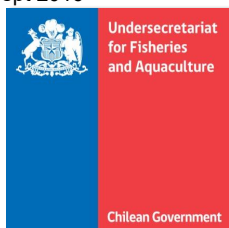


Table II. Number of industrial purse seiners catching jack mackerel in the SPRFMO area between 2012 and July 2016. Data were assembled by year and hold capacity. (2016* are preliminary data).

Hold capacity (m ³)	2012	2013	2014	2015	2016 (*)
0-300	0	0	0	0	0
300-600	0	0	0	0	0
600-900	0	2	0	3	1
900-1200	2	1	3	3	0
1200-1500	1	3	3	9	0
1500-1800	3	3	4	7	2
1800-2100	3	1	1	4	1
TOTAL	9	10	11	26	4

1.2. Catches, Seasonality of Catches, Fishing Grounds and Bycatch

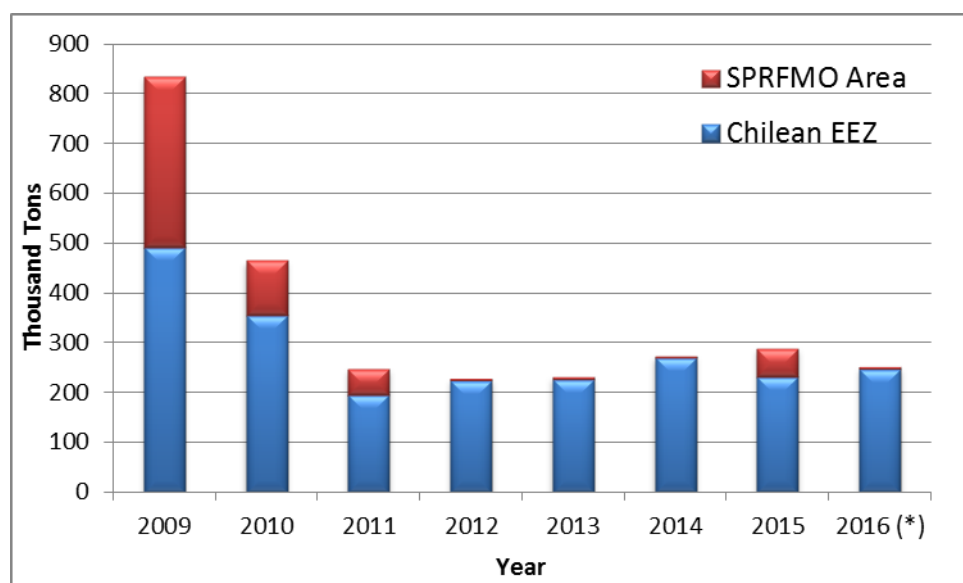
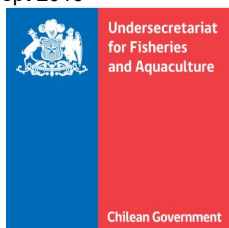
a) Catches

As observed from 2011 to date, the total catch of jack mackerel by the Chilean fleet has remained stable due to compliance with the catch quotas set by the SPRFMO's Commission.

Unlike 2016 this year 5,245 tons have been captured in the SPRFMO Area, representing only 2% of the total catch of the national fleet (**Figure 1** and **Table III**).

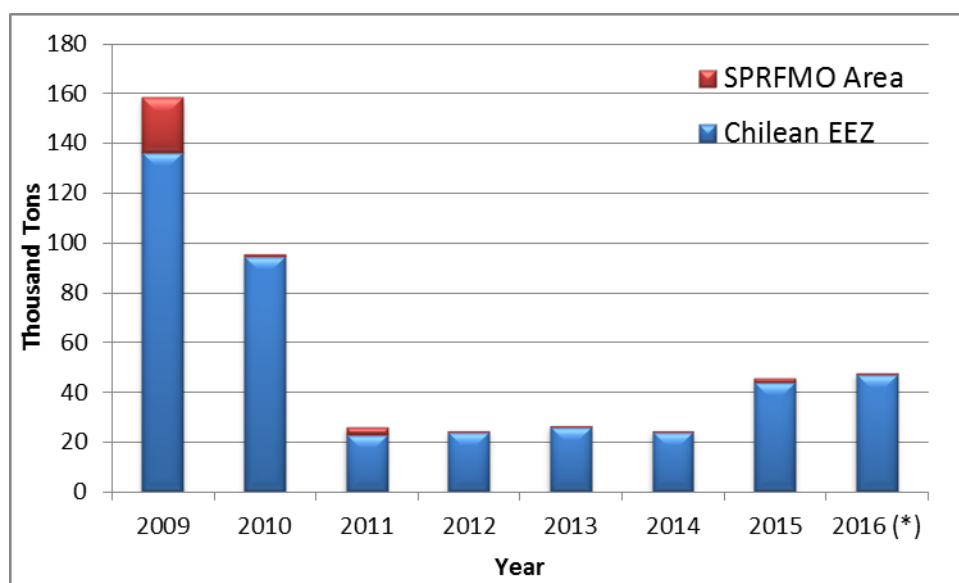
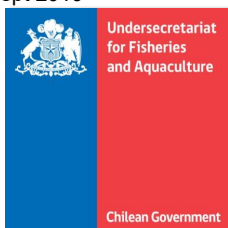
During 2016, jack mackerel catches in the northern area has reached 14,400 tons, half of the catch registered in the first semester of 2015, due to a decline of the catch of anchovy as target species. It is important to note that most of this catch corresponds mainly to jack mackerel caught as incidental fishing in anchovy fishery.

Besides jack mackerel, the national fleet also caught chub mackerel, which totaled 49,601 by June 2016, similar to 2015 records and exceeding the average registered for the last four years (2011-2014). However, catches of chub mackerel in the SPRFMO area did not exceed 1% of the total catch of this resource at the same period (**Figure 2** and **Table IV**).



Year	Chilean Jack Mackerel (t)		
	Chilean EEZ	SPRFMO Area	Total
2009	491,792	343,135	834,927
2010	355,510	109,298	464,808
2011	193,722	53,573	247,295
2012	223,322	4,138	227,460
2013	225,443	5,917	231,360
2014	268,531	3,983	272,514
2015	231,288	56,806	288,094
2016 (*)	245,628	5,245	250,873

Figure 1 and **Table III**. Total annual jack mackerel catches in the Chilean EEZ and the SPRFMO area by purse seiners for the period 2009 – June 2016 (preliminary).



Years	Chub Mackerel (t)		
	Chilean EEZ	SPRFMO Area	Total
2009	136,516	21,936	158,452
2010	94,723	936	95,659
2011	23,077	2,979	26,056
2012	24,120	199	24,319
2013	26,086	243	26,325
2014	24,135	31	24,166
2015	43,863	1,820	45,683
2016 (*)	48,809	792	49,601

Figure 2 and **Table IV**. Total annual chub mackerel catches in the Chilean EEZ and SPRFMO area by purse seiners for the period 2009 - June 2016 (preliminary).

b) Seasonality of Catches

During January 2016 and similar to 2012, high catches of jack mackerel around 65,000 tons were recorded (**Figure 3**). During February and March, subsequently, catches dropped to near 20,000 tons per month mainly because of the high presence of juvenile specimens in those catches. A significant increase in the quarter April-June with average catches of 48,000 tons per month was recorded, accounting for 55% of the jack mackerel total capture accumulated up to July of this year. Coincidentally, this increase in catches during the April-June period is similar to what occurred in 2015. However, it differs from the 2012-2014 performance, generally with lower catches for the second quarter of such years.

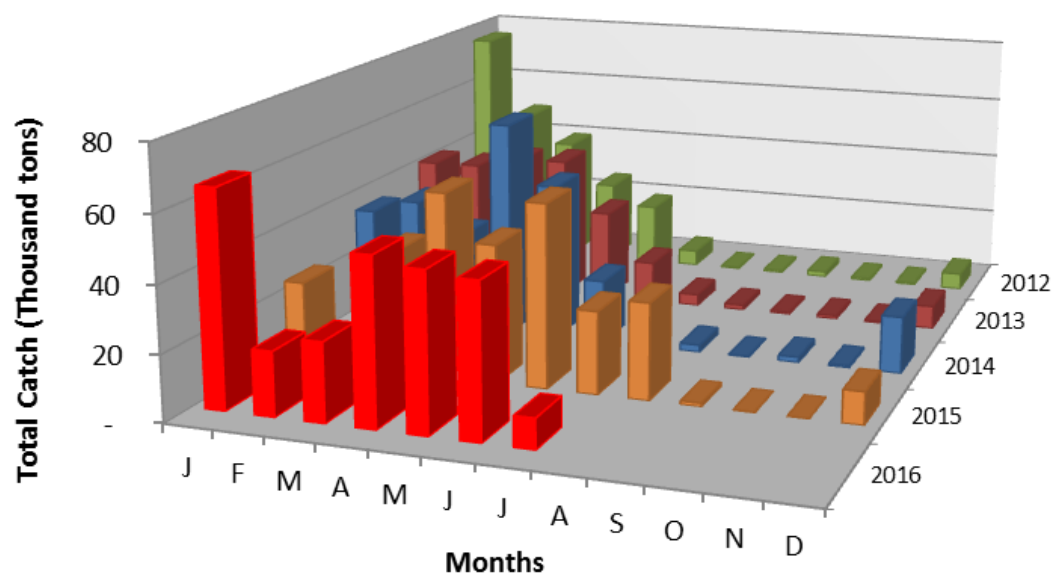
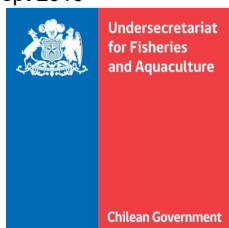


Figure 3: Seasonality of jack mackerel catches caught by purse-seiners for the period 2012-July 2016. Source: SERNAPESCA.

c) Spatial Distribution of Catches

During 2014 and 2016, the fleet operating in the Chilean south-central area has shown a catch pattern mainly circumscribed to the EEZ, within the first 100 nm, without displaying the typical shift towards oceanic waters during the second and third quarter as observed in previous years.

During the first quarter of 2015, the spatial distribution of jack mackerel catches in the south central area of Chile were concentrated near the coast (first 100 nm). Subsequently, between June and August, catches were concentrated further south (between 35° - 40° SL) and westward outside the EEZ (**Figure 4**).

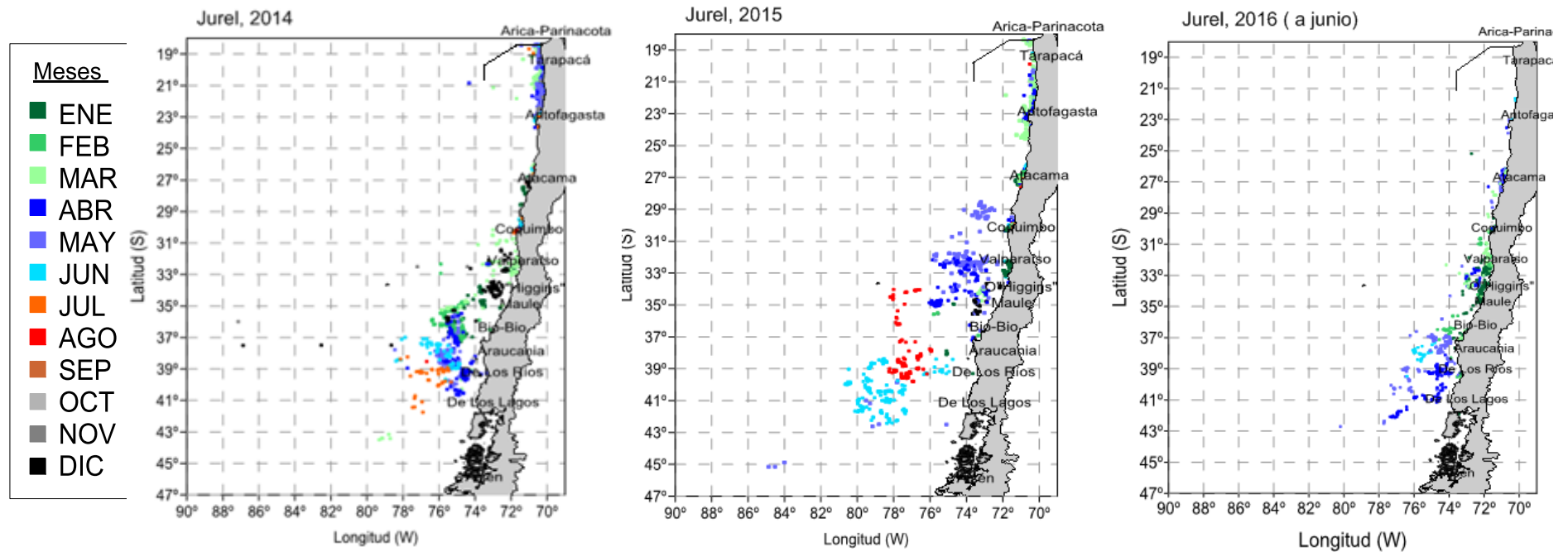
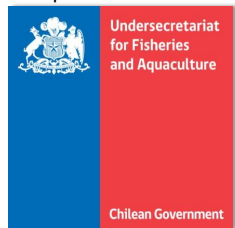
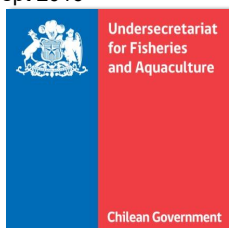


Figure 4: Spatial-temporal distribution of industrial jack mackerel purse seiners 2014, 2015, and Jun 2016. Source: IFOP.



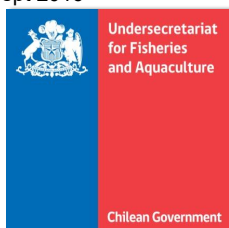
d) Bycatch

In 2012, the Chilean Fisheries and Aquaculture Act was amended through the incorporation of new regulations on discard and incidental catch as well as control mechanisms and sanctions for those engaged in these practices during fishing operations. The specific objectives of the amendments were to reduce discards of target and non-target species, as well as the incidental catch of seabirds, mammals, and turtles. However, the law introduced fisheries exceptions to the discard ban, conditional on a minimum 2-year monitoring program to quantify and identify the causes of these practices, and to develop and implement mitigation plans. Further exemptions may apply in a near future as long as the following requirements are met: (i) monitoring programs are completed and discard mitigation plans are established, (ii) sufficient technical background has been collected according to the protocols established by the monitoring programs, (iii) the monitoring program continues to run, (iv) a global catch quota, which accounts for discards, has been set for the target species, (v) target and non-target species are subjected to a mitigation plan, and (vi) discarding does not affect the conservation of the target species. Finally, there are restrictions on the use of previously discarded catches for human consumption, such as under minimum landing sizes (MLS), but these may be lifted within the remits of the mitigation plans. Legal compliance will be monitored by electronic monitoring systems (EMS) in all vessels of the industrial fleet as of 2017, while small-scale boats longer than 15 m will be required to carry EMS 3 years later. Observer programs, carried out since 1990, are extended with the amendment of the Fisheries and Aquaculture Act, but will continue with the sole objective of collecting biological and fisheries data to be used in scientific advice for management, without any jurisdiction in compliance. The monitoring program of discard and incidental catch for the jack mackerel fishery, both within the EEZ and SPRFMO area was launched in February 2015, and the results are expected for the first half of 2017.

2. EFFORT AND CPUE FOR JACK MACKEREL FISHERY

The information contained in this section concerns the fleet of the central-southern area targeting jack mackerel. Catch, effort, and CPUE were calculated for fishing trips where jack mackerel represented more than 50% of the catch.

Due to the remoteness of the fishing grounds, until 2010, the length of fishing trips for jack mackerel exhibited a growing trend (**Figure 5**). Subsequently, in 2012 and 2013, catches were concentrated within the EEZ, which reduced considerably (-50%) the average length of the fishing trips. In the last year of the series (2016), catches were again concentrated in areas near the coast, within the first 100 nm, as evidenced by increased length of the fishing trips. Consequently, fishing effort, measured as the



number of fishing trips with catch, decreased progressively until reaching the lowest levels in 2010, then stabilized between 2011 and 2016.

On the other hand, the standardized CPUE, measured as the utilization rate of the carrying capacity of the fleet (catch/(hold capacity displaced x length of fishing trip)) exhibited a decreasing trend between (2001 - 2011). Subsequently, in 2012, this indicator changed its trend toward higher values with a slight decreasing tendency between 2012 and 2015 and ultimately increasing in 2016. The change in trend observed from 2012 onwards is explained by a decrease in the average length of the fishing trips as a result of changes in the distribution of the jack mackerel (**Figure 6**).

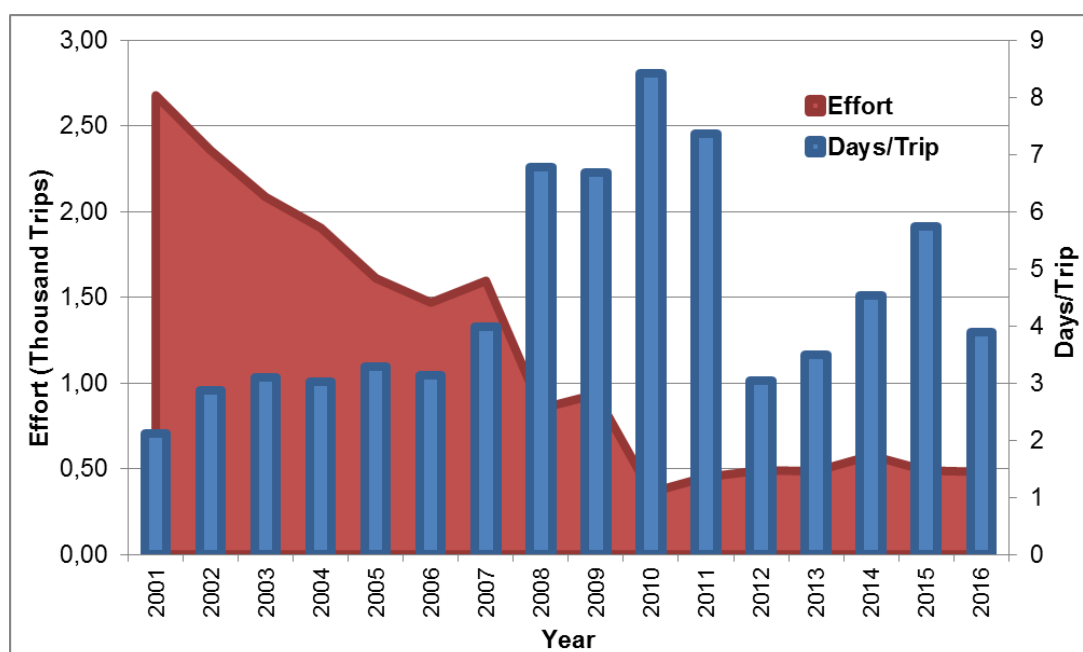


Figure 5: Effort in number of trips with catch (red), and length of fishing trips in days (blue) for the purse seine fleet in the center-southern zone, period 2001-2016 (preliminary). Data SERNAPESCA. Source: IFOP.

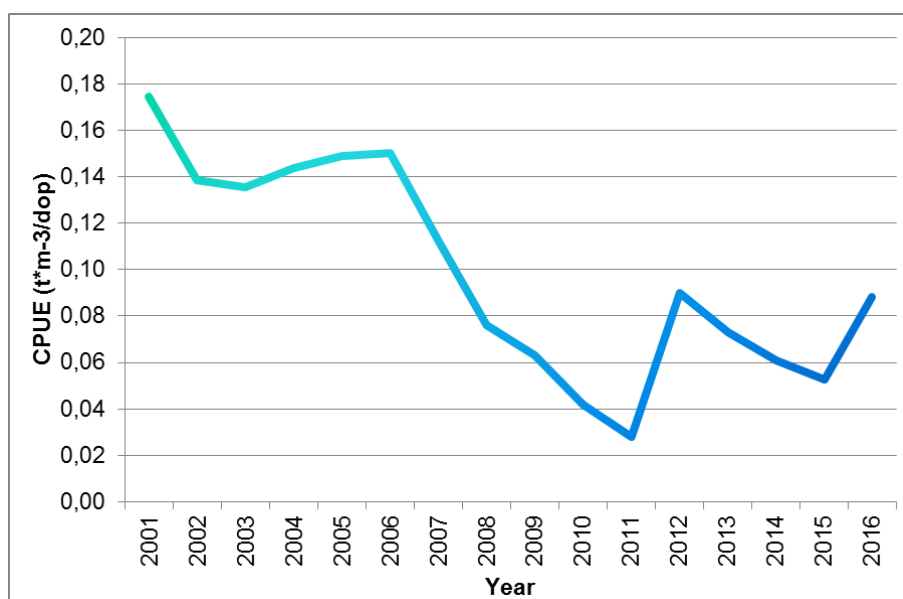
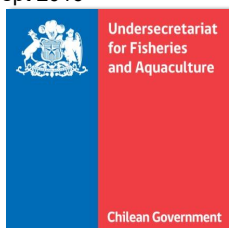


Figure 6: Nominal CPUE for the purse seine fleet in the center-southern zone, period 2001-2016 (preliminary). Source: Base IFOP information.

3. RESEARCH PROGRAMS

Research programs for jack mackerel include standard projects carried out annually by IFOP (Fisheries Development Institute) along with complementary projects. The information obtained is used by the Fishing Authority to support the decision-making process.

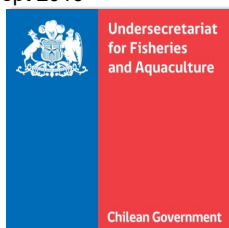
Basic (standard) projects performed by IFOP during 2015:

- Hydroacoustic assessment of jack mackerel biomass between XV-IV Regions, 2015

This research cruise took place from March 11th through April 12th 2015, and included an exploration area located between the northern boundary of the country and Coquimbo (29° 45' S), with perpendicular to the coastline transects reaching up to 100 nm from the coast. As a result, in the prospected area, a jack mackerel total biomass of 459,485 tons was estimated.

- Monitoring of the jack mackerel fishery

This study allowed gathering real-time information on the evolution of the main biological and fishing indicators, associated with the jack mackerel fishery and its bycatch. The monitoring was carried out along the entire maritime space between



the north boundary of Chile and 47°00' S, and included information gathered at sea from both the small-scale, and the industrial fleet.

- Assessment of the total allowable catch

Similarly as done by the SWG, this study used the Joint Jack Mackerel (JJM) model. This project was aimed to set up the status of the resource, and also to assess biologically sustainable exploitation rates. The results were used by the Fishing Authority to improve the stock evaluation, simulate different exploitation scenarios and conduct additional analyses.

- Otolith Project

In accordance with the commitments made by Chile at the SPRFMO Scientific Committee in 2014, the Fisheries and Aquaculture Research Fund (FIPA) financed the project “Reading Protocol of jack mackerel otoliths” (FIPA N° 2014-32) and conducted the following international workshops:

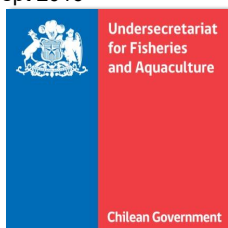
- a) 1st Workshop “Validation of first annual ring of Jack mackerel based on otolith microstructure analysis” (Research project: FIP 2014-32), December 14-18, 2015, Valparaíso, Chile. The objective of the workshop was to analyze and discuss on the identification criteria of primary-micro increments in otoliths of juveniles and adults, in order to validate the first annulus of Chilean jack mackerel.

Although the workshop was open to all SPRFMO Members, only Chilean researchers participated.

- b) 2nd Workshop “Chilean Jack mackerel otolith interpretation and ageing protocol” (Research project: FIP 2014-32), March 14-18, 2016 Valparaíso, Chile. The objective of the workshop was to analyze and discuss on the otolith’s ageing criteria in order to develop a reading protocol of annual age determination of Chilean jack mackerel with the consensus of SPRFMO members.

The Workshop was coordinated by Dr. Beatriz Morales-Nin.

Although the workshop was open to all SPRFMO Members, only Chilean and Ecuadorian researchers participated.



4. BIOLOGICAL SAMPLING AND LENGTH/AGE CATCH COMPOSITION

4.1 Biological Sampling

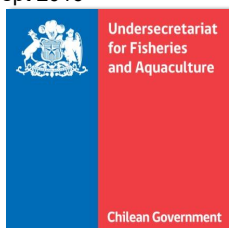
Biological information is obtained on a regular basis from samples collected along the Chilean coast for jack mackerel and its associated species. Sampling is conducted on a daily basis, mainly at landing sites and processing plants, and is also complemented with information gathered by fisheries observers on board fishing vessels. The information collected includes fork length measurements, otolith collection, total weight, gutted weight, gonad weight, and sex and maturity stages.

The amount of lengths and biological samples obtained for jack mackerel during 2015 added up 54,524 and 16,317 specimens, respectively. For the industrial fleet, samples included at-sea sampling as well as port sampling, covering the whole range of activity reported for this fishery in Chile. The main landing ports sampled were Caldera and Coquimbo in the northern area, and San Antonio in the central-south area of the fishery (**Table V**).

Chub mackerel, as the main bycatch for jack mackerel, was also sampled during 2015. A total of 817 and 321 specimens for length and biological samples were collected, respectively.

Table V. Number of Jack mackerel and Chub mackerel specimens collected in 2015 to gather biological and length samples.

Landing Port	Jack Mackerel		Chub Mackerel	
	Length Sampling	Biological Sampling	Length Sampling	Biological Sampling
Arica	0	0	0	0
Iquique	1,072	0	82	0
Antofagasta	3,187	90	107	0
Caldera	7,536	2,702	280	125
Coquimbo	4,889	1,680	196	39
S. Antonio	15,824	4,644	98	129
Talcahuano	10,519	3,466	12	6
Valdivia	10,224	3,246	42	22
Chiloé	1,167	489	0	0
Guaitecas	106	0	0	0
TOTAL	54,524	16,317	817	321



4.2 Length and Age Catch Composition

a) Jack Mackerel

During the first half of 2016, size structure of jack mackerel showed a unimodal distribution, with a shift of the main mode toward larger individuals with respect to 2015 (**Figure 7**). However, during this year there are no observations regarding the secondary modes of 34 and 40 cm FL present in 2015, making clear the low availability with respect to catches.

This year, the size range varied between 11 and 64 cm FL. The main mode was 30 cm FL, both in the northern and center-south areas of the country, where the presence of specimens of a larger size in the northern area with respect to 2015. Catches within the latter area correspond mostly to by-catch in the anchovy fishery.

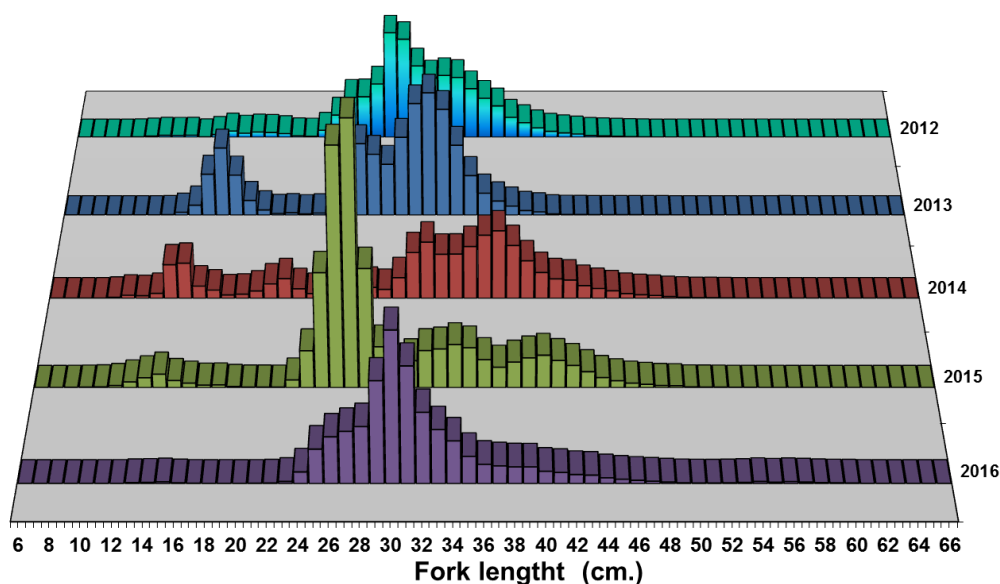
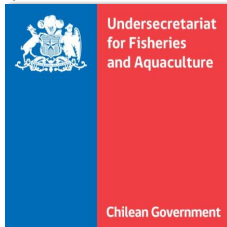


Figure 7. Catch at Length structure of jack mackerel, total catch in number. Period: 2012 to June 2016. Source: IFOP

Age structure in the first quarter of 2016 was composed of 16 age groups, where ages IV and V highlight as main modes, concentrating 70% of the catch. Both age groups captured both in the northern and center-south areas during this year (**Figure 8**).



A reduction in the contribution of older ages (VII+) is detected during 2016 and with respect to previous years. This may be caused by catches conducted nearer to the coast this year, within the EEZ of our country and to the presence of the El Niño event (ENSO) 2015-2016.

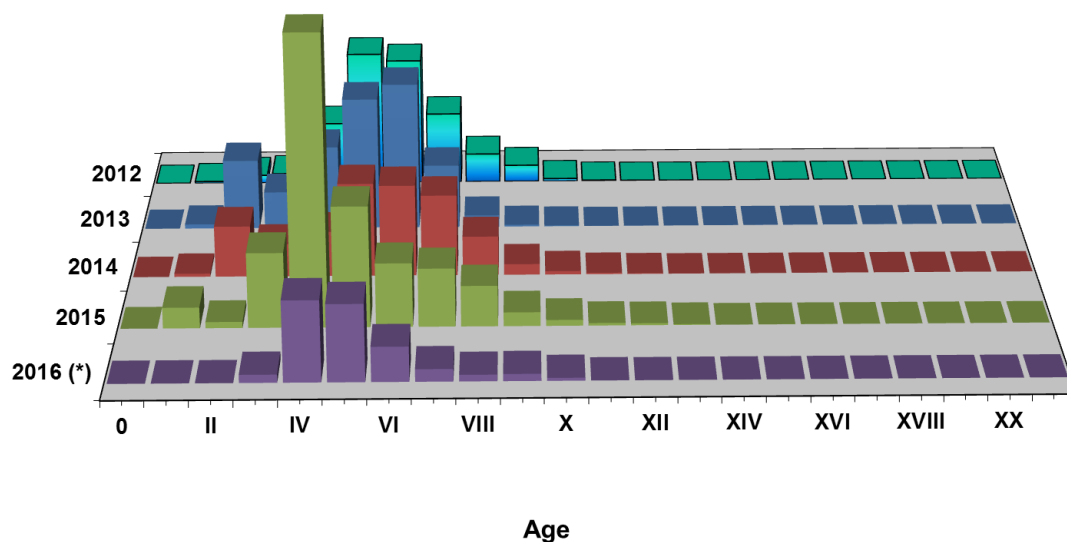
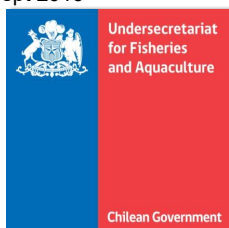


Figure 8: Catch at Age structure of jack mackerel, total catch in numbers. Period: 2012 to January–March 2016. Source: IFOP.

b) Chub Mackerel size composition

Restricted by small catches of chub mackerel during the last years (2012-2016), the numbers of samples obtained have not been representative enough as to establish a catch at age structure. However, as a reference point, it is possible to indicate that samples obtained between 19° - 24° S during 2015 exhibited a multimodal structure with a main and a secondary mode at 35 and 29 cm FL, respectively. In the southern area of the country (33 °-40 ° S), the size structure for this resource was composed of a main mode of 35 cm FL.



5. AT-SEA AND PORT SAMPLING PROGRAM

In order to evaluate the sampling coverage within the SPRFMO Area, only fishing trips targeting jack mackerel were considered for this report (i.e. more than 50% of the total catch per fishing trip). This also included fisheries observers onboard and/or at-port sampling coverage.

Since the fishery pattern of jack mackerel nearer to the coast over the last years, it has been difficult to cover the fleet operations within the SPRFMO Area with onboard observers due to low frequent and unpredictable fishing trips in such area. Those fishing trips are not planned in advance either as to ensure the presence of an observer. In spite of the restrictions, onboard sampling coverage and at-port sampling coverage for fishing trips in the SPRFMO Area in 2015 was 23.3% and 19.6% respectively, with a total combined sampling coverage of 42.9%. (**Table VI**).

Within the Chilean EEZ, onboard sampling coverage conducted by observers was 11.8%, and at-port sampling coverage was 16.2%, with a total combined sampling coverage of 28.2%.

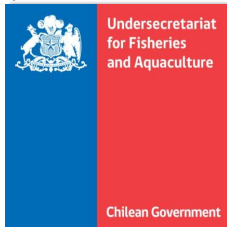
Table VI. At port and onboard sampling coverage conducted by observers in the Chilean jack mackerel fishery in 2015.

	At-Port	On Board	TOTAL
Chilean EEZ	16,40%	11,80%	28,20%
SPRFMO area	19,60%	23,30%	42,90%
TOTAL	17,20%	14,50%	31,60%

6. MANAGEMENT MEASURES

Each year by December, the Undersecretariat for Fisheries and Aquaculture establishes catch quotas for every resource in full exploitation regime, to be applied in the next year. The 2016 quota for jack mackerel proposed by the Undersecretariat in December 2015 was 310 thousand tons.

Subsequently and according to agreements reached in February 2016 during the fourth Meeting of the SPRFMO in Valdivia, Chile, the annual quota for jack mackerel (including high seas and jurisdictional waters) was reduced to 297,000 tons (Exempted Decree N° 1142/2015), which is close to be fully consumed.



7. ENVIRONMENTAL CONDITION

During 2015 and the first half of 2016, Chile was hit by the El Niño event, with an increase of the sea surface temperature (SST), the reduction in the rise of colder waters off the coast and the low availability of nutrients, which causes changes in the productivity in the main national fisheries. During an El Niño event, fish move from one place to another seeking more appropriate conditions for their survival, some of them disappear from their distribution area and other appear in new areas where they were not present before.

An intense El Niño event is detected when the raise in the temperature is higher than 1.5°C. The current event (2015-2016) has been classified as “Strong” since the temperature anomalies have surpassed this average value reaching 3°C above the historic average value (**Figure 9**).

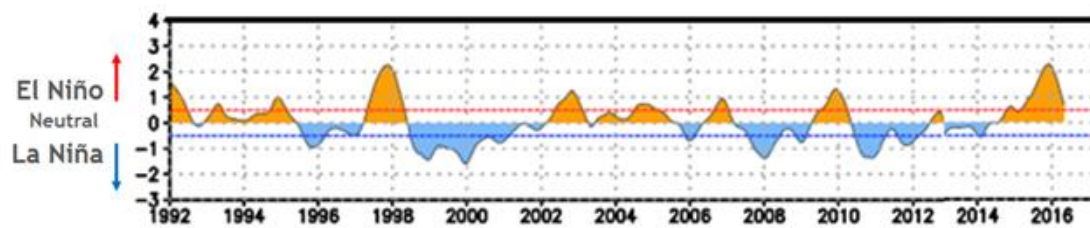
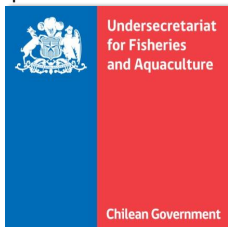


Figure 9. Oceanic Niño Index (ERSST. V4 ONI). Niño 3.4 SST (°C) Anomalies 1992-2016.

Source: NOAA.

In the case of the jack mackerel fishery, a large presence of juvenile in catches with a higher availability of the resource in areas near the coast and with low sea surface temperature could be observed during the first half of 2016. This same behavior of jack mackerel could also be corroborated in the research program of hydroacoustic assessment for jack mackerel in the northern area associated to patches of colder waters.



JUMBO SQUID FISHERY

8. DESCRIPTION OF THE FISHERY

8.1 Composition of the Fleet

The jumbo squid (*Dosidicus gigas*) fishery includes the participation of small-scale¹ and industrial² fleets, with distribution percentages of the national annual catch quota of 80% and 20%, respectively. The small-scale fleet operates with hand jiggers and the industrial fleet operates mainly with mid-water trawling.

Small-scale Fleet

The small-scale fleet authorized to operate by 2015 is composed of 5,117 vessels, where 4,340 are smaller than 12m in length, 240 between 12 and 15m in length, and 537 between 15 and 18m in length. Out of this total, around 1,400 vessels participate actively in the fishery.

Industrial Fleet

The industrial fleet authorized to operate on squid and that makes direct effort on the resource corresponded to 5 trawling vessels during 2015, accounting for 86% of the industrial landings.

8.2 Catches, Seasonality of Catches, Fishing Ground and Bycatch

Catches

National landings of squid have not exceeded 200 thousand tons, and last year landings were 140 thousand tons (**Figure 10**). Industrial landings do not exceed 40 thousand tons due to the distribution of the catch annual quota between the two fleets. Total catch is entirely conducted within the EEZ of the country.

¹ Vessels smaller than 18 m in length operating mainly with hand jigger.

² Vessels larger than 18 m in length operating mainly with mid-water trawling.

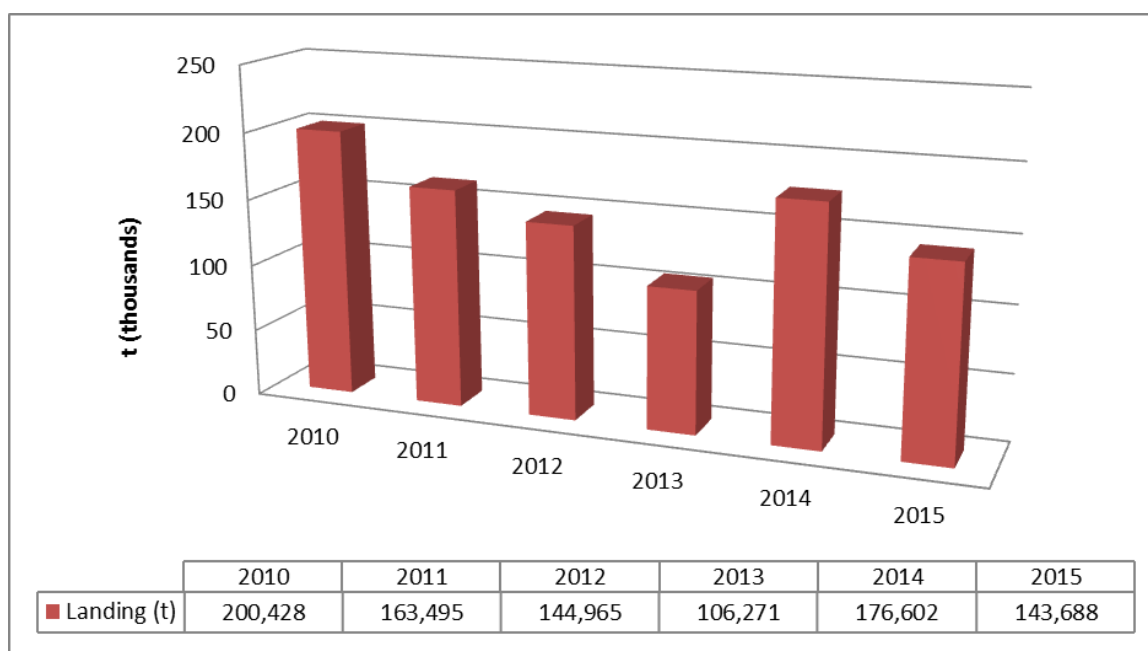
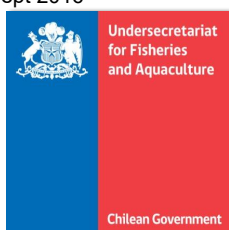


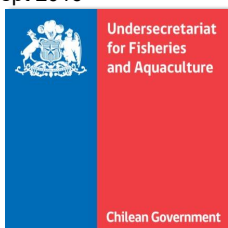
Figure 10: Total landing of squid in Chile.

Seasonability of Catches

Catches mainly concentrate during the first nine months of the year due to the low availability of the resource during the last quarter. An increase of the industrial activity during the first quarter was observed in 2015. This is explained by a design effect of the temporary allocation of the catch quota which was corrected for 2016.

Spatial Distribution of Catches

The industrial fleet operates in areas between 10 and 30 nm (36° and 37°S), near landing ports. On the other hand, the small-scale fleet operates mainly in Coquimbo, Valparaíso, and Bio-bio Regions, with Valparaíso as the most important region accounting for 59% of the small-scale annual landing during 2015.



9. EFFORT AND CPUE FOR JUMBO SQUID FISHERY

The monthly effort in trawling time [in hours, (t.t.)] of the industrial fleet in 2015 that operated between 35°30' – 38°39' S., concentrated in the first quarter, in which the total quota allocated to the sector was extracted. The maximum effort was recorded during March, reaching 346 t.t., accounting for 34% of the annual effort (**Figure 11**).

When analyzing the historical series of the industrial fleet effort, the peaks corresponded to Autumn-Winter during 2013-2014, which was not observed during 2015 according to the information mentioned before (**Figure 12**).

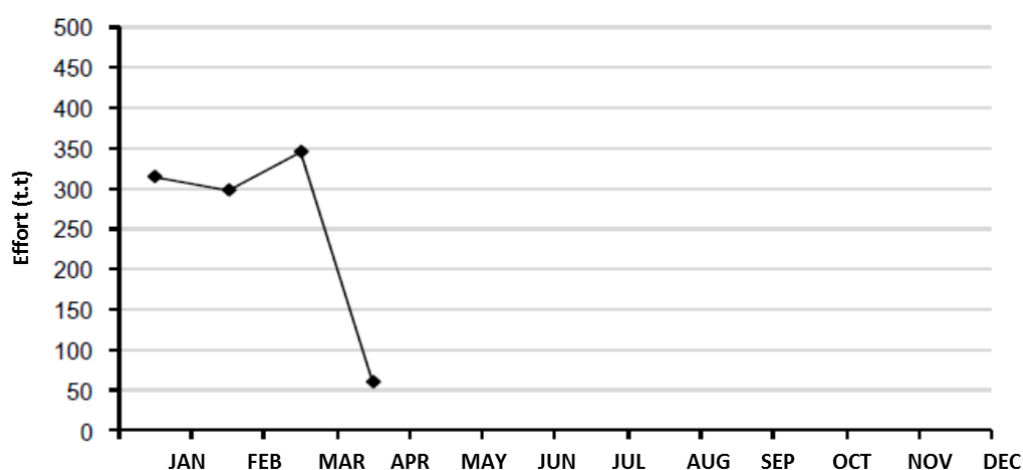


Figure 11. Squid monthly effort (t.t.) of the fleet larger than 18 meters in length, fishing season 2015. Source: IFOP-SERNAPesca.

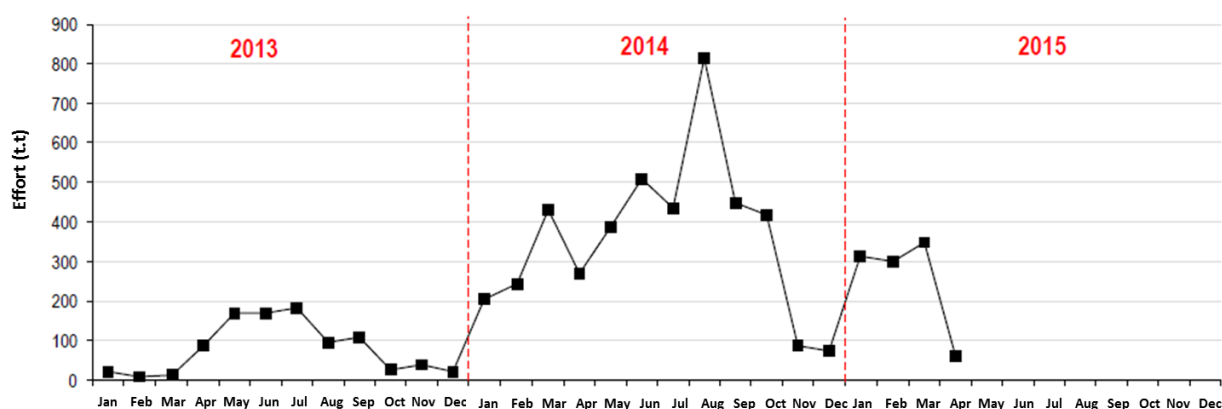
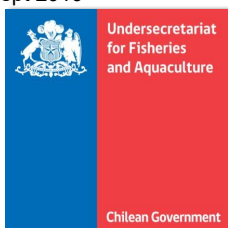


Figure 12. Monthly effort (t.t.) with squid catches as target species, from vessels larger than 18 m in length, fishing seasons 2013, 2014, and 2015, between 35°30' – 38°39' SL. Source: IFOP-SERNAPesca.



The catch per unit of effort (CPUE) obtained from fishing trips targeting squid in 2015 showed high values during the first four months of the year, with an average of 20,8 tons/t.t. and a maximum in March (**Figure 13**).

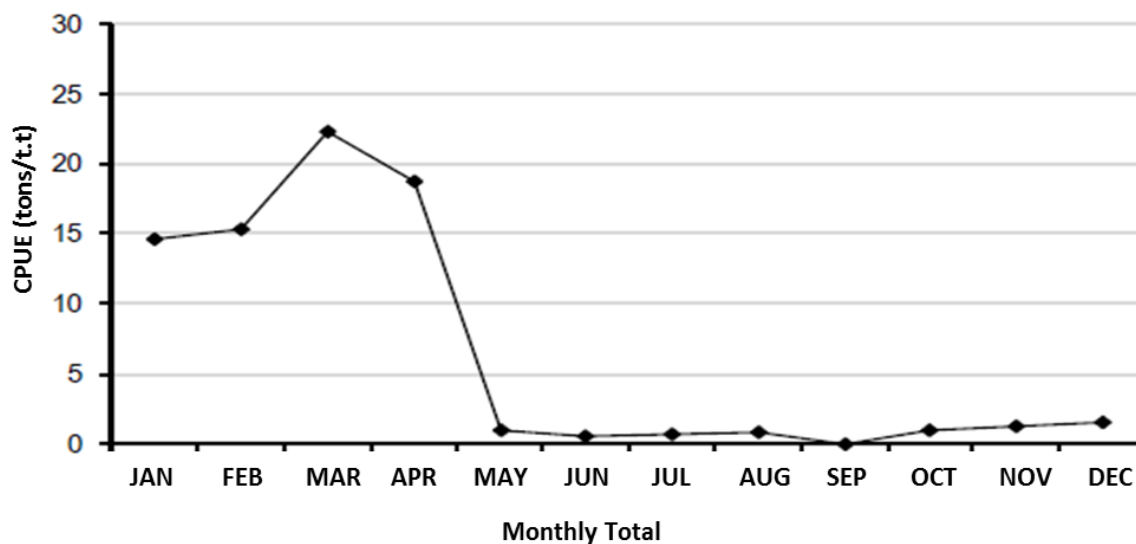


Figure 13. Monthly fishing CPUE of squid (tons/t.t.), season 2015. Source: IFOP-SERNAPesca.

In 2015, the effort made by small-scale vessels, varied between 171 Hours Out of Port (HOP) in November and 1,409 HOP in February with an annual average of 769 HOP (**Figure 14**). The yield fluctuated between 0.15 (t/HOP) in November and 0.37 (t/HOP) during August, with an annual average yield of 0.25 (t/HOP). A higher yield between the second and third quarter of the year was observed, with 0,28 and 0.30 (t/HOP) respectively. There was a significant reduction of the yield during the last quarter of the year with an average of 0.16 (t/HOP).

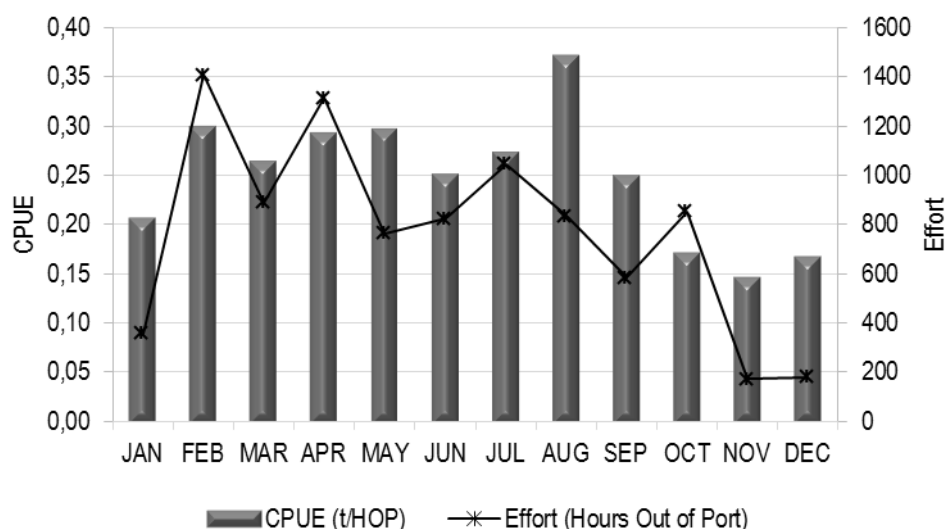
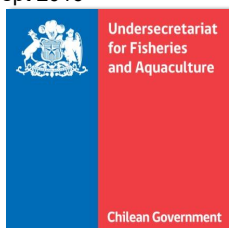


Figure 14. Monthly distribution of the effort and CPUE, operation with jigging, season 2015.
Source: IFOP.

10. RESEARCH PROGRAMS

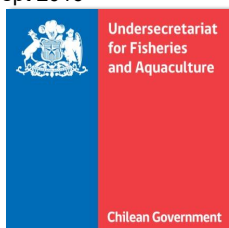
The strategic research program for 2015 was composed of the following studies:

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

This study is conducted annually and allows the real-time collection of information on the evolution of the main biological and fishing indicators, associated to the squid fishery and its accompanying fauna. Monitoring was conducted in the most important regions of the country in which the fishery is developed, with Coquimbo, Valparaíso, and Bio-bio regions operated by the small-scale fleet and the Bio-bio operated by the industrial fleet.

- **Status Analysis and Exploitation Possibilities Program**

This project is conducted on an annual basis and it is aimed at providing the fisheries authority with the relevant technical advice, data, background and information needed to analyzing status, possibilities of exploitation and the determination of the Acceptable Biological Catch (ABC) levels for the next extractive season of the squid fishery.



- **Direct Assessment Program of Squid in the Center-South Area.**

This project is aimed at estimating abundance and demographic structure of squid (*Dosidicus gigas*) in the center-south area of Chile, through a direct assessment survey. Currently, the program is at the methodological development stage.

11. BIOLOGICAL SAMPLING AND LENGTH/AGE CATCH COMPOSITION

11.1 Biological Sampling

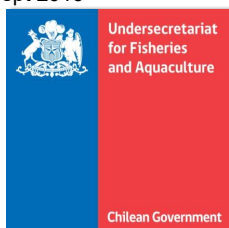
During 2015, biological data of the industrial fishing activity developed exclusively in the Biobio region as target resource in Talcahuano, San Vicente, and Coronel ports were collected.

Length sampling to 2,983 specimens in 47 fishing trips and biological sampling to 2,394 specimens in 72 fishing trips were conducted. Biological sampling carried out in Puerto Chacabuco included 6 fishing trips and 146 specimens (**Table VII**).

Table VII. Number of trips, sets and individuals sampled in the industrial squid fishery, season 2015. Source: IFOP.

PORT	TYPE OF SAMPLING					
	Length			Biological		
	Trips	Sets	individuals	Trips	Sets	individuals
Talcahuano	29	40	1,824	22	22	640
San Vicente	10	10	281	44	55	1,608
Coronel	8	24	878			
Puerto Chacabuco				6	7	146
TOTAL	47	74	2,983	72	84	2,394

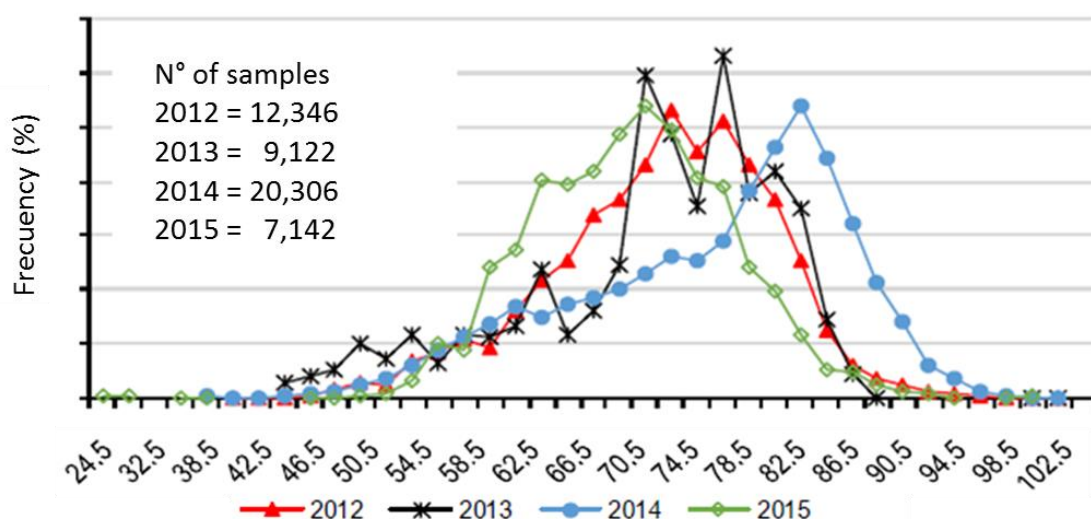
Table VIII summarizes biological samplings, of the small-scale fleet to the resource squid both onboard and onshore during 2015. Regarding length sampling, data were collected from 3,664 individuals in 111 fishing trips, with San Antonio and Coquimbo as the most important ports. Biological sampling included 66 trips and 1,936 specimens with San Antonio and San Vicente as the most significant ports.

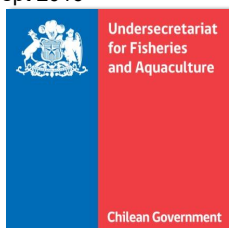
**Table VIII.** Sampling effort in the small-scale fleet, 2015. Source: IFOP.

PORT	TYPE OF SAMPLING					
	Length			Biological		
	Trips	Sets	Individuals	Trips	Sets	Individuals
Coquimbo	35	35	1,045	3	3	76
Guayacán	10	10	295	3	3	60
San Antonio	61	61	2,148	33	33	990
San Vicente	5	5	176	27	27	810
TOTAL	111	111	3,664	66	66	1,936

11.2 Length and Age Composition of Catches

Composition of length mantle (LM) in squid catches of the industrial fleet in the center-south area showed a size range between 24.5 and 102.5 cm LM, with a negative symmetry, that is, with an outdated mode towards larger individuals at 72.5 cm LM. Also, more than 84% of specimens sampled were above the size of sexual maturity of 63.8 cm LM in females and 56.5 in males (Liu *et al.*, 2010) (**Figure 15**). The composition observed in 2015 differs from the composition of previous years regarding two aspects: in relation to seasons 2012 and 2013, corresponds to a unimodal structure and, b) presents a higher proportion of juvenile specimens with respect to all the previous years.

**Figure 15.** Annual average mantle length of squid specimens sampled by SO in the industrial fleet, 2012 – 2013 – 2014 – 2015 period, center-south area, both sexes. Source: IFOP.



Length composition for the Valparaíso Region³, regarding the small-scale fleet catch, demonstrated that sampled specimens showed a size range between 44.5 and 98.5cm LM, this is, smaller specimens than those of the 2014 season. The mode of this composition was between 78.5 cm LM, which ratifies the presence of smaller specimens than the previous season. 94% of individuals was above the sexual maturity size (including males and females) (**Figure 16**).

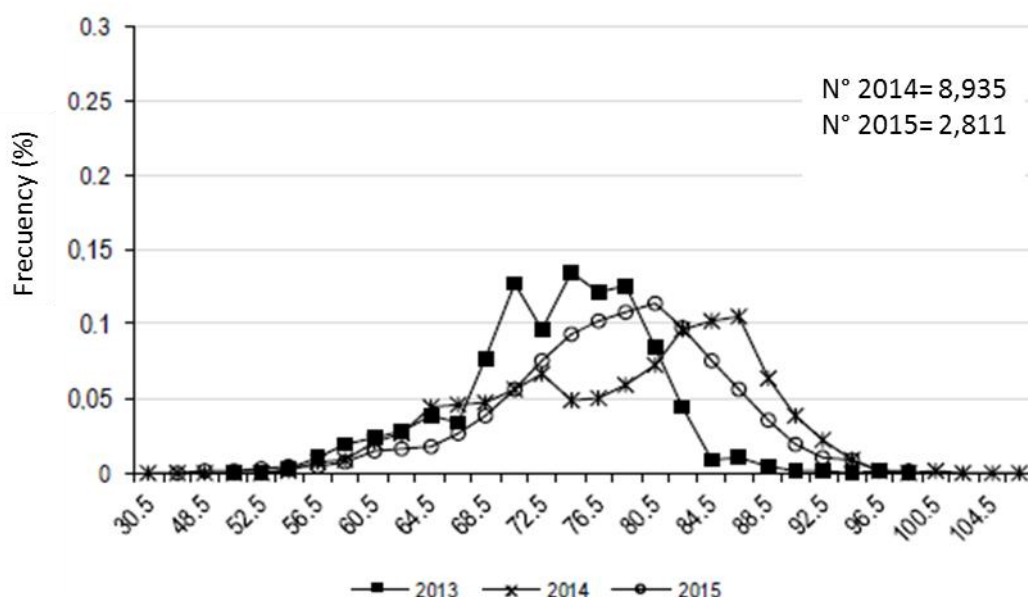
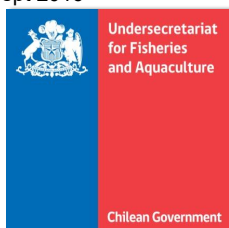


Figure 16. Annual mantle length composition of squid of small-scale catches (both sexes combined). Valparaíso Region, season 2013-2014-2015. Source: IFOP.

12. AT SEA AND PORT SAMPLING PROGRAM

Sampling was conducted with the participation of Scientific Observers (SO) onboard and at port. These activities included the small-scale and industrial fishing sector, focused mainly in the regions with the highest participation in catches. The industrial case includes the VIII Region and the small-scale case includes Coquimbo, Valparaíso and Biobío Regions. In total, 166 trips were covered with SO onboard and 850 samplings on shore during 2015.

³ The most important region regarding squid landings of the small-scale fleet.



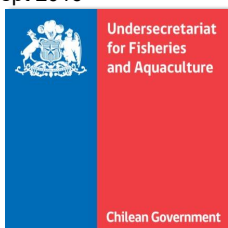
13. MANAGEMENT MEASURES

Management measures applied to the squid fishery started in 2012, with the aim at conserving the resource. The Undersecretariat for Fisheries and Aquaculture declared this resource in fully exploitation, prohibited the access, established annual catch quota, and prohibited elaboration of fishmeal with its catch.

Management Measure	Purpose
Access	In 2012, registration of new extractive actors in the fishery is suspended and users are allowed to operate on squid until 2019.
Global Annual Catch Quota (CGAC)	For 2012, CGAC allocated was 180,000 tons. 2015 CGAC is 200,000 t. with a sectorial fractioning of 80% and 20%, for the small-scale and industrial fishing sectors, respectively.
Other Measures	In 2012, the use of Squid (<i>Dosidicus gigas</i>) as raw material for the production of fishmeal.

14. REFERENCES

Belmar, K., Galvez, P., Gonzalez, J., Toledo, C., Gallardo, A., Villarroel, N., & Villarroel, Y. (2016). Informe final, Monitoreo pesquería de jibia, año 2015. Valparaíso: Instituto de Fomento Pesquero.



15. Nazca-Desventuradas Marine Park

On 14 March, 2016, the Decree N° 5 was signed. This decree creates the Nazca Desventuradas Marine Park (**Figure 17, ANNEX 1**), a no-take Marine Protected Area depending administratively on the Valparaíso Region and covering approximately 300 thousand square kilometers. The objective of creating the park is to preserve marine ecosystems present in the Desventuradas Islands ecoregion, as well as those areas related to seamounts that are part of the Salas y Gomez submarine ridge.

This park will preserve species such as the Juan Fernandez Fur Seal, deep-water sharks, forest kelp, deep-sea corals associated with seamounts, Juan Fernandez spiny lobster, among others.

This protected area will also help to preserve the migration route of the blue whale and marine turtles, breeding and feeding grounds of seabirds, feeding grounds and migration route of swordfish, and recruitment grounds for Jack mackerel.

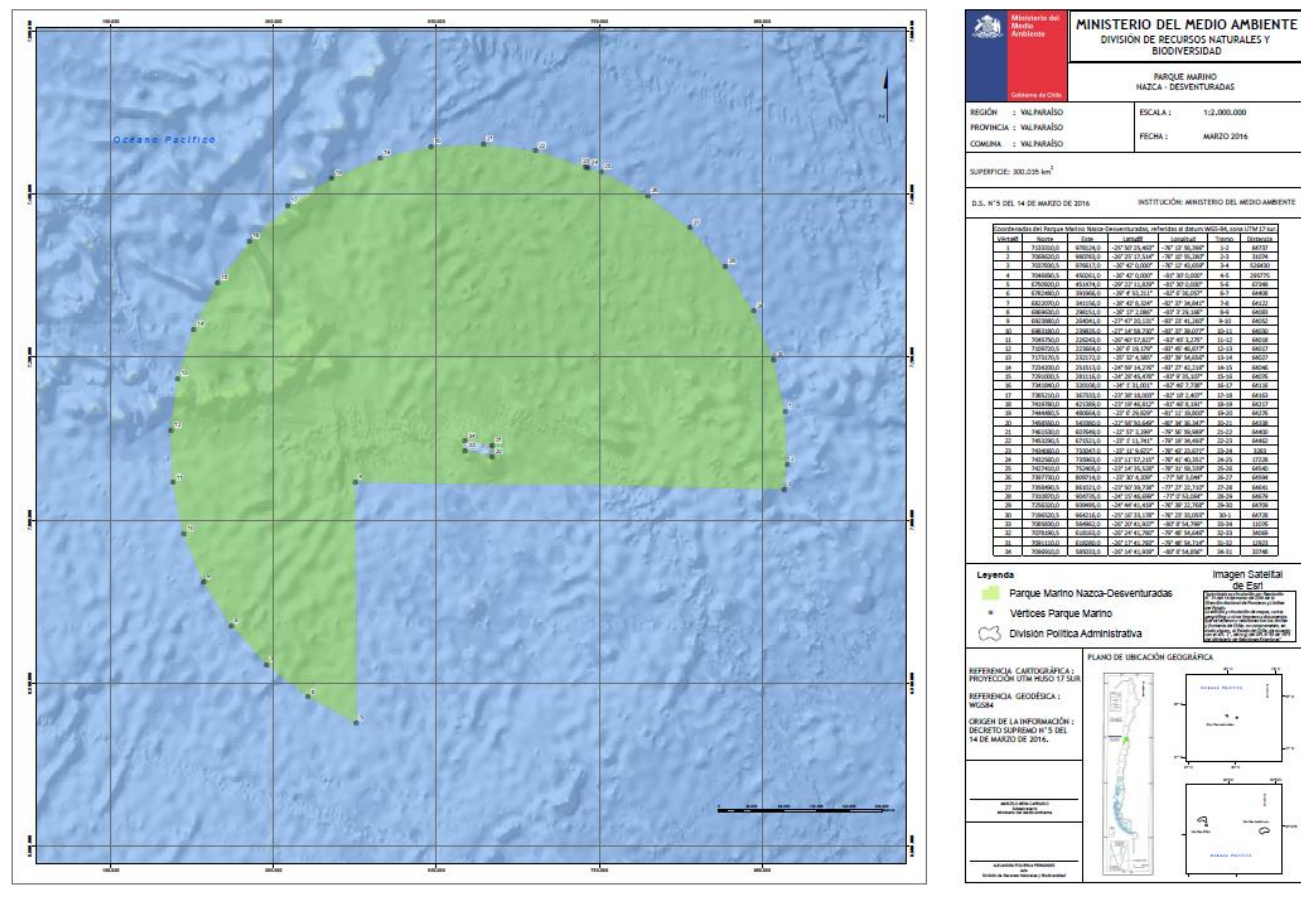
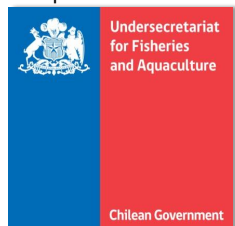
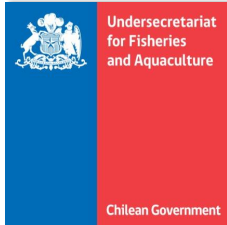


Figure 17. Nazca-Desventuradas Marine Park coordinates.



ANNEX 1.

Nazca-Desventuradas Marine Park



Undersecretariat for Fisheries
and Aquaculture

Marine Park Nazca-Desventuradas

300,035 km²

Of protection for a unique
marine ecosystem.

An area equivalent to **40%**
of Chile's continental land. It
may be compared with the size of
Italy.

The protected area may be considered a
World scientific reference site.



Autorizada su circulación por Resolución Exenta N° 104 del 29 de septiembre de 2015 de la Dirección Nacional de Fronteras y Límites del Estado. La edición y circulación de mapas, cartas geográficas u otros impresos y documentos que se refieran o relacionen con los límites y fronteras de Chile, no comprometerán, en modo alguno, al Estado de Chile, de acuerdo con el Art. 2°, letra g) del DFL N° 83 de 1979 del Ministerio de Relaciones Exteriores.



Activities of observation
scientific research or studies
will only be allowed.



Ensures the conservation of
pristine sea bottom, almost
without human intervention.



72% of fishes inhabiting the
marine park are endemic in the
region and now they are protected.

FOTOGRAFÍAS ENRIC SALA, NATIONAL GEOGRAPHIC

