

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

*La Havana, Cuba, 7 to 12 October 2019*

**SC7-Doc29**

**Chile's Annual report (Jack mackerel)**

*Chile*



# **CHILE ANNUAL REPORT**

## **SPRFMO-SCIENTIFIC COMMITTEE**

September, 2019.

## 1. DESCRIPTION OF THE FISHERY

### 1.1 Composition of the Fleet.

The industrial purse seine fleet operating on the jack mackerel fishery in the SPFRMO area and Chilean EEZ between January and July 2019 consisted of 61 fishing vessels. This number is lower than previous years (Table I) as a result of the low availability of jack mackerel for the northern fleet of the country represented by vessels below 600m<sup>3</sup>. On the other hand, participation of fishing vessels from the center-south area (larger than 900m<sup>3</sup>) has been stable in the last five years.

Between 2015 and 2019, the number of vessels operating within the SPRFMO area showed a reduction, with the exception of 2015, where almost 30% of the industrial fleet operated in this area. During 2016 and 2019 operations on jack mackerel have been concentrated within the Chilean EEZ (Table II).

**Table I.** Number of industrial purse seine vessels catching jack mackerel in the Chilean EEZ and the SPRFMO (combined) area between 2015 and Jun 2019. Data were assembled by year and hold capacity (2019\* preliminary data).

Hold capacity (m <sup>3</sup> )	2015	2016	2017	2018	2019 (*)
0 - 300	1	3	0	0	0
300 - 600	59	57	57	46	32
600 - 900	6	7	5	5	6
900 - 1.200	3	1	2	1	1
1.200 - 1.500	7	6	8	7	8
1.500 - 1.800	9	9	9	9	10
1.800 - 2.100	4	4	4	4	4
<b>TOTAL</b>	<b>89</b>	<b>87</b>	<b>85</b>	<b>72</b>	<b>61</b>

**Table II.** Number of industrial purse seine vessels catching jack mackerel in the SPRFMO area between 2015 and Jun 2019. Data were assembled by year and hold capacity. (2019\* are preliminary data).

Hold capacity (m <sup>3</sup> )	2015	2016	2017	2018	2019 (*)
0 - 300	0	0	0	0	0
300 - 600	0	0	0	0	0
600 - 900	3	1	0	0	0
900 - 1.200	3	0	1	0	0
1.200 - 1.500	9	0	0	1	0
1.500 - 1.800	7	2	2	0	2
1.800 - 2.100	4	2	0	1	0
<b>TOTAL</b>	<b>26</b>	<b>5</b>	<b>3</b>	<b>2</b>	<b>2</b>

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

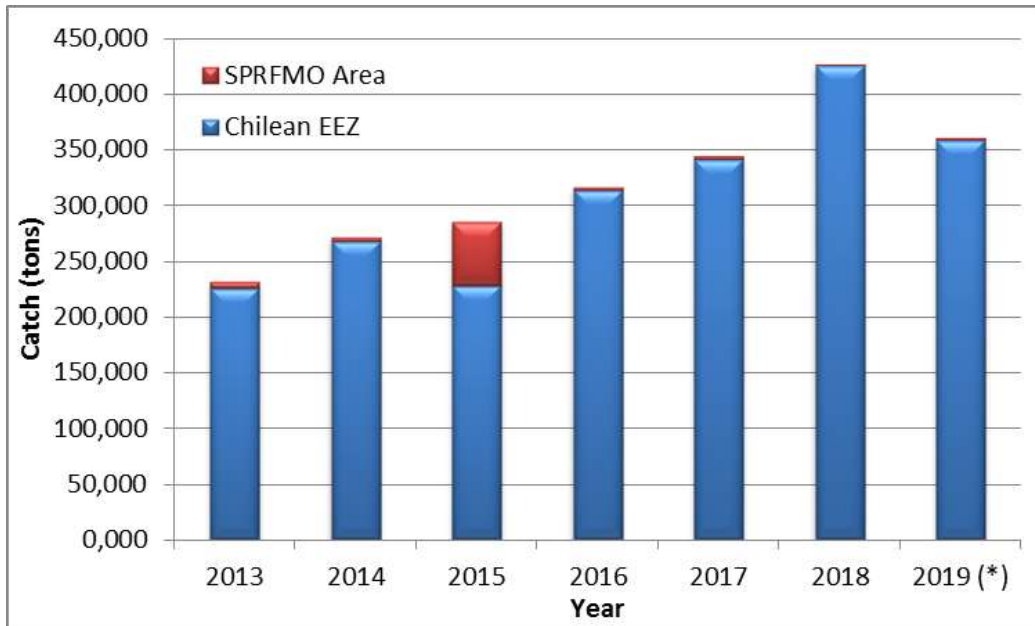
### a) Catches

During the period between 2013 and 2018, an increase of jack mackerel catches has been observed because of the consumption of quota allocated to our country and, on the other hand, of the transfers of jack mackerel from other fishing nations. The main catches concentrate during the first half of each year (80% in average of the annual quota).

In this same period, there is a decreasing trend in the catches of jack mackerel within the SPRFMO area, with the exception of 2015 where such catches corresponded to 20% of the total captured in such year (Figure 1 and Table III).

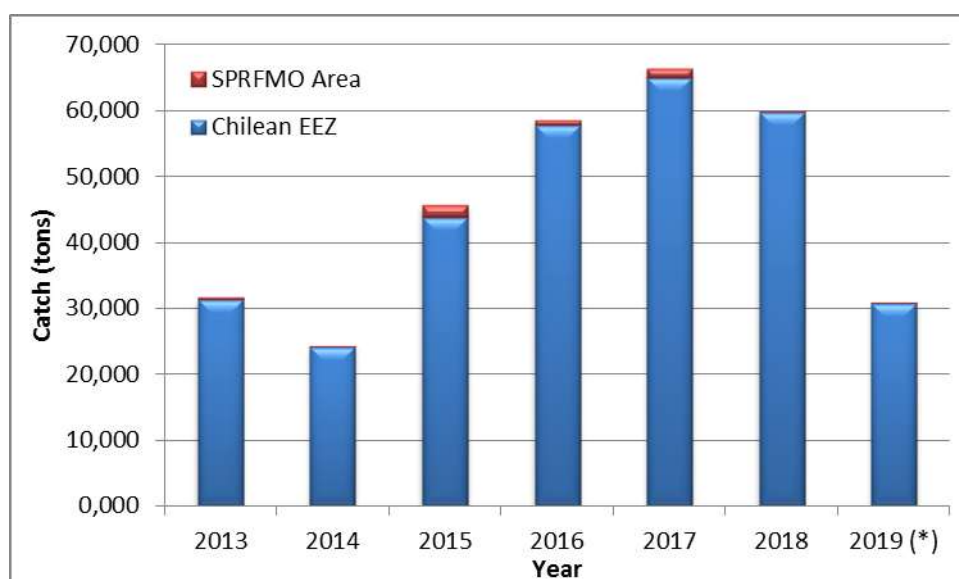
During the first half of 2019, 2,283 tons of jack mackerel have been captured within the SPRFMO area.

Besides jack mackerel, the national fleet also registered chub mackerel catches which totaled 30,871 tons until June 2019. These catches have shown a reduction during the last 3 years and they are expected to maintain such trend. In the same line, catches of chub mackerel will not surpass 1% of the total capture of this resource within the SPRFMO area (Figure 2 and Table IV).



Year	Chilean Jack Mackerel (t)		
	Chilean EEZ	SPRFMO Area	Total
2013	225,443	5,917	231,360
2014	267,615	3,983	271,598
2015	228,409	56,805	285,214
2016	313,403	3,159	316,562
2017	341,572	3,173	344,745
2018	425,013	974	425,987
2019 (*)	358,564	2,283	360,847

**Figure 1** and **Table III.** Total annual jack mackerel catch within the Chilean EEZ and the SPRFMO area with purse seine nets for the period 2013 – June 2019 (\*) preliminary.



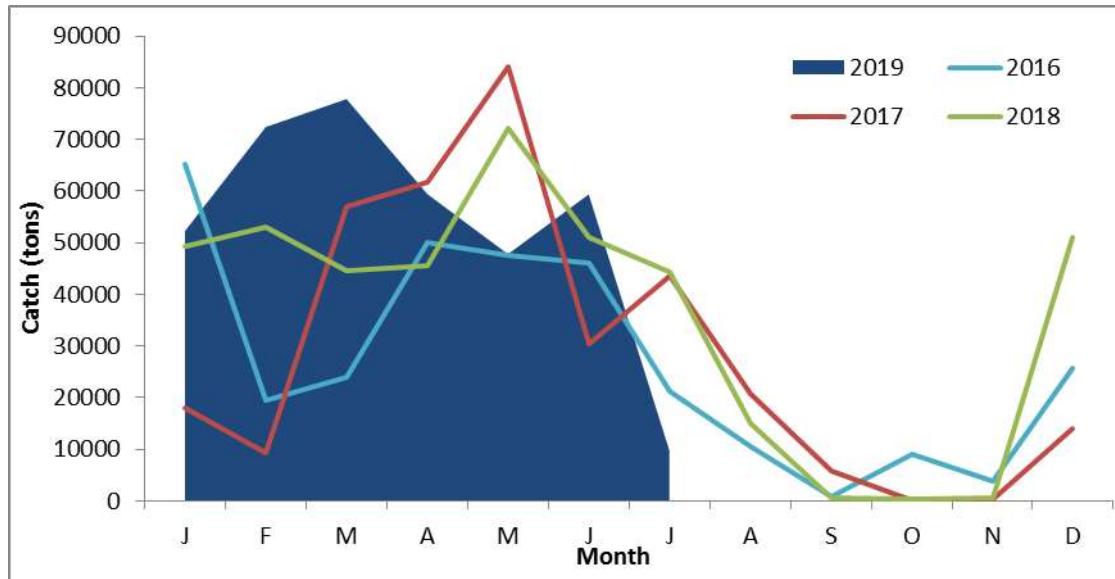
Year	Chilean Chub Mackerel (t)		
	Chilean EEZ	SPRFMO Area	Total
2013	31,226	431	31,657
2014	24,127	31	24,158
2015	43,867	1,820	45,687
2016	57,769	814	58,583
2017	64,915	1,492	66,407
2018	59,774	61	59,835
2019 (*)	30,671	200	30,871

**Figure 2** and **Table IV**. Total annual chub mackerel catches in the Chilean EEZ and SPRFMO area with purse seine nets for the period 2013 - June 2019 (\*) preliminary.

### b) Seasonality of Catches

During the first semester of 2019, jack mackerel catches (315,000 tons) were the highest of the period between 2016 and 2019. These catches started in December 2018 until June 2019 with a monthly average of 60,000 tons during the first semester.

Absence of juveniles and a distribution of schools of jack mackerel near the coast during the first semester of 2019 resulted in the high catches. This situation occurred in 2018 as well.

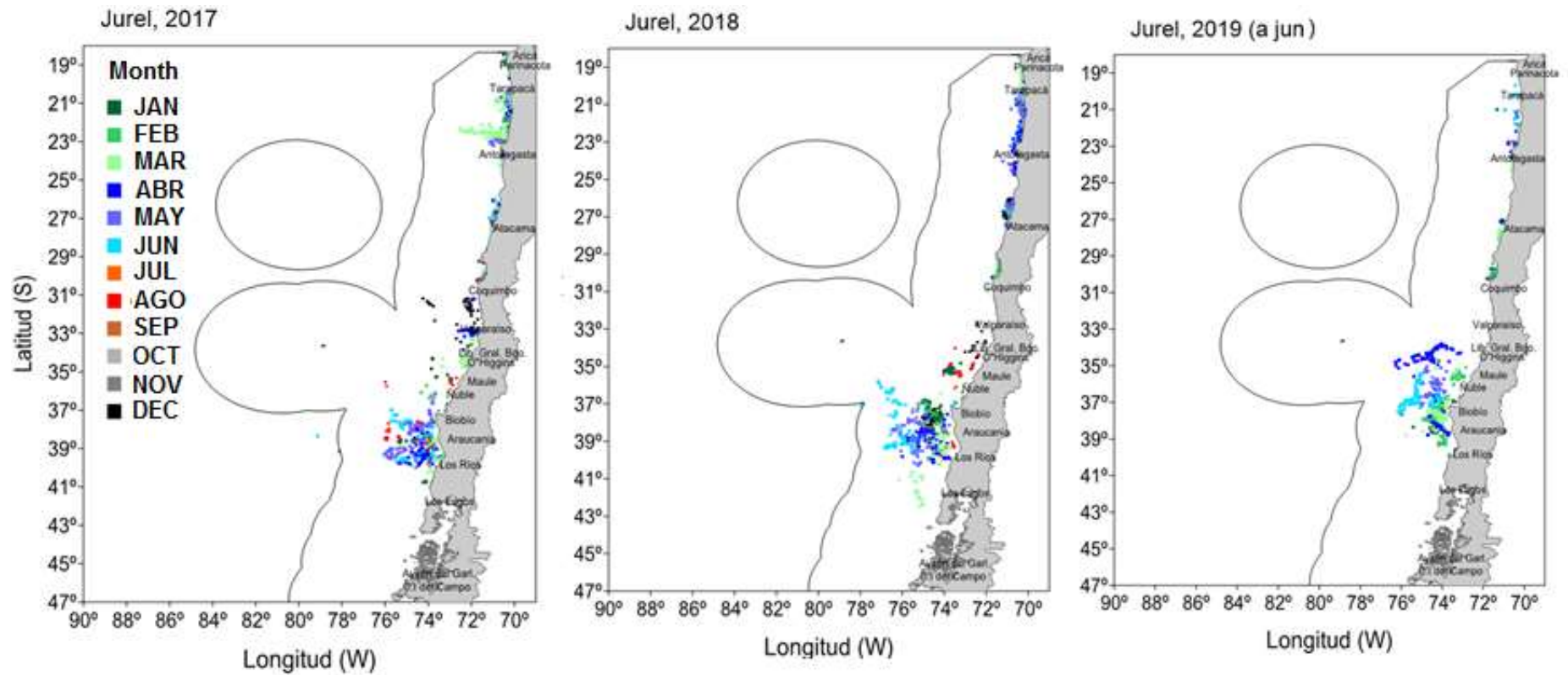


**Figure 3:** Seasonality of jack mackerel catches by the purse-seine fleet for the period 2016-June 2019. Source: SERNAPESCA.

### c) Spatial Distribution of Catches

During 2017 and 2018, spatial distribution of jack mackerel catches in the center-south area concentrated in areas near the coast (first 150 nm). The North area of the country concentrated catches in areas near the coast (first 50 nm) associated to the capture of anchovy as target species. However, unlike previous years, jack mackerel catches concentrated in 22° SL during March 2017 with catches of individuals over the legal minimum size of 26 cm FL.

During 2018, the fleet operating within the center-south area has shown a very similar catch pattern, concentrating its operation zone between 38° LS and 41° LS, always within the EEZ. On the other hand, the fleet concentrated its catches a little further north (34° SL- 40° SL) in areas closer to the coast within the first 100 nm (Figure 4).



**Figure 4:** Spatial-temporal distribution of industrial jack mackerel purse seine fleet 2017, 2018, and Jun 2019. Source: IFOP.



#### **d) Bycatch**

During the period between 2013 and 2018, operations within the SPRFMO area and Chilean EEZ targeted, almost completely, jack mackerel as target species and chub mackerel appeared as the main associated species. Other species captured showed a marginal presence.

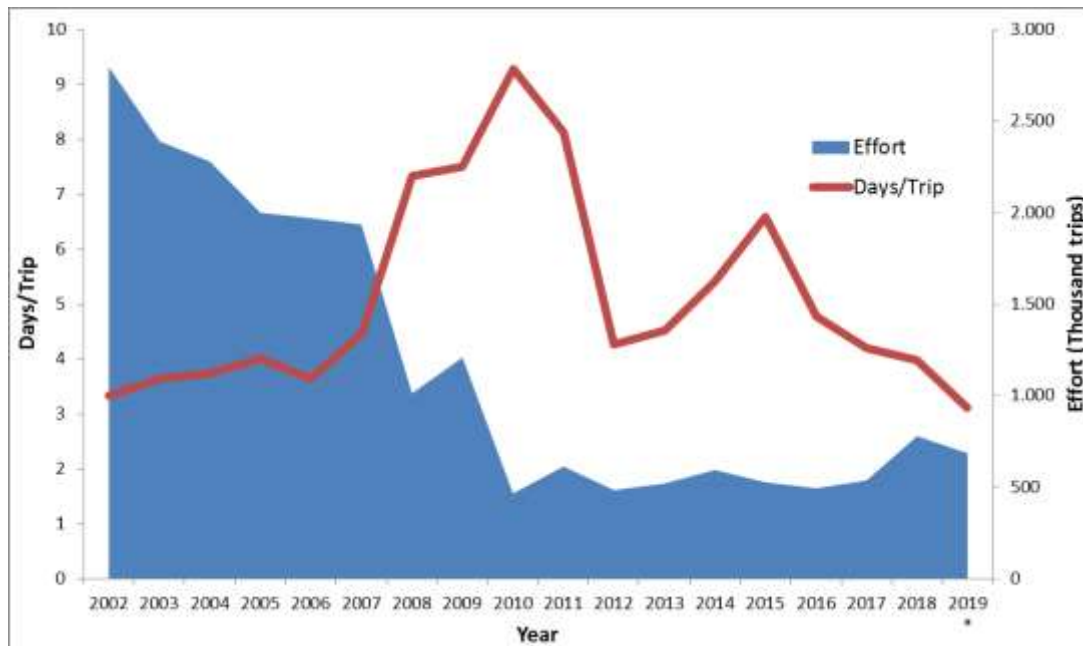
In the northern area of the country, jack mackerel was mostly captured as associated catch of anchovy.

## **2. EFFORT AND CPUE FOR JACK MACKEREL FISHERY**

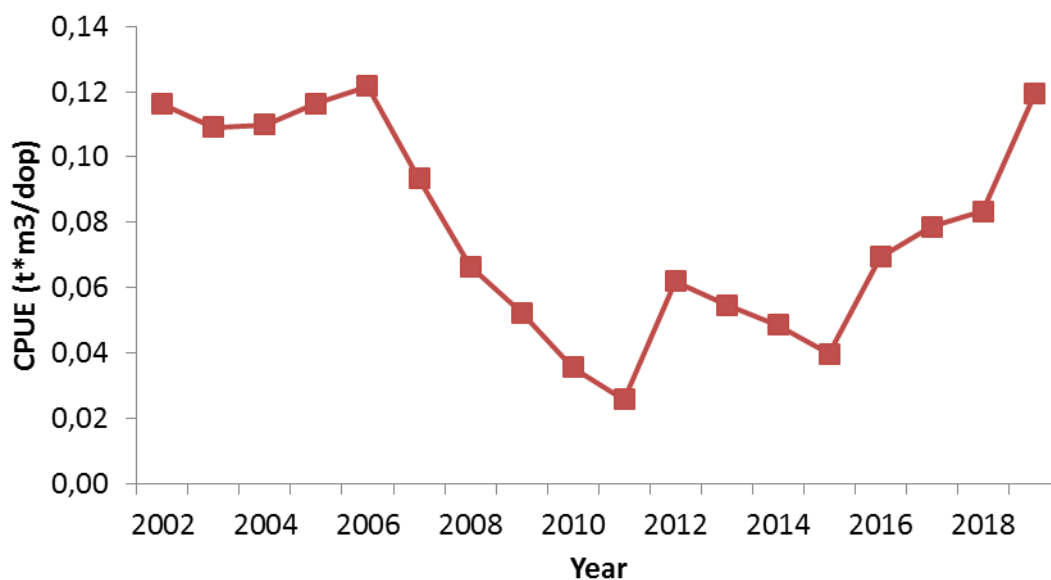
Information contained in this document refers to the fleet of the center-south operating on jack mackerel as target species. Catches, effort and CPUE were calculated for each trip in which jack mackerel represented over 50% of the total catch.

Until 2010, an increasing trend in the length of fishing trips was observed (Figure 6), due to the distances from the catch areas for jack mackerel. After that, during 2012 and 2013, catches concentrated within the EEZ which reduced substantially (50%) the average length of fishing trips. In 2015, catches outside the EEZ were made again and length of fishing trips reached 7 days in average. For the last years of the series (2016-2019), levels of the total number of trips and their length show some stability since catches concentrated again in areas close to the coast within the first 150 nm.

On the other hand, the standardized CPUE, measured as the utilization rate of the fleet's carrying capacity (catch / (hold capacity displaced x length of fishing trip)) showed a decreasing trend between 2001 and 2011. Subsequently, in 2012, this indicator changed its trend towards an increase over time, explained by a decrease in the average length of the fishing trips as a result of changes in the distribution of the resource (Figure 7).



**Figure 5:** Effort in number of trips with catch (blue), and length of fishing trips in days (red) for the purse seine fleet in the center-southern zone, period 2002-2019 (preliminary). Data SERNAPESCA. Source: IFOP.



**Figure 6:** Nominal CPUE for the purse seine fleet in the center-southern zone, period 2002-2019 (preliminary). Source: IFOP-SERNAPESCA.

### 3. RESEARCH PROGRAMS

Jack mackerel research programs include standard projects carried out annually by IFOP (Fisheries Research Institute) along with complementary projects. Information obtained is used by the Authority to support the decision-making process.

Basic projects performed by IFOP during 2017-2018:

- Jack mackerel fishery monitoring

This study allowed to obtain real-time information on the evolution of the main biologic and fisheries indicators associated to the jack mackerel fishery and its incidental catch. Monitoring was conducted throughout the maritime space between the northern boundary of Chile and 47° 00' SL and included information collected from both small-scale and industrial fleets.

- Assessment of the total allowable catch

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

- Biological condition of jack mackerel in the high seas, 2018

This research cruise took place from November 26 through December 8, 2018, and included an exploration area located between 73°30'W and 92°00'S, and between 33°00'S and 38°00'S. The main objective of this project was to estimate relative indexes of abundance of jack mackerel eggs and larvae within the Chilean maritime center-south area and to characterize aggregations of the resource in the area, during the period of maximum reproductive activity.

- Hydroacoustic assessment of jack mackerel between Arica-Parinacota and Valparaíso regions, 2019.

This research cruise took place from March 17 through April 26, 2019, and included an exploration area located between the northern boundary of the country and Valparaíso (33° 00' SL) in perpendicular transects to the coast, reaching up to 100nm off the coast. As a result, the estimated jack mackerel biomass in the prospection area was 1,459,000 tons.

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

##### 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 scientific observers on board fishing vessels. Information collected includes fork length measurements, otolith collection, total weight, gutted weight, gonad weight, and sex and maturity stages.

The amount of size and biological samples obtained for jack mackerel during 2018 was 39,599 and 23,762 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 were Caldera and Coquimbo in the northern area, and Coronel-Lota and Talcahuano in the center-south area of the fishery (Table V).

Chub mackerel is the main bycatch in the jack mackerel fishery. During 2018, sampling also included a total of 5,246 and 1,417 specimens for length and biological samples, respectively.

**Table V.** Number of Jack mackerel and Chub mackerel specimens collected in 2018 for biological and length samples.

Landing Port	Jack Mackerel		Chub Mackerel	
	Lenght Sampling	Biological Sampling	Lenght Sampling	Biological Sampling
Arica	138		1	3
Iquique	190		9	
Antofagasta	386	163		
Caldera	3.035	2.638	381	557
Coquimbo	3.163	3.401	204	373
San Antonio				
Talcahuano	13.091	7.547	176	563
Coronel-Lota	19.375	10.013	497	1.132
Valdivia	221			
<b>TOTAL</b>	<b>39.599</b>	<b>23.762</b>	<b>1.268</b>	<b>2.628</b>

## 4.2 Length and age composition of catches

### a.- Jack Mackerel

Size structure of jack mackerel has shown a constant growth from 2015 to 2019 (Figure 7), with a shift of the mode size from 27 cm FL as mode size in 2015, to 30-31 cm FL in 2019 (first semester). During 2018, a bi-modal structure with sizes around 15 cm FL was observed, corresponding to catches from the center-south fleet.

For the first semester of 2019, the range of sizes from catches of the center-south fleet varied between 22 and 61 cm in FL. The main mode was 31 cm in FL and the secondary mode 35 cm in FL. The contribution of the north fleet is expected to be lower than the contribution provided in 2018 due to low catches in such area.

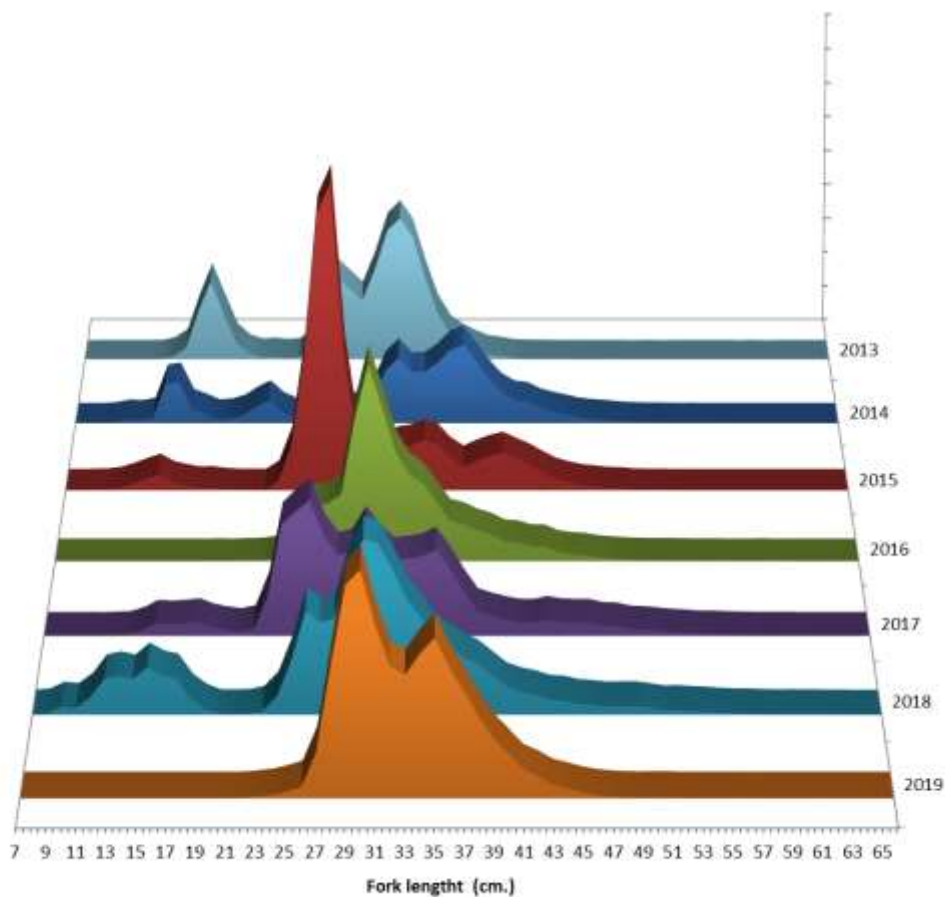
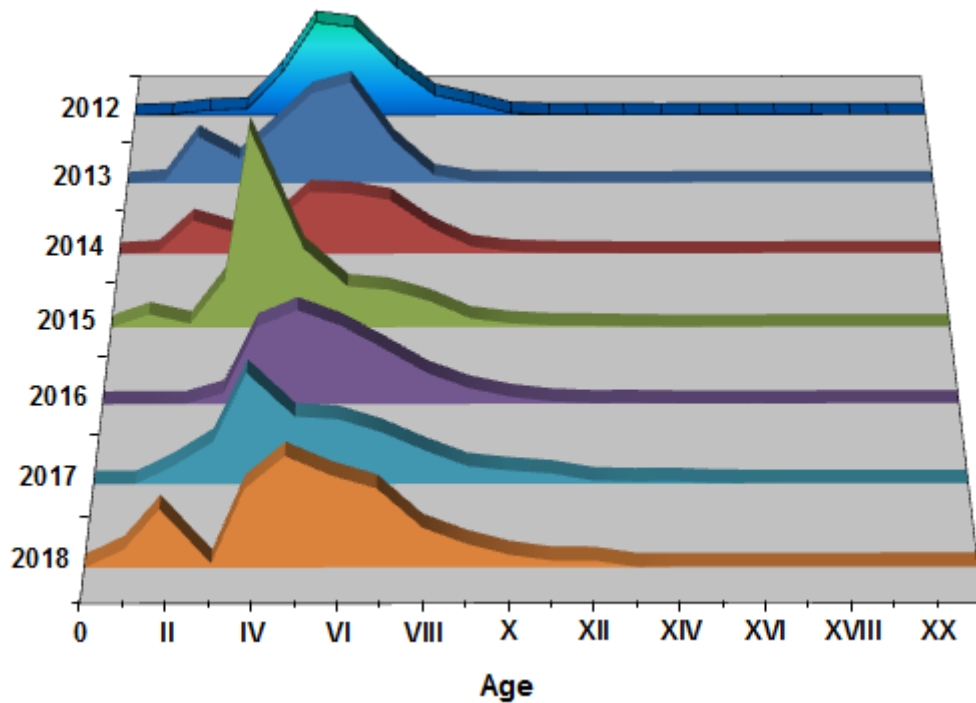


Figure 7. Length structure of jack mackerel, total catch in number 2013 - June 2019 (central-south fleet). Source: IFOP.

Ages IV, V, and VI stand out as the main modes in age structure for 2017, concentrating 55% of catches. These age groups were captured both in the north area and center-south area during 2017 (Figure 8).

For 2018, size structure at a national level showed a structure composed of specimens with a main mode in the age group IV from the north area of the country and a strengthening of older ages (mode VII to XI) in comparison with the rest of the years, which may be caused by a strengthening of the general structure of the stock due to the management measures implemented by SPRFMO.



**Figure 8:** Age structure of jack mackerel, total catch in numbers, 2012 to 2018. Source: IFOP.

## **Ecosystem Approach considerations**

There is a growing concern that the levels of fishing mortality as a result of bycatch and discards, threaten the long-term sustainability of many fisheries worldwide and the maintenance of biodiversity in different areas, compromising the food security and affecting the livelihood of people and countries that depend on fishing resources. However, substantial differences in the use and definition of these terms have been observed.

In some countries the term bycatch is referred to the part of the catch (different from the target species) that is retained and sold. In other countries, bycatch considers species/sizes/sexes of fish that are discarded. On the other hand, the OECD defines bycatch as “the total fishing mortality, excluding that accounted directly by the retained catch of target species”. This last definition thus includes fish that die as a result of the interactions with fishing gears, even if they do not leave the water. It could also include mortalities resulting from “ghost-fishing”.

As a reference, FAO defines bycatch as “any catches conducted during the fishing process beyond species and sizes of the marine organisms targeted by the fishery, from sponges, corals, commercial or not commercial fish, seabirds, marine mammals and marine reptiles”. In this regard, Chile amended its General Law On Fisheries and Aquaculture in 2012 (through Law N° 20.625, known as “discard law or ban”) incorporating the terms incidental catch: marine mammals, seabirds and turtles caught during fishing operations and discards: the action of returning to sea hydro biological species caught (target and non-target). The new discard law also incorporates penalties and mechanisms of control for those species engaged in these practices during fishing operations. The Chilean approach to understand, regulate and mitigate bycatch and discards is broad in scope, encompassing the following groups: target and non-target fish, accompanying fauna (bony fishes, chondrichthyes, invertebrates, etc.) and seabirds, marine mammals and sea turtles. The amendment also introduced fisheries exceptions to the discard ban, conditional on a minimum 2-year monitoring program to quantify discards and bycatch, to identify their causes, and to develop and implement Reduction Plans.

Consequently, from 2013 onwards, the Scientific Observer Program, with a team of trained observers has collected information onboard commercial fleets, for a Nation-wide Program on bycatch and discards in small pelagic purse seine fisheries. This collection is aimed at establishing a reduction plan for these practices, according to the law’s requirements. In January 2015, a specific program for the jack mackerel industrial fleet was initiated, which was concluded in April 2019 with the enactment of a mandatory reduction plan, along with the Management Committee of the fishery. The plan includes:

- Management measures and technological means to eliminate discards and reduce incidental catch
- A monitoring program to evaluate the effectiveness of measures adopted by the reduction plan
- A training program
- A code of good fishing practices
- Government incentives for innovation in systems aimed to reduce bycatch and discards.

As of April 2019, the fishery is subject to a compulsory Reduction Plan aimed to eliminate discards and to reduce the interaction and catch of seabirds, marine mammals and sea turtles. The discard Law's requirements and compliance with reduction plan's measures will be monitored by electronic monitoring systems (EMS) onboard all vessels of the industrial fleet, while artisanal boats longer than 15 m will be required to carry EMS 3 years after. The EMS specific regulations have been enacted in 2017 and is expected to have the system fully implemented in the industrial fleet as of January 2020.

In spite of the existence of incidental catch in the jack mackerel fishery, the mortalities are low since most specimens are released alive except for Pink-footed shearwater where mortalities observed were 100%. The only species of marine mammal affected was the southern sea lion, although mortalities are low, not exceeding 3% of the specimens caught (tables V, VI and VII).

In the case of the vulnerable marine ecosystems indicators (VME), there is no record of interactions with the Jack mackerel purse seine fishery in the EEZ and in the high seas.

**Table VI.** Capture and incidental mortality by species in the jack mackerel industrial fleet.  
Source: data collected by observers onboard from 207 fishing sets during 2016.

Common name	Scientific name	N° Caught	N° Killed	ICR <sup>1</sup>	IMR <sup>2</sup>
Southern sea lion	<i>Otaria flavescens</i>	912	4	4,406	0,019
Dominican gull	<i>Larus dominicanus</i>	2	0	0,010	0
Peruvian pelican	<i>Pelecanus thagus</i>	3	0	0,014	0
Pink-footed shearwater	<i>Ardenna creatopus</i>	13	13	0,063	0,063
Black shearwater	<i>Ardenna grisea</i>	1	1	0,005	0,005
Unidentified swallow	Hydrobatidae	1	1	0,005	0,005



**Table VII.** Capture and incidental mortality by species in the jack mackerel industrial fleet.  
Source: data collected by observers onboard from 416 fishing sets during 2017

Common name	Scientific name	N° Caught	N° Killed	ICR <sup>1</sup>	IMR <sup>2</sup>
Southern sea lion	<i>Otaria flavescens</i>	256	7	0,615	0,017
Sea swallow	<i>Oceanites oceanicus</i>	18	1	0,043	0,002
Dominican gull	<i>Larus dominicanus</i>	18	1	0,043	0,002
Peruvian pelican	<i>Pelecanus thagus</i>	7	0	0,017	0
Humboldt Penguin	<i>Spheniscus humboldti</i>	13	1	0,031	0,002
Gray-headed Albatross	<i>Thalassarche chrysostoma</i>	8	0	0,019	0
Pink-footed shearwater	<i>Ardenna creatopus</i>	1	1	0,002	0,002
Black shearwater	<i>Ardenna grisea</i>	45	0	0,108	0

**Table VIII.** Capture and incidental mortality by species in the jack mackerel industrial fleet.  
Source: data collected by observers onboard from 717 fishing sets during 2018.

Common name	Scientific name	N° Caught	N° Killed	ICR <sup>1</sup>	IMR <sup>2</sup>
Southern sea lion	<i>Otaria flavescens</i>	267	3	0,372	0,004
Unidentified penguin	<i>Spheniscus Spp</i>	1	1	0,001	0,001
Black-browed Albatross	<i>Thalassarche melanophris</i>	1	1	0,001	0,001
Antarctic giant petrel	<i>Macronectes giganteus</i>	8	0	0,011	0
Large black shearwater	<i>Procellaria aequinoctialis</i>	1	1	0,001	0,001

**In Tables VI, VII and VIII:** Incidental Capture Rate (**ICR<sup>1</sup>**): Number of dead animals/Number of sets observed; Incidental Mortality Rate (**IMR<sup>2</sup>**): Number of dead animals/ Number of sets observed

## Observer Implementation Reports

### a) AT-SEA AND PORT SAMPLING PROGRAM.

In order to evaluate 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.

Due to the more coastal pattern of the jack mackerel fishery over the last years and low frequent and unpredictable fishing trips in such area, fleet operations within the SPRFMO Area with onboard observers have been difficult to cover. Nevertheless, the 2 fishing trips made operating on jack mackerel within the SPRFMO area (2018) were covered by scientific observers onboard (100%) corresponding to a total combined sampling coverage of 35.4% (Table IX).

Within the Chilean EEZ, onboard sampling coverage conducted by observers was 20.2%, and at-port sampling coverage was 14.9%, with a total combined sampling coverage of 35.1%.

**Table IX.** Sampling coverage by observers at port and observers onboard in the Chilean jack mackerel fishery 2018.

	At-Port	On Board	TOTAL
Chilean EEZ	14,9	20,2	35,1
SPRFMO area		100,0	100,0
<b>TOTAL</b>	14,9	20,5	35,4

## 6.- ADMINISTRATIVE MEASURES

### a.- Total catch quota.

In December each year, the Undersecretariat for Fisheries and Aquaculture establishes the catch quotas for each resource in full exploitation regimes to be implemented next year. The jack mackerel quota established by the Undersecretariat for Fisheries and Aquaculture in December 2018 was 381,572 tons (Exempt Decree N° 541/2018) that is close to be captured.