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**Chile Annual report**

***Undersecretariat for Fisheries and Aquaculture***

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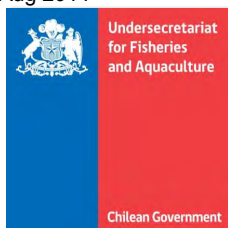


# **ANNUAL NATIONAL REPORT**

## **SPRFMO-SCIENTIFIC COMMITTEE**

### **JACK MACKEREL FISHERY IN CHILE**

August, 2014.



## 1. DESCRIPTION OF THE FISHERY

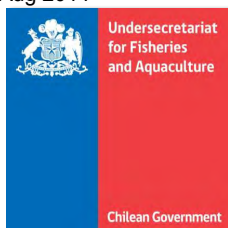
### 1.1 Composition of the Fleet.

The industrial purse seine jack mackerel fleet operating from January to July 2014 on the SPFRMO area and Chilean EEZ (combined) consisted of 89 vessels. This number is slightly lower than 2013 (96), and continues with the downward trend observed since 2009, when 129 vessels operated. The fleet shrinkage is mainly associated with a catch quota reduction resulting from the critical resource condition. The fleet in 2014 was represented in a 69% by vessels with a hold capacity not exceeding 600 m<sup>3</sup> which worked mainly in the north area. (**Table I**)

As a result of changes in the resource's distribution, since 2012 the jack mackerel fleet has operated mainly within the Chilean EEZ, condition confirmed by only 10 vessels operating in the SPRFMO area in 2013 and 2014. This number represents a third of the vessels registered in the same area in 2011, and has been mainly characterized in 2014 by vessels with hold capacities greater than 900 m<sup>3</sup> (**Table II**).

**Table I.** Number of industrial purse seine vessels catching jack mackerel in the Chilean EEZ and the SPRFMO (combined) area between 2010 and July 2014. Data were assembled by year and hold capacity. (2013\* and 2014\* are preliminary data).

Hold Capacity (m <sup>3</sup> )	2010	2011	2012	2013 (*)	2014 (*)
0-300	3	2	0	0	0
300-600	68	67	60	64	61
600-900	7	10	8	9	8
900-1200	17	10	6	6	5
1200-1500	10	11	9	7	6
1500-1800	11	12	9	6	6
1800-2100	6	5	5	4	3
<b>TOTAL</b>	<b>122</b>	<b>117</b>	<b>97</b>	<b>96</b>	<b>89</b>



**Table II.** Number of industrial purse seine vessels catching jack mackerel in the SPRFMO area between 2010 and July 2014. Data were assembled by year and hold capacity (2013\* and 2014\* are preliminary data).

Hold Capacity (m <sup>3</sup> )	2010	2011	2012	2013 (*)	2014 (*)
0-300	0	0	0	0	0
300-600	0	0	0	2	0
600-900	4	4	0	1	1
900-1200	12	4	2	2	3
1200-1500	8	9	1	2	3
1500-1800	12	10	3	2	3
1800-2100	6	5	3	1	0
<b>TOTAL</b>	<b>42</b>	<b>32</b>	<b>9</b>	<b>10</b>	<b>10</b>

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

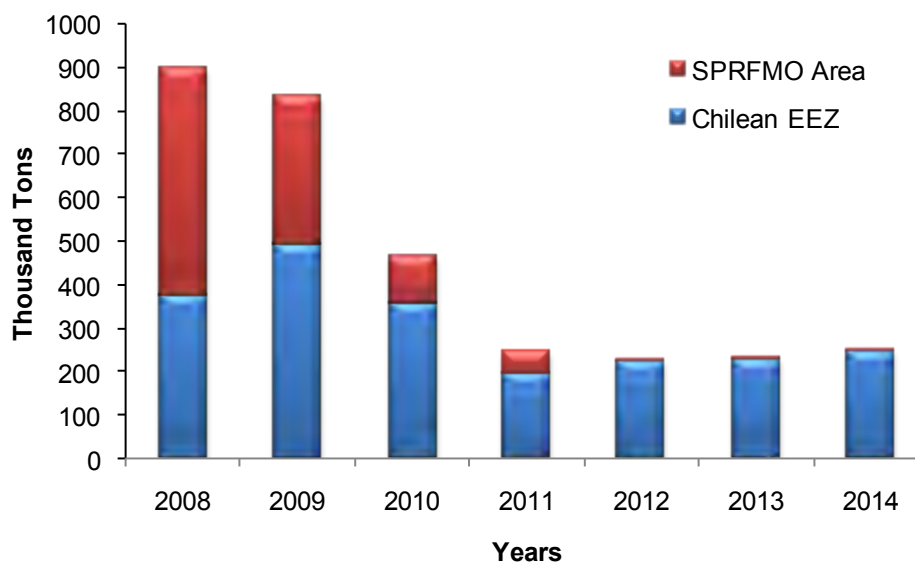
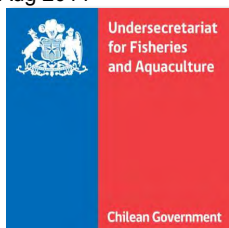
### Catches.

As observed since 2011, jack mackerel catches by the Chilean fleet have remained steady due to compliance with catch quotas set by the SPRFMO.

By July 2014, accumulated jack mackerel catches adding up 250,252 tons were registered, surpassing by 16% catches registered for the same period in 2013. However, only 3,952 tons were caught in the SPRFMO area, accounting for merely 1.6% of the total jack mackerel catch by the national fleet, (**Figure 1 and Table III**).

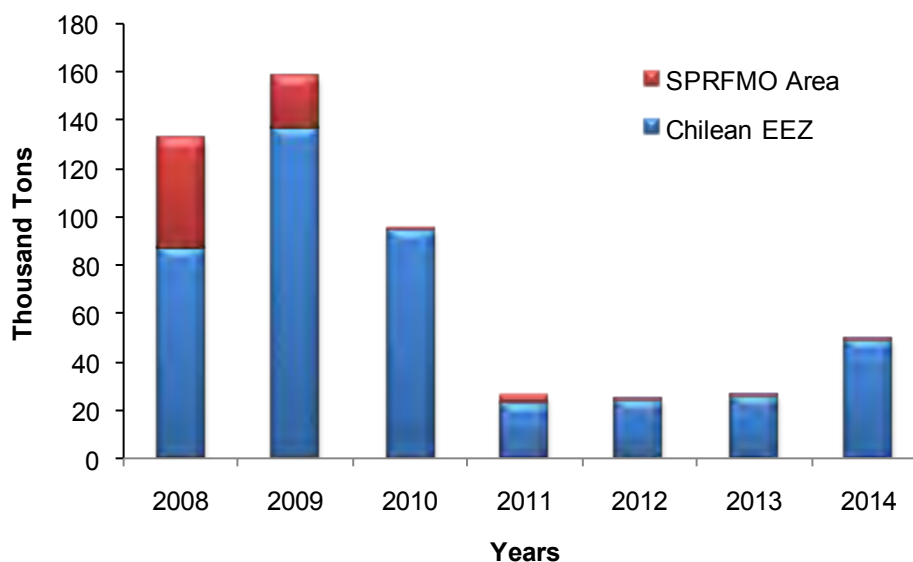
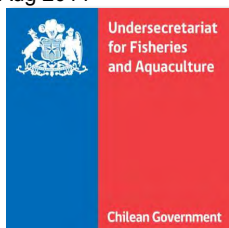
Constrained by small quotas, jack mackerel catches in the northern area of the country remained low for a fourth consecutive year. Thereby by July 2014, only 17,000 tons have been registered in this area, representing 7,8% of the cumulative national total. These catches were mainly represented by jack mackerel caught as bycatch in the anchovy fishery.

Besides jack mackerel, the national fleet also captured chub mackerel in 2014, adding 49,448 tons by July, and doubling up the average catches registered for this resource during the period 2011-2013. However, catches of chub mackerel in the SPRFMO area do not exceed 1% of the total Chilean during the same period (**Figure 2 and Table IV**).



Years	Chilean Jack Mackerel (t)		
	Chilean EEZ	SPRFMO Area	Total
2008	376,370	519,738	896,108
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	246,300	3,952	250,252

**Figure 1** and **Table III**. Total annual jack mackerel catch in the Chilean EEZ and the SPRFMO area with purse seine nets for the period 2008 - July 2014



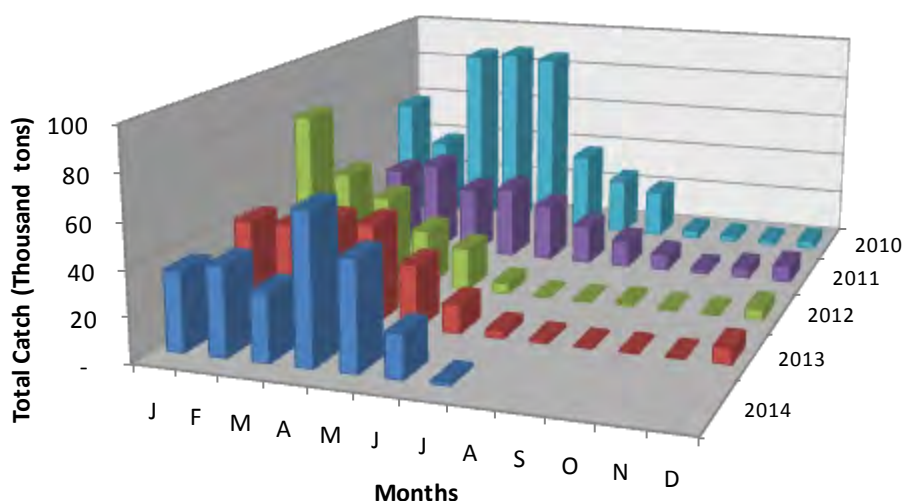
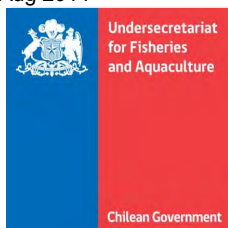
Years	Chub Mackerel (t)		
	Chilean EEZ	SPRFMO Area	Total
2008	87,316	45,702	133,018
2009	136,516	21,936	158,452
2010	94,723	936	95,659
2011	23,077	2,979	26,056
2012	24,120	199	24,319
2013	26,086	243	26,325
2014	48,986	462	49,448

**Figure 2** and **Table IV**. Total annual chub mackerel catches in the Chilean EEZ and SPRFMO area with purse seine nets for the period 2008 - July 2014.

### Seasonality of Catches

During the first half of 2014, monthly jack mackerel catches fluctuated around 35 thousand tons. However substantial increases were observed in April and May when catches reached 66.9 and 48.6 thousand tons respectively, which accounted for 48% of the total catch accumulated by July 2014. These increases are unusual compared with the fisheries performance observed from 2011 onwards, when catches were lower in the second quarter.

Besides the increases observed in catches during April and May 2014, these dropped considerably in June and July, highlighting a progressive shortening of the fishing season similarly as observed in previous years (2012 and 2013) (**Figure 3**).



**Figure 3:** Seasonality of jack mackerel catches by the purse-seine fleet for the period 2010-2014. Source: SERNAPESCA.

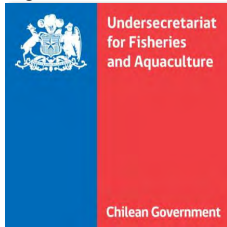
### Spatial Distribution of Catches

During 2014, catches for jack mackerel in the northern area of the fishery were restricted to the first 50 nm, following the same spatial pattern observed in previous years.

On the other hand, since 2012, catches in the central south area of the fishery have exhibited a spatial pattern restricted to the EEZ (within the first 100 nm), not evidencing the typical shift toward oceanic waters during the second and third quarter of each year observed before 2012.

During the first half of 2013, the spatial distribution of jack mackerel catches in the central south area of the fishery was concentrated between 31°-37° SL. However there was a monthly pattern marked by a beginning of the fishing season around 35° SL between January and March, followed by both a northward shift to 31°-34° SL and westward shift within the EEZ between April and June. During the second half of 2013 the fishing activity for jack mackerel in the central south area was negligible (**Figure 4**).

During the first half of 2014, the activity of the jack mackerel fleet exhibited a spatial pattern similar to the observed in 2013, with catches concentrated within the first 100 nm (EEZ). However during the first quarter 2014 catches were concentrated farther south than 2013 (35°-37° SL) moving further south again in the second quarter (35°-41° SL)



Catches of jack mackerel in the high seas during 2014 were small, and obtained between 37° and 39° SL, near the western limit of the Chilean EEZ.



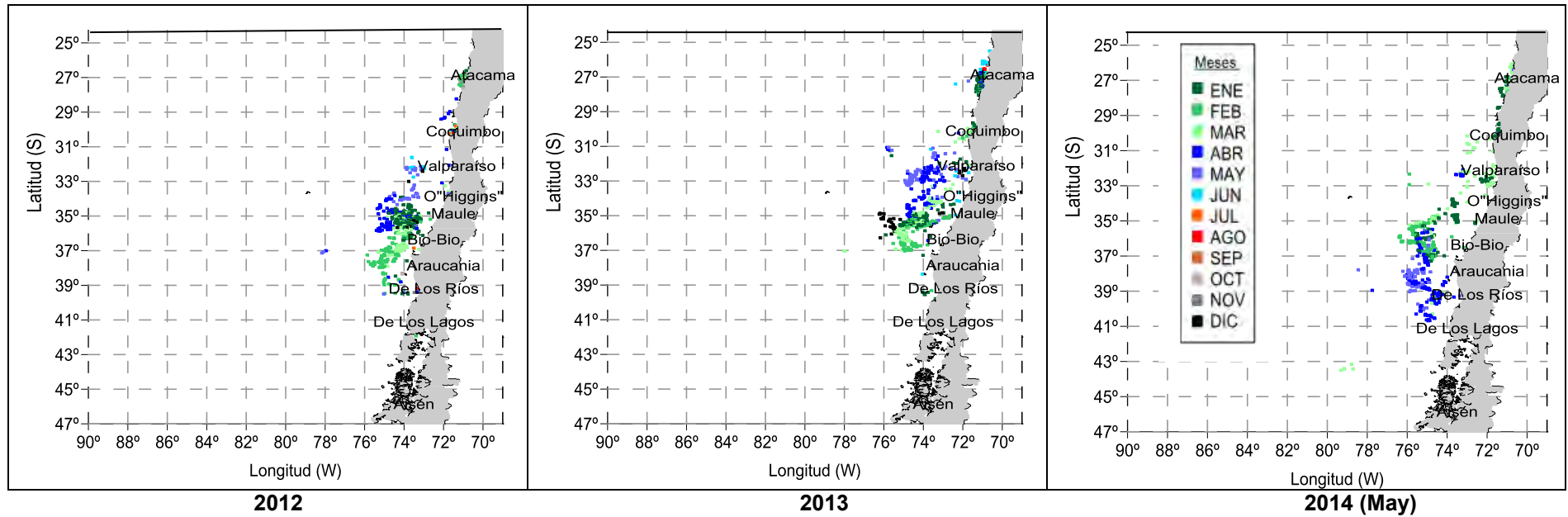
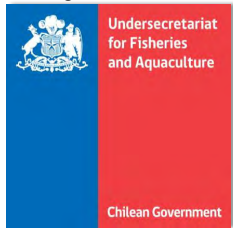
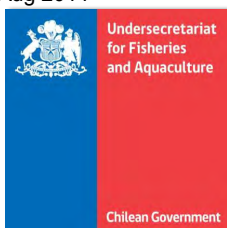


Figure 4: Spatial-temporal distribution of industrial jack mackerel purse seine fleet 2012, 2013, and May 2014. Source: IFOP.



## Bycatch

In 2013, catches for the Chilean jack mackerel fleet operating in the SPRFMO area and the EEZ were almost exclusively composed by the target species (*Trachurus murphyi*) which represented 100% and 99% of the catch composition respectively. Within the EEZ, bycatch for this fishery was mainly composed by chub mackerel (*Scomber japonicus*) which represented 1% of the catch composition.

In the northern zone of the country fishery, jack mackerel was mostly caught as bycatch in the anchovy fishery.

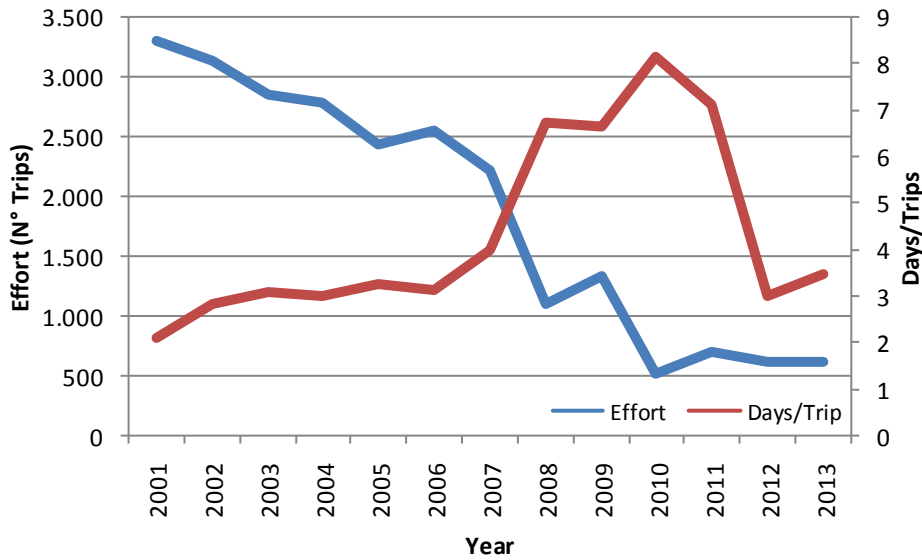
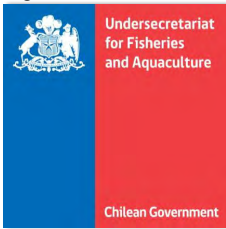
At the beginning of the second half of 2014, fisheries observers currently deployed in the purse seine fishing fleet operating in the central south area of the fishery were trained in subjects related to seabirds, such as species identification, sighting, documentation of interactions, etc. Therefore from the second semester onward is expected to gather systematic information related to seabird interactions with the jack mackerel fishery.

## 2. EFFORT AND CPUE FOR JACK MACKEREL FISHERY

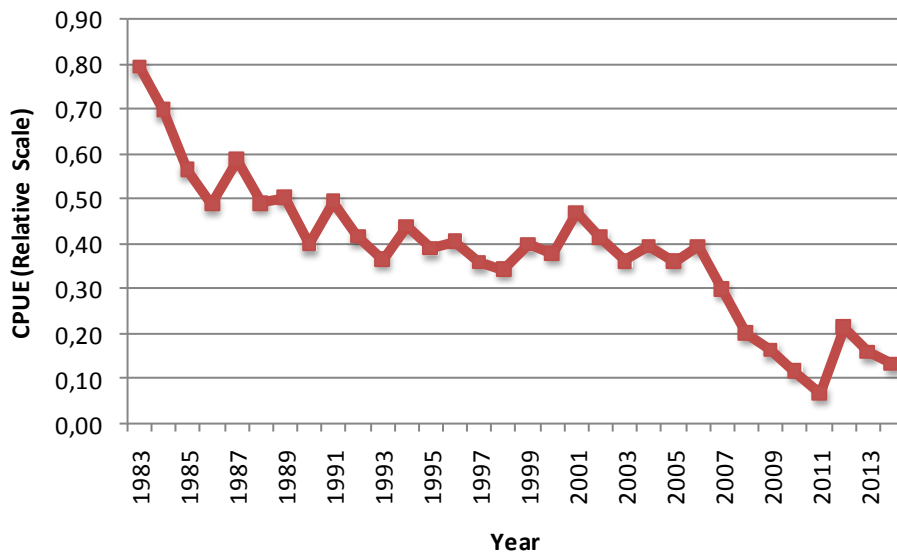
The information contained in this section concerns the central-southern zone fleet, targeting jack mackerel. Catch, effort, and CPUE were calculated for fishing trips where jack mackerel represented more than 50% of the catch.

Until 2010, it was observed a growing trend in length for jack mackerel fishing trips, due to the remoteness of the fishing grounds. This condition resulted in a gradual reduction of the fishing effort (measured as number of fishing trips with catch) which reached its lowest level that year for the period 2001-2014 (**Figure 5**). Subsequently, in 2012 and 2013, catches were concentrated within the EEZ, reducing considerably (-50%) the average length of the fishing trips and stabilizing the fall off the fishing effort.

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 steady trend between 1989 and 2006, followed by a declining tendency from 2007 to 2011. Subsequently, due to a diminution in average length of fishing trips in 2012 and 2013, associated with changes in the resource distribution, the standardized CPUE shifted its tendency toward higher values (**Figure 6**).

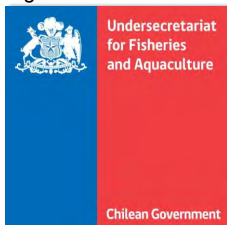


**Figure 5:** Effort in number of trips with catch (blue), and length of fishing trips in days (red) for the purse seine fleet in the center-southern zone, period 2001-2013. Data SERNAPESCA. Source: IFOP.



**Figure 6:** Standardized CPUE for the purse seine fleet in the center-southern zone, period 1983-2014. Source: IFOP.

Note: Due to standardization of the CPUE, this index has been expressed in a different scale of magnitude in 2014 relative to that described in the 2013 National Report.



### 3. RESEARCH PROGRAMS

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

Basic (standard) projects performed by IFOP during 2013:

- ***Hydroacoustic assessment of jack mackerel biomass between XV-III Regions, 2013***

This research cruise took place from March 19<sup>st</sup> through April 22<sup>th</sup> 2013, and included an exploration area located between the northern boundary of the country and 28°50' SL, where perpendicular transects reaching up to 100 nm from the coast, were prospected. As a result, in the prospected area, a jack mackerel biomass of 144,000 tons was estimated.

- ***Monitoring of the jack mackerel fishery***

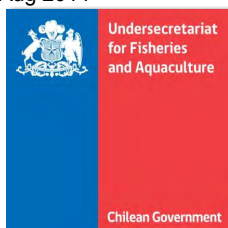
This study allowed the gathering of real-time information on the evolution of the main biological and fishing indicators, associated with the jack mackerel fishery and its bycatch. The monitoring was carried out along the entire maritime space between the north boundary of Chile and 47°00' SL, and included information gathered from both the small-scale fleet, and the industrial fleet.

- ***Jack mackerel stock assessment and total allowable catch estimation***

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 Authority to improve the stock evaluation, simulate different exploitation scenarios and conduct additional analyses.

According to needs and requirements outlined in the SWG framework, in addition to the standard projects mentioned above, during 2014, the following complementary project will be also carried out:

- Standardized Protocol for otoliths reading in jack mackerel
- Bio-physic-based models for Population structure and recruitment index assessments in Jack mackerel (Phase I)



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

### 4.1 Biological sampling.

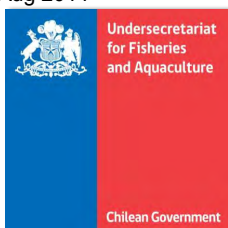
Biological information is obtained on a regular basis from samples collected along the Chilean coast for jack mackerel and its associated species. Sampling are conducted on a daily basis, mainly at landing sites/processing plants, but are also complemented with information gathered by fisheries observers 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 length and biological samples obtained for jack mackerel during 2013 added up 47,416 and 17,189 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 Iquique in the north area, and Talcahuano/Coronel in the central-south area of the fishery (**Table IV**).

Chub mackerel, the main bycatch for jack mackerel, was also sampled during 2013. A total of 857 and 720 specimens for length and biological samples were collected respectively.

**Table IV.** Number of Jack mackerel and Chub mackerel specimens collected in 2013 to gather biological and length samples.

Landing Port	Jack mackerel		Chub mackerel	
	Lenght Sampling	Biological Sampling	Lenght Sampling	Biological Sampling
ARICA	693		243	
IQUIQUE	1.153	160	206	
ANTOFAGASTA	484	74	235	
MEJILLONES			0	
CALDERA	5.683	1.250	48	38
COQUIMBO	2.254	797	51	30
SAN ANTONIO				
TALCAHUANO	30.551	11.902	39	460
SAN VICENTE				
CORONEL	6.598	3.006	35	192
LOTA				
CORRAL				
CALBUCO				
<b>TOTAL</b>	<b>47.416</b>	<b>17.189</b>	<b>857</b>	<b>720</b>



## 4.2 Length and age composition of catches

### a.- Jack mackerel

Similarly as seen in previous years, during the first half of 2014, the size structure for jack mackerel showed a multimodal distribution, with a slight shift of the main mode toward larger sizes, comparable to the observed in 2013.

During 2014 the main mode was 36-37 cm FL, followed by a secondary mode of 32 cm FL. These modes belong to fish caught in the south-center area of the fishery, where juveniles have been of low occurrence since 2011(**Figure 7**).

It should be noted that a smaller mode occurred at 14-15 cm FL, which belongs to juvenile fish caught as bycatch in the purse seine fishery for anchovy in the north area of the country (**Figure 7**).

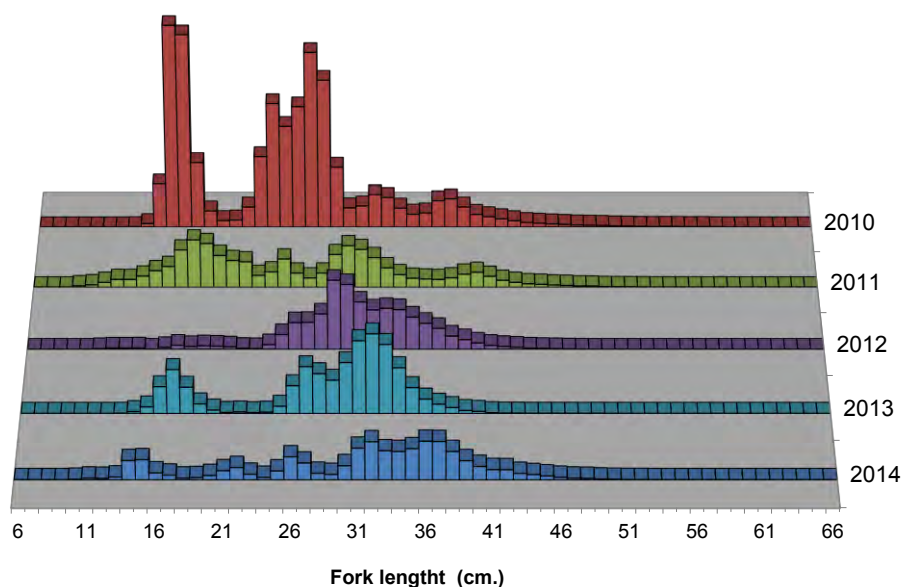
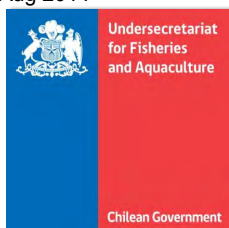
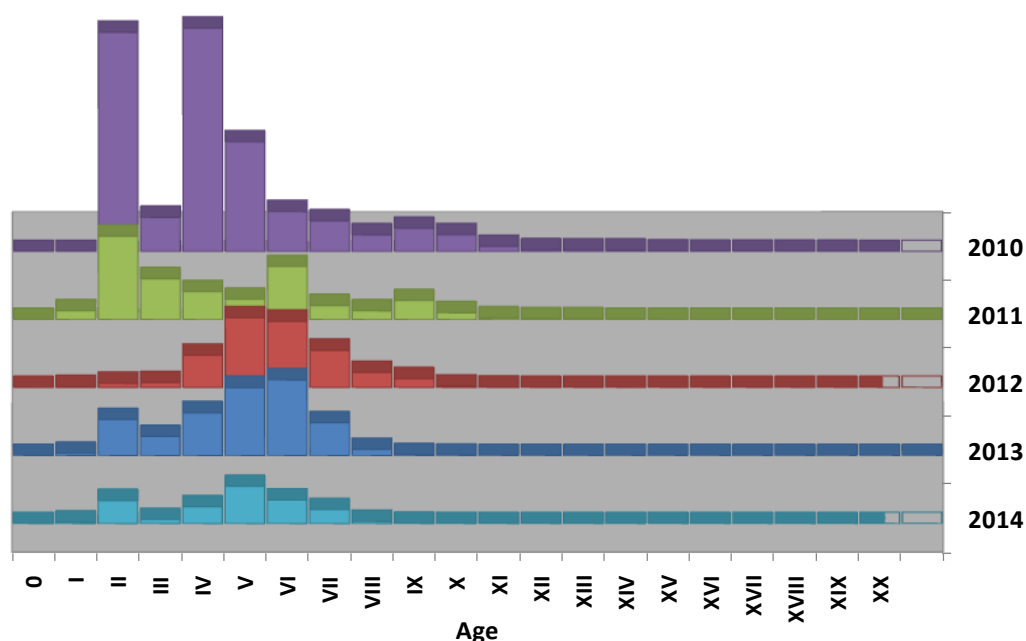


Figure 7.Length structure of jack mackerel, total catch in number, 2010 - June 2014. Source: IFOP



During the first trimester of 2014, the age structure for jack mackerel was constituted by 20 age groups, where ages V and VI (caught in the central south area), and age II (caught in the north area) represented the main modes.

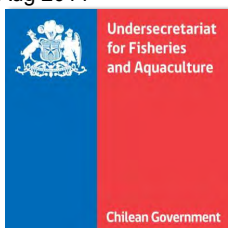
Similarly as observed in 2013, an important contribution of juvenile fish (age II) was detected in 2014, differing from 2012, when juveniles were almost absent in the fishery (**Figure 8**).



**Figure 8:** Age structure of jack mackerel, total catch in numbers, 2010-2013, and January–march 2014. Source: IFOP.

#### b. – Chub mackerel size composition

Restricted by small catches for chub mackerel during the last three years (2011-2013), the numbers of samples obtained have not been representative enough as to establish an age structure. However, as a reference point, it is possible to indicate that samples obtained between 26° - 27° SL during the first half of 2014, exhibited a multimodal structure with a main and a secondary mode at 34 and 39 cm FL respectively. While during the same period, a unimodal distribution of 37 cm FL was registered in samples collected south of 32° SL.



## 5. AT-SEA AND PORT SAMPLING PROGRAM.

To assess the level of sampling coverage in the SPRFMO area, only fishing trips targeting jack mackerel (i.e. over 50% of the total catch per fishing trip) that also carried fisheries observers on board and/or included at-port samplings by observers, were considered in this report

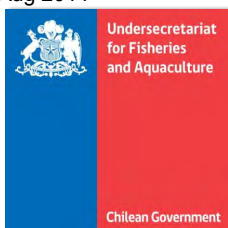
Due to a more costal pattern of the jack mackerel fishery during the last years, it has been difficult to cover the operations of the fleet in the SPRFMO area with observers on board, since fishing trips have become infrequent and unpredictable there and not planned in advance as to guarantee the presence of an observer. In spite of the restrictions, onboard sampling coverage and at-port sampling coverage for fishing trips in the SPRFMO in 2013 was 9.1% and 45.5% respectively, with a total combined sampling coverage of 54.6%. (**Table V**).

Inside the Chilean EEZ, on board sampling coverage by observers was 15,2%, and at-port sampling coverage was 20,1%, with a combined total sampling coverage of 35,3%.

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

	At-Port	On board	Total
Chilean EEZ	20,1%	15,2%	35,3%
SPRFMO area	45,5%	9,1%	54,6%
Total	24,6%	15,1%	39,7%





## **6.- ADMINISTRATIVE MEASURES**

### **Total catch quota.**

Each year, by the month of 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 quota for jack mackerel proposed by the Undersecretariat and approved by the National Fishing Council in December 2013 was 298 thousand tons.

Subsequently and according to agreements reached in January 2014 during the 2<sup>st</sup> Meeting of the SPRFMO in Manta, Ecuador, the annual quota for jack mackerel (including high seas and EEZ catches) was reduced to 290,000 tons (Exempted Decree N° 172/2014), which is close to be consumed.