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Chile 2012 Report

Subsecretaría de Pesca y Acuicultura

Gobierno de Chile

ANNUAL NATIONAL REPORT
SPRFMO-SCIENCE WORKING GROUP
JACK MACKEREL FISHERY IN CHILE

September, 2012.

Subsecretaría de Pesca y Acuicultura

Gobierno de Chile

1. DESCRIPTION OF THE FISHERY

1.1 Composition of the Fleet.

Over the last five years, the size of the industrial purse seine fleet catching jack mackerel in the SPRFMO area and the Chilean EEZ has decreased 23%, reducing its number from 126 vessels in 2008 to 97 in 2012. During this period more than 56% of the fleet, has been represented by vessels with hold capacities under 600 m^3 () (**Table I**).

Correspondingly, the number of vessels operating in the SPRFMO area has also exhibited a decreasing trend for the period 2009-2012, particularly in 2012, when as late as July, no more than 9 vessels were registered. The fleet operating in the SPRFMO area has been mainly represented by vessels with hold capacities greater than 900 m^3 (**Table II**).

Table I. Number of industrial purse seine vessels catching jack mackerel in the Chilean EEZ and the SPRFMO area between 2008 and July 2012. Data were assembled by year and hold capacity. (2011* and 2012* are preliminary data).

Hold capacity (m3.)	2008	2009	2010	2011*	2012*
0-300	8	8	3	0	0
300-600	65	65	68	63	60
600-900	9	10	7	10	8
900-1200	19	19	17	12	6
1200-1500	10	10	10	11	9
1500-1800	10	11	11	12	9
1800-2100	5	6	6	5	5
Total	**126**	**129**	**122**	**113**	**97**

Table II. Number of industrial vessels catching jack mackerel in the SPRFMO area between 2009 and July 2012. Data were assembled by year and hold capacity.(2011* and 2012* are preliminary data).

Hold capacity (m3.)	2009	2010	2011*	2012*
0-300	1	0	0	0
300-600	16	0	0	0
600-900	5	4	4	0
900-1200	17	12	5	2
1200-1500	10	8	8	1
1500-1800	12	12	10	3
1800-2100	6	6	5	3
Total	**67**	**42**	**32**	**9**

1.2 Catches, Seasonality of Catches, Fishing Grounds and Bycatch

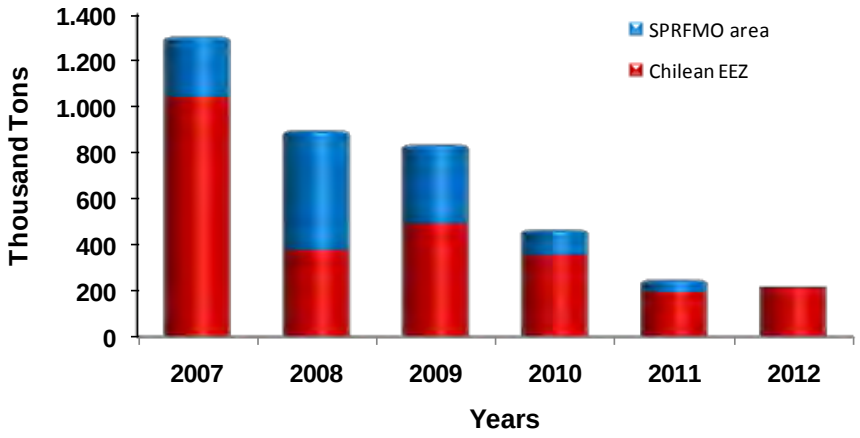
Catches

As observed in previous years, the total catch for jack mackerel by the national fleet continued a declining trend in 2011, with a 47% drop compared to 2010.

By July 2012, accumulated catches adding up 217,000 tons were registered, representing a 5% increase compared to the same period in 2011. However, barely 4,138 tons were caught in the SPRFMO area, accounting for only 1.9% of the total catch, and representing a significant 92% decrease compared to the same period in 2011 (**Figure 1** and **Table III**).

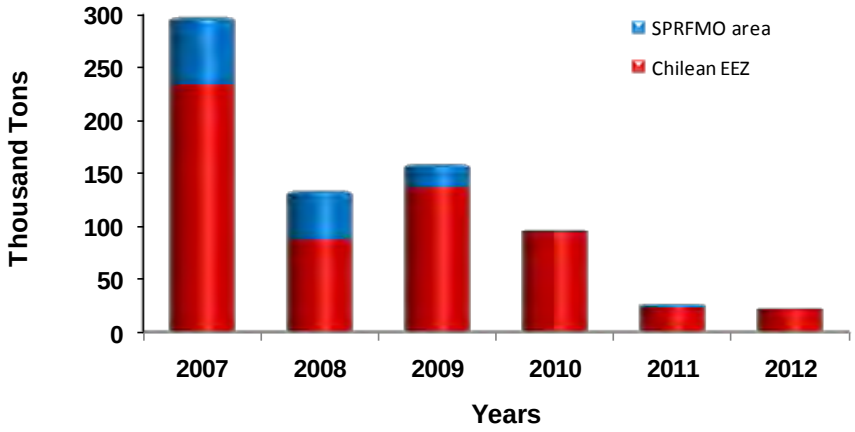
On the other hand, similarly as occurred in 2011, the reduction of the jack mackerel quota in 2012, restricted the catches in the northern area of the country, where only 12,000 tons were registered by July 2012, accounting for 5.6% of the country's total catch for this resource during the same period. These catches were mainly represented by jack mackerel caught as bycatch by the anchovy fishery.

Besides jack mackerel, chub mackerel catches were also registered for the period 2007-2012. Landings have decreased over the last six years as well, not exceeding 22,000 tons by July 2012, with only a small amount caught in the high seas (**Figure 2** and **Table IV**).



Years	Chilean Jack mackerel (t)		
	Chilean EEZ	SPRFMO area	Total
2007	1,040,167	262,617	1,302,784
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	213,284	4,138	217,423

Figure 1 and **Table III**. Yearly jack mackerel catch in the Chilean EEZ and the SPRFMO area with purse seine nets for the period 2007 - July 2012.



Years	Chub mackerel (t)		
	Chilean EEZ	SPRFMO area	Total
2007	233,697	63,492	297,189
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	21,490	199	21,689

Figure 2 and **Table IV**. Yearly chub mackerel catches in the Chilean EEZ and SPRFMO area with purse seine nets for the period 2007 - July 2012.

Seasonality of Catches

As seen in previous years, jack mackerel catches were also concentrated during the first semester in 2011 (February-May); the highest catch values were 48,000 and 42,000 tons, registered in February and March respectively. However, starting from June, a significant decline in the catches was observed (**Figure 3**).

On the other hand, in 2012 catches exhibited an atypical tendency during the first semester, with an early peak of 76,000 tons registered in January, followed by a steady decline to minimum values in June (**Figure 3**).

Before 2010, high catches for jack mackerel were common until August each year; therefore, a condition of premature declining of the catches observed between 2010

and 2012 suggests a shortening of the fishing season for this resource. However the short fishing season observed in 2012 may be explained in part by restriction of catches due to quota allocation.

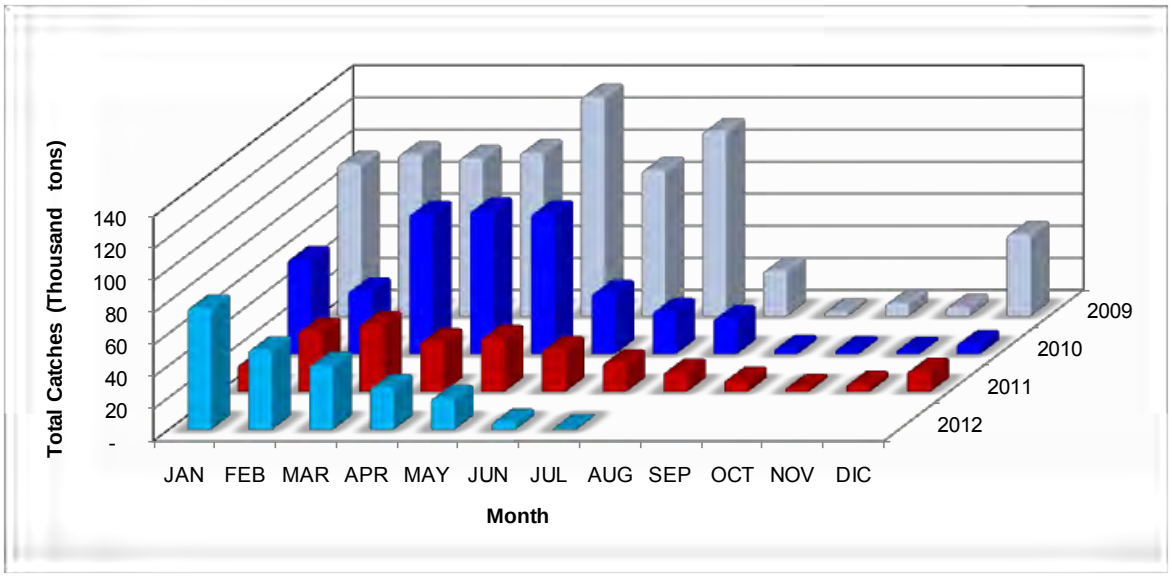


Figure 3: Seasonality of jack mackerel catches by the purse-seine fleet for the period 2009 - July 2012. Source: SERNAPESCA.

Spatial Distribution of Catches

The spatial distribution of jack mackerel catches in the northern area of the fishery followed the same pattern in 2011 as observed in previous years, characterized by coastal catches restricted to the first 50 nm.

During the first semester 2011, the spatial distribution of jack mackerel catches in the central-southern area, followed the same pattern observed during the last three years, characterized by the entering of jack mackerel through the San Antonio area, evidenced by coastal catches occurring within the first 100 nm of the EEZ, between January and March. Subsequently, by late March catches moved south westward and remained aggregated south of 41° SL until June, when they reached a longitudinal extension of 88° W (**Figure 4**).

During the second semester 2011, the fleet moved northwestward in July as normal, following the jack mackerel offshore migration toward oceanic waters. Afterward, the fleet returned to the EEZ.

On the other hand, during the first semester 2012, the fleet exhibited an unusual behavior pattern compared to previous years, restricting its operations to the first 100 nm, not evidencing the typical displacement toward oceanic waters, where the catches registered in 2012 were minimal. In addition, during the first quarter of 2012, the fleet operated further south than usual; between the VI and VIII Regions (33° 50´ ; 38° 30´ SL), moving then northward in the second quarter, between the IV and VII Regions (30° 15´ ; 36° 00´ SL) (**Figure 4**).

Catches of jack mackerel in the high seas were obtained from two restricted areas in 2012, located close to the western border of the EEZ between 31°S to 37° S.

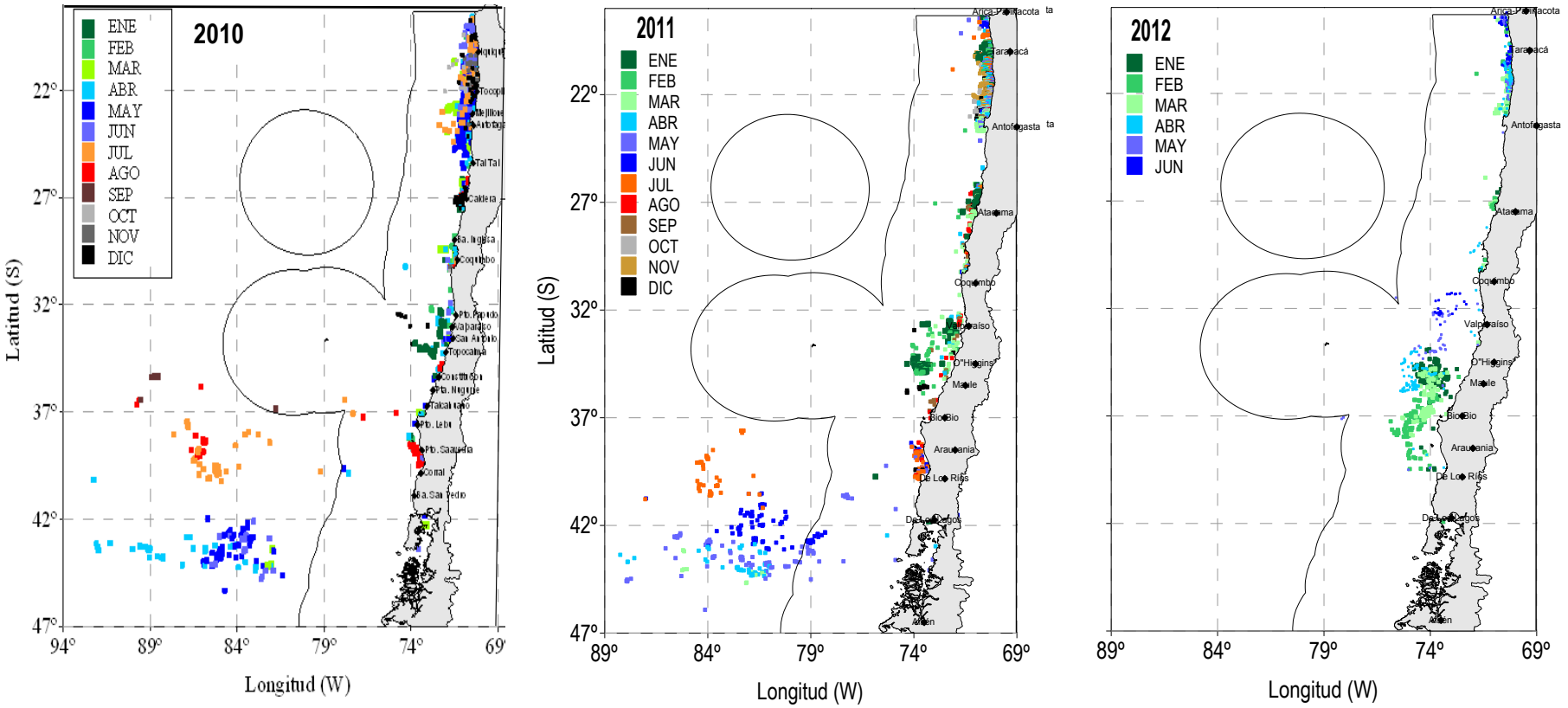


Figure 4: Spatial-temporal distribution of industrial jack mackerel purse seine fleet 2010, 2011, and 2012. Source: IFOP.

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Bycatch

Catches in the SPRFMO area in 2011 were mainly represented by the target species **(*Trachurus murphyi*)** (99.8%), with only small amounts of bycatch composed of Chub Mackerel (***Scomber japonicus***) (0.17%), and Pacific pomfret (***Brama australis***) (0.03%).

A similar pattern was observed inside the EEZ, where the main species caught as bycatch were Chub mackerel (***Scomber japonicus***) (0.17%), Pacific saury (***Scomberesox saurus***) (0-002%), and Jumbo flying squid (***Dosidicus gigas***) (1.5%), registered only in February.

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

2. EFFORT AND CPUE FOR JACK MACKEREL FISHERY

The information contained in this section concerns the central-southern zone fleet, targeting primarily jack mackerel. Catch, effort, and CPUE are referred to fishing trips in which jack mackerel represented more than 50% of the total catch.

In addition to the decline of jack mackerel catches observed in 2011, the performance of the fleet showed a slightly higher fishing effort (measured in number of fishing trips with catch) compared to 2010. Likewise, the average length of fishing trips remained high, at levels over 7 days/trip, as a result of the fishing grounds retreating towards oceanic waters, with consequent higher searching times (**Figure 5**).

The standardized CPUE, measured as the utilization rate of the carrying capacity of the fleet (catch/(hold capacity displaced x length of fishing trip)) showed a steady trend between 1989 and 2006, followed by a declining tendency in recent years (2007-2011) (**Figure 6**). Details over the methodology used to calculate the standardized CPUE are available at the SPRFMO web page in “Analysis of jack mackerel CPUE in the central-southern area”.

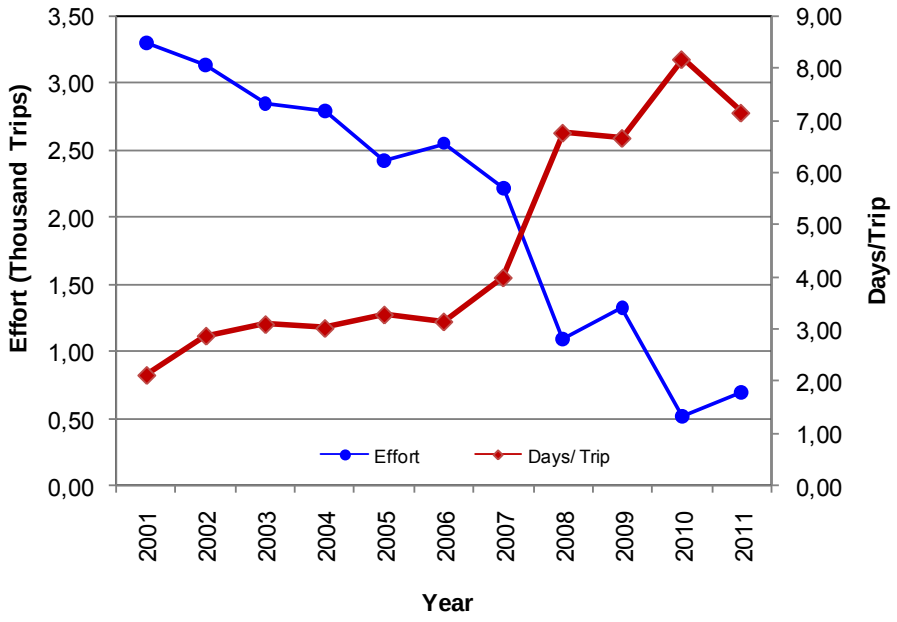

Figure 5: Effort in number of trips with catch (blue), and length of fishing trips in days (red) for the purse seine fleet in the center-southern zone, period 2001-2011. Data SERNAPESCA. Source: IFOP.

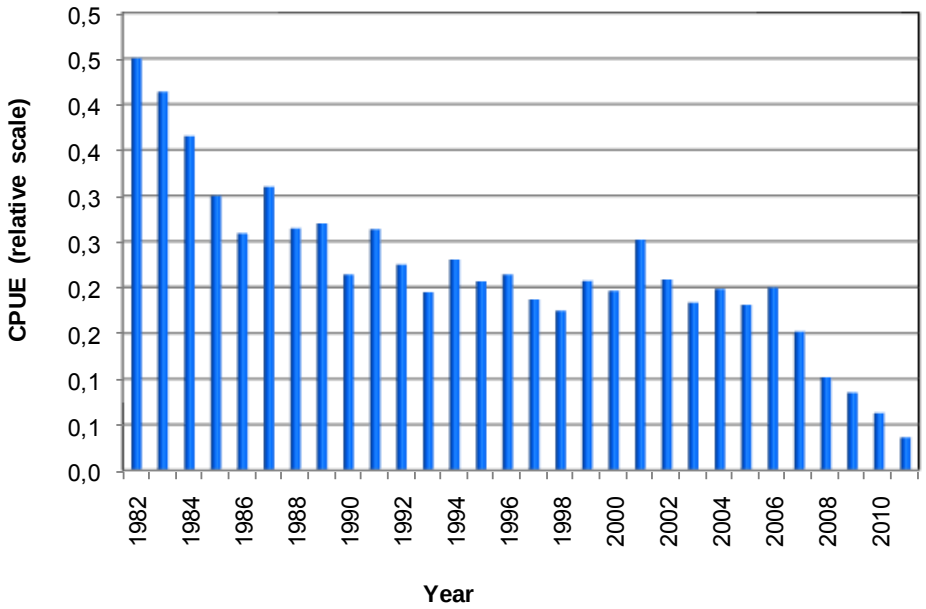

Figure 6: Standardized CPUE for the purse seine fleet in the center-southern zone, period 1982-2011. Source: IFOP

3. RESEARCH PROGRAMS

The jack mackerel research program includes standard projects carried out annually by IFOP along with complementary projects. The information obtained is used by the authority to support the decision-making process.

Basic projects performed by IFOP during 2011:

- ***Hydroacoustic assessment of jack mackerel biomass between XV-III Regions, 2011***

  This research cruise took place from April 13th through May 11th 2011, and included the area between the northern boundary of the country and 27°10 SL, where perpendicular transects from the coast, reaching up to 200 nm were prospected.

- ***Hydroacoustic assessment of jack mackerel biomass between V-X Regions, 2011***

  This research cruise took place from June 19th through July 19th 2011. Due to budget and infrastructure restrictions, the typical prospection area had to be modified. The adjusted design focused on the high seas; therefore, prospecting the area between 39° 10' and 42° 05' SL from 200 to 600 nm. Due to adverse weather conditions that restricted the maneuvering of the research vessel "Abate Molina", a commercial vessel from the jack mackerel industrial fleet had to be used instead.

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

  This study allowed obtaining real-time information on the evolution of the main biological and fishing parameters 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 SPRFMO SWG, this study used the Joint Jack Mackerel (JJM) model. The 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

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

In addition to the standard projects mentioned above, complementary projects were conducted according to needs and requirements outlined in the SWG framework. During 2012, the following complementary projects have been conducted:

- ***Jack mackerel stock structure assessment (Phase II)***

  The results obtained in the project: "Jack Mackerel Stock Structure Assessment (Phase I)" called for additional studies implementing a multidisciplinary approach, in order to assess the stability of the parameters/markers used in Phase I. In Addition, It was recommended to include seasonal samplings to reduce potential uncertainty on Phase I data.

  Following this advice, since the beginning of 2011 a *Phase II* for this project has been underway, and is expected to be concluded by the end of 2012.

- ***Assessment of a maturity ogive for jack mackerel (2011)***.

  This project was carried out by IFOP, and was extended from the beginning of 2011 throughout 15 months. It was aimed at obtaining a maturity ogive that would allow assessing a mean size and age at sexual maturity for jack mackerel. Samples were collected during the reproductive peak of this species along the entire range of its fishery in Chile, including the EEZ and oceanic waters. Direct readings on otoliths collected was part of the methodology used. The information gathered is considered the most comprehensive for this resource so far, allowing for a very first time the assessment of the maturity ogive at-age for jack mackerel.

  The conducting of an international workshop was a significant part of this project, allowing the standardization of criteria used to establish the maturity stages.

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

4.1 Biological sampling [1].

Biological information is obtained on a regular basis from samples collected along the Chilean coast for both the target species (jack mackerel) and its associated species. Samplings are conducted on a daily basis, mainly at landing sites/processing plants, but are also complemented with information gathered by scientific observers on board fishing vessels. The information collected included 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 2011 added up 69,924 and 17,456 specimens respectively, including at-sea sampling for the industrial fleet, as well as port sampling, covering all the range reported for this fishery in Chile. The main landing ports sampled were Iquique in the north area, and San Vicente and Coronel in the central-southern area of the fishery (**Table IV**).

Chub mackerel, the main bycatch for jack mackerel, was also sampled during 2011. A total of 1,504 and 594 specimens for length and biological samples were collected respectively.

[1] For further details see document SPRFMO-V-D&IWG; “Brief description of the jack mackerel sampling in the Chilean fisheries”.

Table IV. Number of Jack mackerel and Chub mackerel specimens collected in 2011 to gather biological and length samples.

Landing Port	Jack mackerel (t)		Chub mackerel (t)	
	Lenght Sampling	Biological Sampling	Lenght Sampling	Biological Sampling
ARICA	62		158	
IQUIQUE	11.870	577	616	50
TOCOPILLA	1.541	203	183	
MEJILLONES	1.499	275	298	
CALDERA				
COQUIMBO	5.663	969	38	2
SAN ANTONIO				
TALCAHUANO				
SAN VICENTE	18.395	6.336	33	345
CORONEL	30.040	8.776	178	197
LOTA	544	160		
CORRAL	217	80		
CALBUCO	93	80		
TOTAL	**69.924**	**17.456**	**1.504**	**594**

Source: IFOP.

4.2 Length and age composition of catches

a.- Jack mackerel

As seen in previous years, the size structure observed for jack mackerel in 2011 showed a multimodal distribution, mainly focused on 18 cm FL specimens that were caught in the northern area of the fishery, followed by secondary modal groups with values of approximately 25 and 29 cm FL, caught in the northern and central-southern areas of the fishery. These last values would correspond to modal progression of specimens that existed in the stock in 2010.

Compared to data registered for previous years, the size structure observed during the first semester 2012 was characterized by a low presence of specimens under 26 cm FL. In addition, the observed mode of 29-30 cm FL, belongs to specimens caught in the central-southern area, not evidencing the entering of juveniles in this area (**Figure 7**).

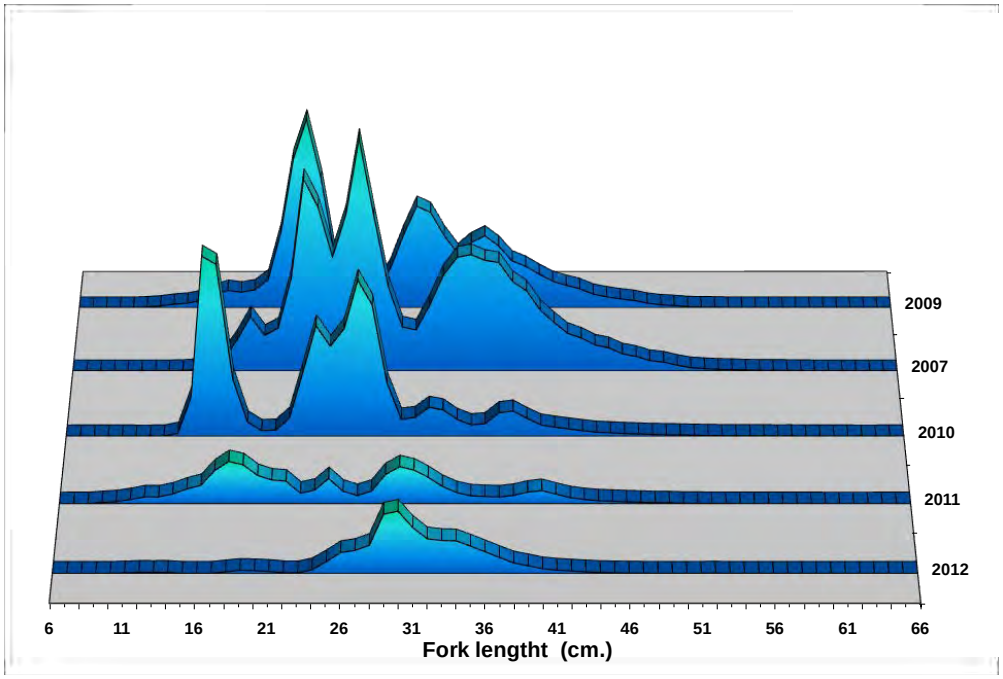

Figure 7. Length structure of jack mackerel, total catch in number 2006 - jun 2012. Source: IFOP

In 2010, the age structure displayed a bimodal distribution, focused on age II and age IV specimens. The occurrence of age II specimens in the north, suggests the entrance of juveniles to the fishery in this area. A similar pattern was also observed in 2008; however, in 2010 other age groups were barely represented. The occurrence of age IV specimens was significant in the northern and the central-southern zones (**Figure 8**).

In 2011, the occurrence of an age II mode was yet again observed along with the disappearance of the age IV mode, registered in previous years. The modal progression of these specimens was observed with the emergence of the age VI mode.

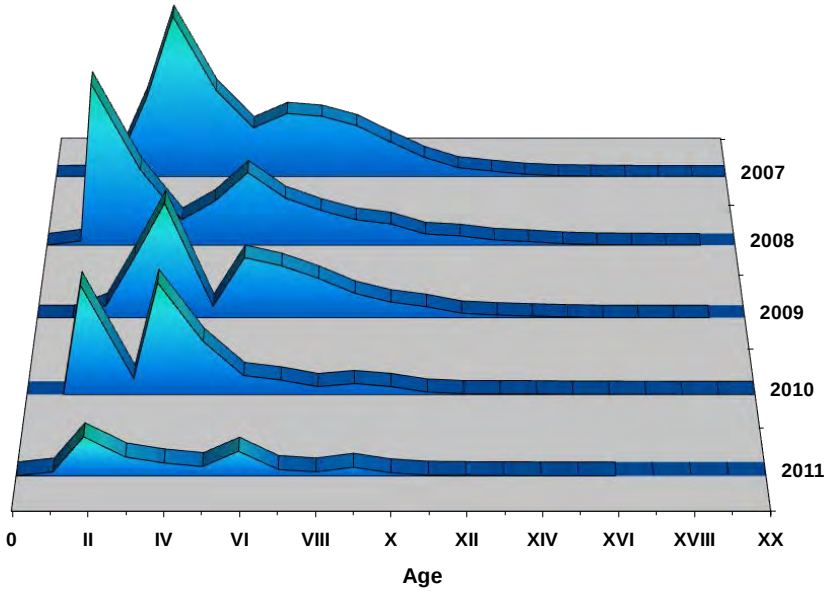

Figure 8: Age structure of jack mackerel, total catch in numbers, 2007-2011. Source: IFOP.

b. - Chub mackerel size composition

Samples obtained for chub mackerel during 2011 were not representative enough as to establish a satisfactory size structure.

However, a modal size of 33 cm FL was observed during 2010. This condition would be the result of the growth of the cohort entering to the fishery in 2006, with a modal size of 28 cm FL. No signs of new recruits entering the fishery were observed in 2010 (**Figure 9**).

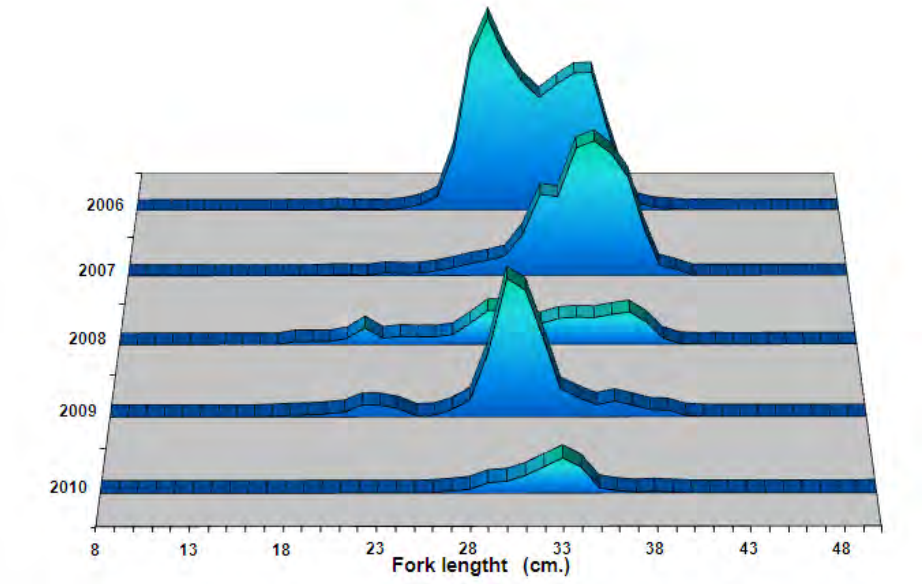

Figure 9: Length structure of chub mackerel, total catch in numbers, 2006-2010. Source: IFOP.

5. AT-SEA AND PORT SAMPLING PROGRAM.

The sampling program carried out by observers on board fishing vessels and at landing ports/processing plants has not been significantly modified with regard to previous years[2]. However, the program is continuously improving its information and online data collection system, optimising the information gathering, processing, and response times, with a settled quality standard.

To estimate 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 observers onboard and/or included at-port samplings by observers, were considered.

[2] For further details see document SPRFMO-V-D&IWG; "Brief description of the jack mackerel sampling in the Chilean fisheries".

In 2011, sampling coverage by observers on board fishing vessels reached 18.2% of the total number of fishing trips in the SPRFMO area, while at-port sampling coverage was significantly higher, reaching up to 30.6% of the total number of trips, allowing a 48.8% combined total sampling coverage for the SPRFMO area.

In the EEZ of Chile, on board sampling coverage by observers was 7.4%, and at-port sampling coverage was 24.2%, with a combined total sampling coverage of 31.6%.

6.- ADMINISTRATIVE MEASURES

a.- Total catch quota

The Undersecretariat for Fisheries and Aquaculture proposed in December 2011, a total quota of 186,000 tons to the National Fisheries Council. This quota was to be reviewed after the Third SPRFMO Preliminary Conference hosted in Chile by the end of January 2012. However, the quota proposed was rejected by the Council, and consequently, as stated by the Fisheries and Aquaculture Law, a new quota representing 80% of the preceding quota (year 2011) was established for 2012.

As a result, the total catch quota set for jack mackerel in 2012 was 252,000 tons (Ex D. N 1251/2011), including high seas and EEZ catches.

b.- Legal size and bycatch quota for jack mackerel

Law 20485 (18/12/2010) mandated a study of size and age at first sexual maturity for jack mackerel no later than 18 months from the time it was enacted. The Law also required the assessment of a legal size according to the results obtained in the study. In the meantime, by virtue of Law 20560 (30/01/2012) a transitory legal size of 22 cm FL was authorized until June 6th 2012, between the XV and IV Regions.

With regard to the size and age at first maturity, the Undersecretariat for Fisheries and Aquaculture deemed necessary to further evaluate this issue along with a National Scientific Working Group and other Consulting Groups.

As a result of these additional analyses and applying a precautionary approach, the Authority resolved that an adjusted median size at first maturity of 23 cm FL was not suitable as a reference value to assess the legal size for jack mackerel, since it would not promote its recovery.

Consequently, by virtue of Ex. Res. N 1665/12, a legal size of 26 cm FL was adopted for the entire country, with the exception of specimens of jack mackerel caught as bycatch in the anchovy fishery, between XV and II Regions up to a yearly maximum total of 40,000 tons deductible from quotas allocated to this area.