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Summary

The fishery by EU trawlers in 2015 was different from previous years in respect to fishing area, fishing season, and size distribution of the catches. At the start of the season in April and early May, the fishery took place in waters much further to the south than in previous years. From May to July substantial quantities of young jack mackerel were taken in the area between 40 - 44°S. This is an area where young fish had not been encountered in large quantities during previous years. The abnormal distribution of both the adult and juvenile component of the jack mackerel stock in the first half of 2015 may have been caused by the El Niño conditions during this time of the year. Therefore, the high abundance of young jack mackerel outside the Chilean EEZ may have been partly the result of an abnormal distribution of this year-class, rather than of its absolute size.

1 Introduction

This report is one in a series of annual reports on the EU fishery in the SPRFMO area (South Pacific Regional Fisheries Management Organization). The EU fleet in this area presently consists exclusively

of pelagic trawlers and tuna vessels. As SPRFMO does not deal with tuna, this report only concerns the pelagic trawlers.

The report describes the activities of the EU pelagic trawlers in 2014 and in the first 8 months of 2015. Data for earlier years were presented in the annual report of 2014 (Corten 2014) and earlier years. The EU pelagic fleet in the south-eastern Pacific in 2014 and 2015 consisted of two pelagic trawlers that were fishing for Chilean jack mackerel (*Trachurus murphyi*). At the time of writing this report (August 2015), the vessels had nearly finished their quota for jack mackerel in 2015, so the data presented here for 2015 may be considered as a first approximation of the final figures for this year.

Data presented here are based on catch and effort data reported directly by the vessels, and on the data collected by scientific observers on board the vessels. In 2015, in parallel to the activities of scientific observers, a program of self-sampling was introduced on board the EU trawlers. Under this programme, crew members took length measurement of each commercial category of jack mackerel retained on board. On the basis of these measurements and the total quantities of each commercial category landed, an independent estimate was made of the length composition of the total catch. In this report, the results of this self-sampling program are compared with the results of the sampling by scientific observers.

2 A short history of the EU pelagic fishery in the Pacific

The EU pelagic fleet in the south-eastern Pacific consists of pelagic trawlers that fish for jack mackerel (*Trachurus murphyi*) outside the economic zones of Chile and Peru. The stock of jack mackerel occurs in international waters mainly in April – November. During the rest of the year, the fish stay inside the 200 mile EEZ, and they are not accessible to the EU fleet. Consequently, the vessels then return to Europe or West Africa.

The first EU pelagic trawler arrived in the Pacific in 2005 and it worked for 3 months in the second half of the year. The next year, the same vessel returned and worked for the whole season (March – October). Following the positive results of this season, the number of vessels increased to six in the following three years (2007 – 2009). All these vessels belonged to the Pelagic Freezertrawler Association (PFA), a consortium of European pelagic ship owners based in the Netherlands. In addition to the PFA vessels, some Polish vessels worked in the area in 2009 - 2011.

Starting from 2010, the number of PFA vessels was reduced as a result of declining catches. The number of EU vessels by year and by country is presented in Table 1.

year	EU countries involved and number of vessels
2005	Netherlands (1)
2006	Netherlands (1)
2007	Germany (3), Lithuania (1), Netherlands (2)
2008	Germany (3), Lithuania (1), Netherlands (2)
2009	Germany (3), Poland (3), Lithuania (1), Netherlands (2)
2010	Germany (3), Poland (3), Lithuania (1), Netherlands (1)
2011	Germany (1), Netherlands (1), Poland (1)
2012	no fishing

2013	Lithuania (1)
2014	Germany (1), Netherlands (1)
2015	Netherlands (1), Lithuania (1)

Table 1. EU pelagic trawlers in the Pacific in 2005 – 2015.

Over the period 2008-2011, there was a continuous decline of the catch per unit of effort (CPUE), leading to a complete stop of the fishery in 2012. In 2013 the fishery was resumed by one vessel, and in 2014 - 2015 two vessels returned to the Pacific. Starting from 2012, catches have been restricted by national quota set by SPRFMO.

3 Catches, effort and CPUE of the PFA fleet

3.1.1 Catches and catch composition

The fishery by PFA vessels in the Pacific is aimed at jack mackerel (*Trachurus murphyi*). Other species make up only a small fraction of the total catch, as is shown in Table 2.

year	total catch in tons	species composition in percentages			
		<i>Trachurus murphyi</i>	<i>Scomber japonicus</i>	<i>Brama australis</i>	other species
2009	91 336	95.3	4.3	0.4	0.0
2010	34 083	97.2	1.9	0.6	0.3
2011	1 810	98.3	0.2	1.3	0.2
2012	0				
2013	10 390	97.2	2.2	0.6	0.0
2014	21431	95.7	3.5	0.3	0.5
2015	25990*	98.1	1.1	0.6	0.2

*) provisional

Table 2. Total catches and species composition of PFA fleet in 2009 – 2015. Based on landing data provided by ship owners. Data for 2015 are provisional.

The catch in 2015 was up by 21% compared to 2014. This increase in catch was due to a slight increase in the national quota for the EU, and to the acquisition of additional quota by the ship owner.

As in the previous two years, the species composition of the catch in 2015 was dominated by jack mackerel (*Trachurus murphyi*). This species made up 98.1% of the total catch. The chub mackerel (*Scomber japonicus*) came in as second with 1.1%, and the Pacific bream (*Brama australis*) as third with 0.6%.

The evolution of monthly catches over the period 2010 – 2015 is presented in Figure 1. It is seen that catches in 2015 peaked already in May. This was related to the abundance of young jack mackerel in the southern part of the fishing area (section 4.3.1). After a small dip in June due to time lost in transshipment, catches recovered in July, but then dropped again in August. Unlike in 2014, the vessels did not move to the area north of the Juan Fernández Islands where they had taken good catches in August 2014 (section 4.3.1).

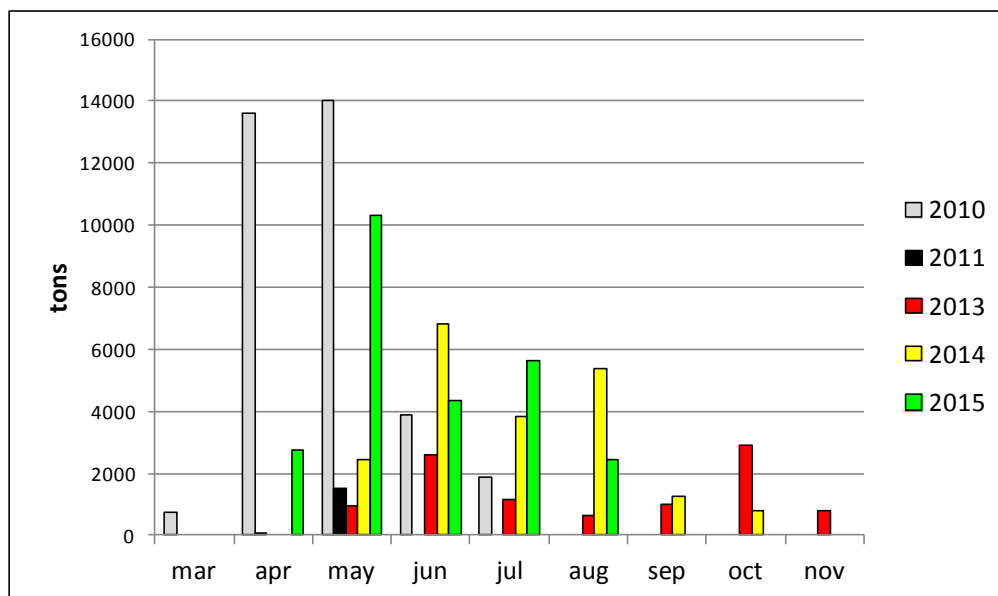


Figure 1. Monthly catches of jack mackerel by PFA vessels in 2010 - 2015. Data for 2015 are provisional. Data based on catches reported by the vessels.

3.1.2 Effort and catch per unit of effort (CPUE)

The development of the annual CPUE for jack mackerel in the PFA fleet is presented in Table 3. The numbers show the decline in CPUE since the first year in which the fishery operated during the whole season (2006). In 2015 the CPUE went up considerably in comparison with 2014, but it was still low in comparison to the period 2006 - 2009.

year	number of fishing days	catch jack mackerel PFA fleet in tons	catch per day in tons
2005	44	6187	141
2006	109	33766	310
2007	401	123523	308
2008	423	108174	256
2009	436	87043	200
2010	274	33129	121
2011	32	1779	56
2012	0	0	0
2013	140	10010	72
2014	231	20510	89
2015*	149	25504	171

*) provisional

Table 3. Catch and effort in the PFA fleet. Fishing days based on trawl station lists provided by the vessels.

The monthly CPUE values (Figure 2) show that the values for all months in 2015 up until August were higher than in 2014.

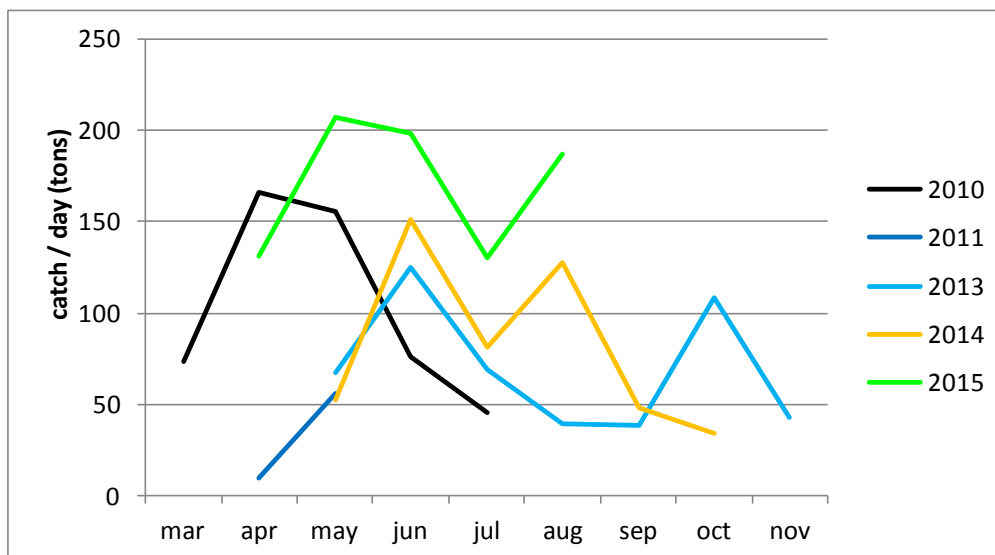


Figure 2. Monthly CPUE of jack mackerel in the PFA fleet for 2010 – 2015. Data for 2015 are provisional.

4 Scientific data collection

Two independent programs of data collection were carried out in 2014 and 2015: the collection of haul-by-haul information directly from the vessels, and an observer program aimed at obtaining detailed biological information on catches and discards. Both programs were organized by the Dutch consultant agency CMR. In 2014 funding was provided by the Dutch ship owners association PFA, and in 2015 by the Data Collection Framework (DCF) programme of the European Union.

The details of these programs are briefly presented below.

4.1 Tow-by-tow information

The trawlers were requested to provide position, time and catch composition for each haul. A simple spreadsheet was used to record the information at sea. The information requested in this spreadsheet corresponded to the data demands of the SPRFMO Data and Information Working Group.

The tow-by-tow information from individual vessels provided a picture of the geographical distribution of the fishery. The results of the fishery in 2014 are presented in Figure 3a. During the

first months of the season (May – July), the fishery was conducted in the southern area between 36° and 44°S. As in 2013, the fishery did not shift westward in the course of the season as it did in the years prior to 2011, but it remained largely concentrated along the border of the Chilean EEZ. In August the vessels moved north of the Juan Fernández Islands, where they worked between 26° and 29°S until November.

In 2015, catches during the first months of the season (April - June) were considerably higher than in the previous 4 years. The fishery was distributed far to the south, down to 47°S, and more offshore than in the previous years. Although there seemed to be some offshore movement of the fish in May, the vessels did not move further to the west as they did in the years 2006 - 2010. There were also trawlers from Vanuatu and China in the area where the two EU trawlers operated, and some 10 Chilean purse seiners.

As a result of the high catches during the early months of the season, the EU quota was finished already in July. After some additional quota had been obtained from another country, the fishery could be continued in August, but by the end of this month the quota was exhausted. Consequently, this year the fleet did not fish in September - November to the area north of the Juan Fernández Islands, as they did in 2013 and 2014.

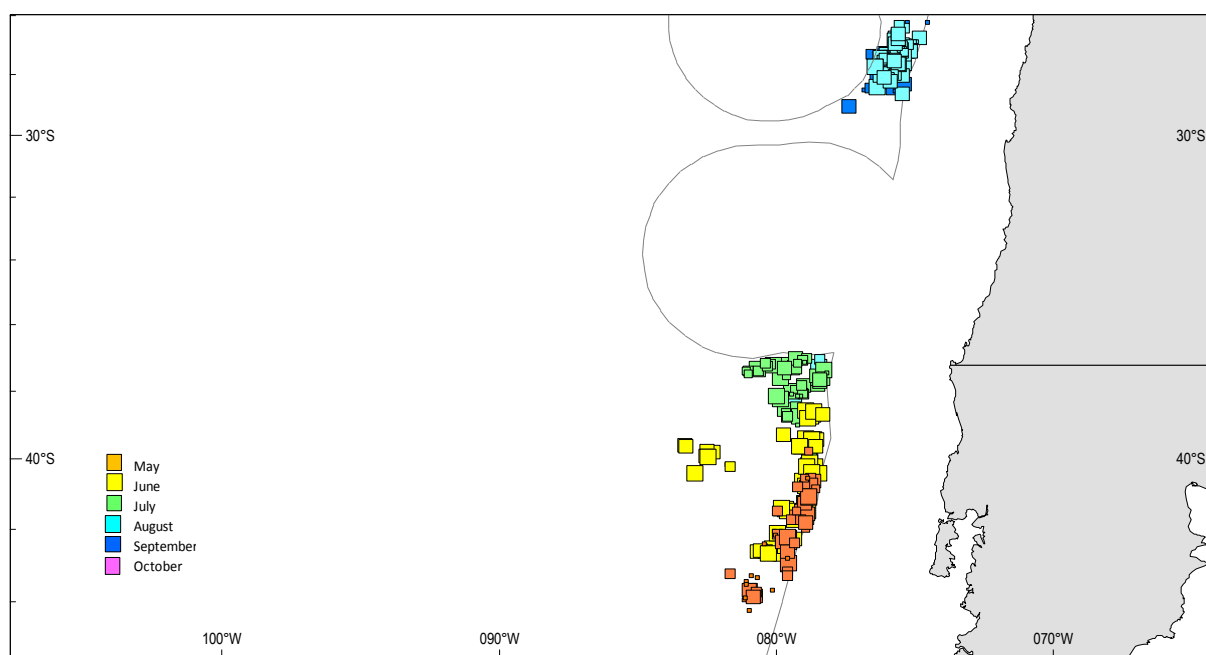


Figure 3a. Catch distribution by month of the PFA fleet in **2014**. Size of squares is proportional to catches.

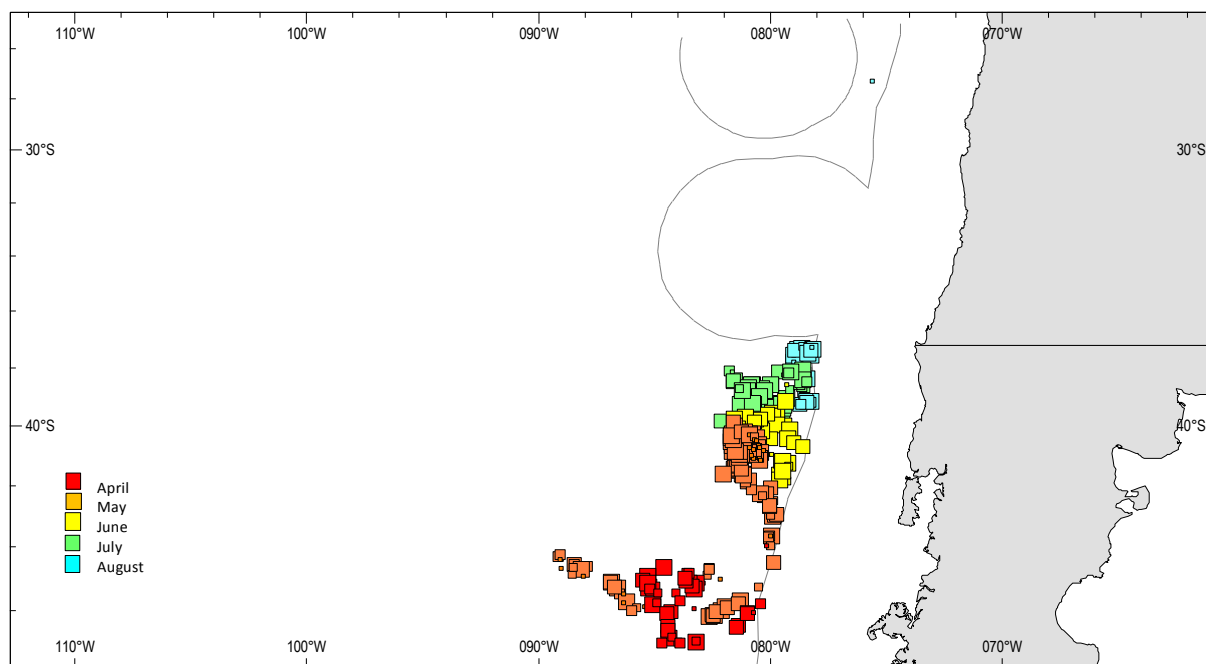


Figure 3b. Catch distribution by month of the PFA fleet in **2015**. Size of squares is proportional to catches.

4.2 Observer data

In 2014 the observer programme was intensified, following the adoption by SPRFMO of Conservation and Management Measure CMM 2.04. In this measure it was recommended that member states in 2014 temporarily increased their observer coverage to at least 50%. In accordance with this recommendation, the PFA had observers at sea during the first four months of the season in 2014.

In 2015, observer coverage was maintained at approximately the same level as in 2014, with a total of 88 days of observations. Whereas in earlier years the scientific observer programme was financed by the PFA, starting from 2015 the funding was taken over by the EU data collection framework (DCF).

year	period	schip	observer	days with observations
2014	20 April – 30 May	Maartje Theadora	Tomasz Raczynski	23
	31 May – 19 August	Maartje Theadora	Co de Klerk	80
2015	29 April - 13 July	Annelies Ilena	Co de Klerk	60
	13 June - 24 July	Margiris	Tomasz Raczynski	28

Table 4. Observer missions in 2014 and 2015

The observers collected data on species composition of catches, length composition, and biological characteristics such as sex and maturity stage, food composition, stomach fullness and fat content. In addition they monitored discards and incidental by-catches of large species.

Both in 2014 and 2015, the observers also monitored by-catches of birds and the presence of birds around the vessels (see below)

4.3 Biological sampling of catches by the PFA fleet

Biological samples were taken from the main species taken in the fishery. These included *Trachurus murphyi*, *Scomber japonicus* and *Brama australis*. In this report, only length data for jack mackerel (*T. murphyi*) are presented. In addition, an inventory is presented of the bird data collected.

4.3.1 Sampling of jack mackerel

In 2015, only the months of April - July were covered by scientific observer. As the two EU vessels were expected to fill their quota by July, no observer missions were scheduled for the month of August. As it turned out, the ship owner bought an additional quota after the original EU quota was finished. Consequently, the fishery continued until the end of August but with no observers on board. For this month, however, information on the length distribution of the catches was obtained through the system of self-sampling (section 5).

A total of 17 563 jack mackerel were measured by scientific observers in 2015. This was the highest number since the peak of the fishery in 2008 (Table 5).

year	number of jack mackerel measured
2008	28 250
2009	15 744
2010	10 540
2011	2 194
2013	2 727
2014	15 148
2015	17 563

Table 5. Number of jack mackerel measured by scientific observers .

The length measurements in 2015 are compared with those of earlier years in Figure 4. In this figure, only data are presented for the southern fishing area, i.e. the waters south of the Juan Fernández Islands. This was the area where all the fishing took place in 2007 - 2011, and also in 2015. In 2013 and 2014, there was also a fishery in August - November to the north of the Juan Fernández Islands, but catches here consisted mainly of smaller fish. This was probably due to the fact that the waters off northern Chile constitute a nursery area for the jack mackerel. In order to compare length distributions between all years of the fishery, the northern catches in 2013 and 2014 have not been included as they would distort the comparison between years.

It is seen that the catches in 2015 contained a high percentage of young jack mackerel with a modal size of 26-27 cm (fork length). These 3 year-old fish were taken in May-July in the area south of the Juan Fernández Island; an area where they normally are not encountered in significant quantities. The last year in which fish of similar size had been recorded here was in 2011, but the absolute quantities then were small. Those fish were the survivors of the 2 year-olds that had been observed

far to the west in 2010, but that seemed to have largely disappeared between 2010 and 2011 (Corten 2014).

It is remarkable that the young jack mackerel in 2015 were found so far to the south. In earlier years, the Dutch trawlers caught young jack mackerel mainly to the north of the Juan Fernández Islands, in the vicinity of the nursery area off northern Chile.

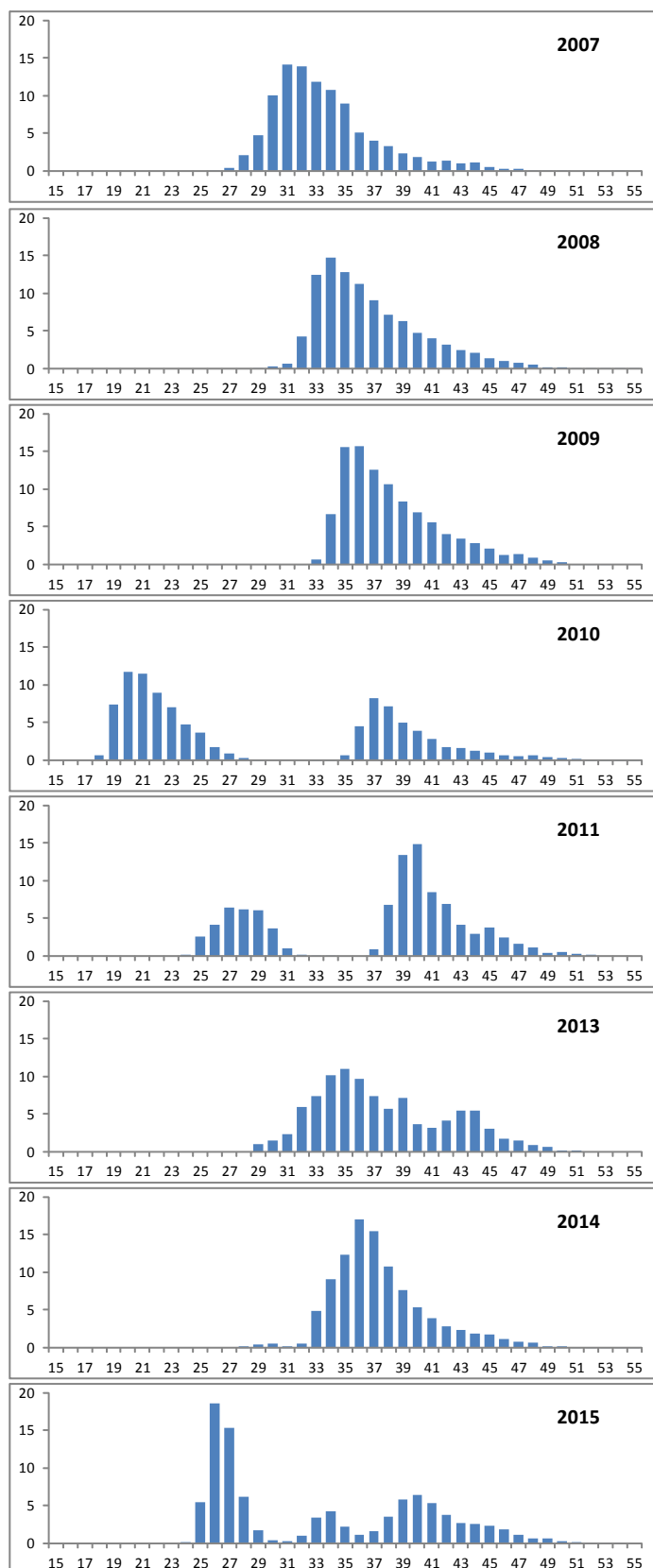


Figure 5. Percentage length composition of jack mackerel in PFA catches in 2007 – 2015 (excluding catches north of Juan Fernández Islands). Length measured as in fork length.

4.3.2 Observations on birds

The observations on birds in the net and around the vessel, initiated in 2014 at the request of SPRFMO, were continued in 2015. No by-catches of birds in the catch were observed. On two occasions, collisions between birds and trawl warps were observed. In both cases, this concerned Black-browed Albatrosses. One collision was classified as "light" since the bird continued to fly apparently unharmed. In the other case, the collision was classified as "heavy" since the bird sat on the water after the incident.

The collisions occurred far behind the vessel where the scaring devices had no effect.

A total review of all bird observations was not yet available at the time of writing this report, but table 6 presents a summary of the birds observed around one of the vessels in May - July 2015.

English name	Latin name	Number of observations	Number sighted
Great Albatrosses	<i>Diomedea sp.</i>	14	22
Black-browed Albatross	<i>Thalassarche melanophrys</i>	43	1133
Salvin's Albatross	<i>Thalassarche salvini</i>	13	38
Chatham Albatross	<i>Thalassarche eremita</i>	1	1
Grey-headed Albatross	<i>Thalassarche chrysostoma</i>	24	83
Buller's Albatross	<i>Thalassarche bulleri</i>	2	3
Giant Petrels	<i>Macronectes sp.</i>	7	9
Cape Petrel	<i>Daption capense</i>	27	521
White-chinned Petrel	<i>Procellaria aequinoctialis</i>	34	84
Sooty Shearwater	<i>Puffinus griseus</i>	13	22
		Total	1937

Table 6. Observations on birds around the "Annelies Ilena" in May - July 2015.

5 Results of the self-sampling programme

In 2015, in parallel to the activities of scientific observers, a program of self-sampling was introduced on board the EU trawlers. Under this program, crew members took length measurement of each commercial category of jack mackerel retained on board. On the basis of these measurements and the total quantities of each commercial category reported by the vessel, an independent estimate was made of the length composition of the total catch.

Both PFA vessels in the Pacific in 2005 participated in the self-sampling programme: the KW174 Annelies Ilena (NL) and the KL855 Margiris (LT). Each vessel made 4 trips, starting on April 15 2015, and ending in August 2015. Self-sampling was carried out during all of the trips. During 3 of the 8 trips, scientific observers were also on board, which allowed a comparison between the results of the self-sampling and the data collected by the observers. The results from the self-sampling programme were kindly provided by Mr. Martin Pastoors from the PFA.

Table 7 shows the number of length samples taken, the number of sampled fish and the number of fishing days up until 18 August 2015. A total of 91 samples have been taken consisting of 5264 fish measurements. The overall sampling rate (measured as the number of days with jack mackerel catches and the number of days sampled) was 63%.

vessel	sampled hauls	sampled fish	fishing days	% days sampled
KL 855	47	2510	67	70%
KW 174	44	2754	77	57%
total	91	5264	144	63%

Tabel 7. Sampling intensity self-sampling programme

An example of the results obtained is presented in Figure 6. It is seen that in this case the results of the self-sampling programme corresponded nicely with those of the observer, except for a difference of 1 cm in the smallest size category.

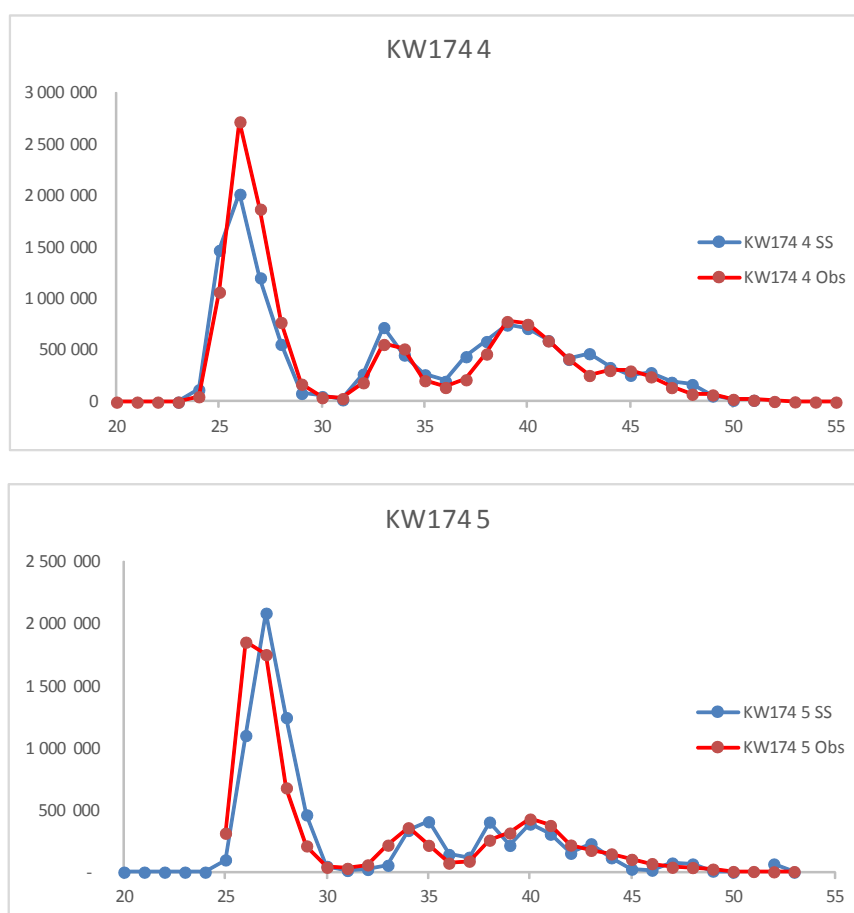


Figure 6. Results of the self-sampling programme (SS) compared to the sampling by scientific observers (Obs) for two trips (4 and 5) of the KW 174 Annelies Ilena.

In other cases, discrepancies were found between the results of the self-sampling and the observer data, and the cause of these discrepancies is still being investigated. In principle, the results of the self-sampling should be at least as accurate as those of the observers, since they incorporate additional information on total catches by size category. Therefore, in future the results of this programme may be used by SPRFMO in addition to the data collected by the scientific observers.

6 Conclusions

The fishery by EU trawlers in 2015 was different from previous years in respect to fishing area, fishing season, and size distribution of the catches. At the start of the season in April and early May, the fishery took place in waters much further to the south than in previous years. From May to July substantial quantities of young jack mackerel were taken in the area between 40 - 44°S. This is an area where young fish had not been encountered in large quantities during previous years. On the other hand, one trawler that searched in August in the waters north of the Juan Fernández Islands could not find young jack mackerel in this area, whereas the EU vessels in 2013 - 2014 had taken good catches of young jack mackerel here during August (and later months). The general impression, therefore, is that the population in 2015 was distributed further to the south than in previous years. This applied in particular to the youngest age group (3 year-olds).

In this respect it is interesting to note that a southerly distribution of young jack mackerel was also observed in 1997 - 1999, apparently as a result of the strong El Niño in 1997/98 (Arcos et al. 2001). An inspection of hydrographic conditions during the 2015 season showed that in April 2015 strong El Niño conditions also prevailed over the Pacific (Figure 7). It is possible, therefore, that the southern distribution of the juvenile jack mackerel was the result of these unusual hydrographic conditions.

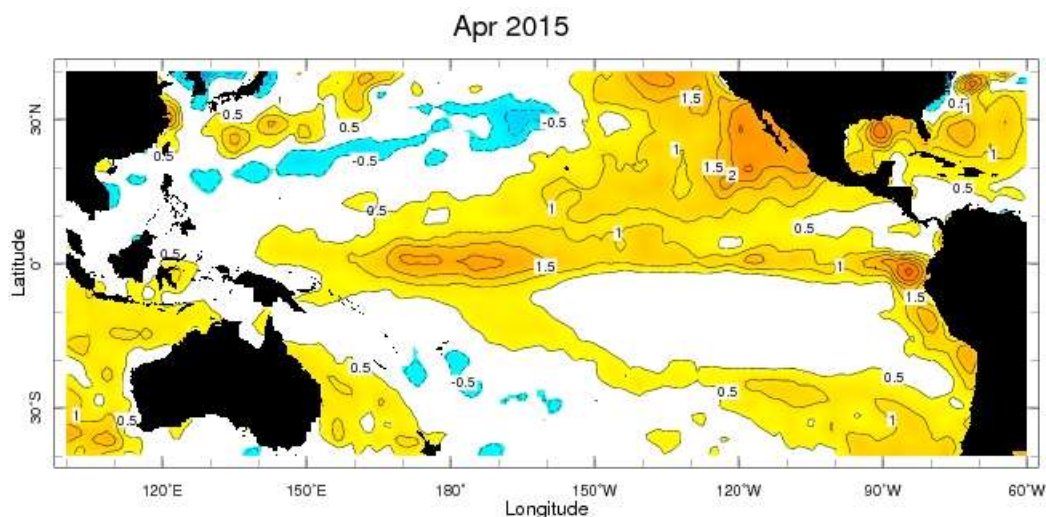


Figure 7. Temperature anomalies over the Pacific in April 2015 indicating El Niño conditions (IRI 2015).

The high CPUE of the EU vessels in 2015 may also have been related to a more westerly distribution of the jack mackerel population. This westerly distribution was evident from the presence of Chilean purse seiners outside the 200 mile EEZ. Whereas in the years 2012-2014, the Chilean fleet took almost their entire catch within the Chilean EEZ (Anon 2014), in 2015 around 10 Chilean purse seiners operated outside the Chilean EEZ alongside the EU vessels. The presence of these Chilean vessels outside the Chilean EEZ may have indicated a scarcity of fish inside the Chilean zone.

Considering that the distribution of jack mackerel in 2015 was abnormal, possibly as a result of special hydrographic conditions, one has to be cautious in drawing over-optimistic conclusions from the high catch of young jack mackerel by the EU trawlers. The high abundance of these juveniles on the fishing grounds outside the Chilean EEZ could be the result of an abnormal distribution of this year-class, rather than of its absolute size.

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