

## **The fishery for jack mackerel in the Eastern Central Pacific by European trawlers in 2008 and 2009**

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### **1 General**

This report describes the activities of trawlers of the Pelagic Freezertrawler Association (PFA) in the Eastern Pacific in 2008 and 2009. The PFA fleet comprises all vessels working under Dutch and German flag, and one vessel under Lithuanian flag. In addition to the PFA vessels, there were other European vessels in the Pacific in 2009 and earlier years. These non-PFA vessels are not considered in the present report. The work described in this report was financed by the PFA and the Dutch Ministry of Agriculture, Conservation and Food Quality.

### **2 Data available**

#### **2.1 Landing data**

Official landing data were available from the PFA for 2008 and earlier years. For 2009, no official landing data were yet available at the time of writing this report.

#### **2.2 Haul-by-haul information from the captains**

Captains of all PFA vessels provided haul-by-haul information on a voluntary basis. The size and species composition of individual catches was estimated by visual inspection of the amount of fish in the net, or in the tanks into which the catch was pumped. It was found that the captains tended to under-estimate the amount of catch at first sight. As a result, the sum of all individual catch estimates provided by the captains was lower than the landing data for the entire trip provided by the ship owner. In order to make the tow-by-tow information check with the landing data, the estimates for individual catches had to be raised by a correction factor.

#### **2.3 Observer data**

Two CMR observers collected data on species composition, length distribution, biological characteristics (sex and maturity), food composition, stomach fullness and fat content. In addition,

they monitored discards and incidental by-catches of large species. The observers worked on 4 different vessels and covered 116 fishing days during the period 6 April – 3 October 2008.

### **3 A brief description of the fishery**

The fishery for jack mackerel by the PFA fleet started in 2005 with a single vessel working 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 PFA vessels increased to six in 2007. This number was kept unchanged in 2008 and 2009, following an agreement by the SPRFMO in 2007 to freeze fishing effort as of 31 December 2007.

year	Number of PFA vessels	Flag state
2005	1	Netherlands (1)
2006	1	Netherlands (1)
2007	6	Germany (3), Lithuania (1), Netherlands (2)
2008	6	Germany (3), Lithuania (1), Netherlands (2)
2009	6	Germany (3), Lithuania (1), Netherlands (2)

The vessels involved in this fishery are large pelagic trawlers. They use single boat pelagic trawls that are fished mainly during the night. The vessels operate exclusively in international waters outside the Chilean EEZ. Fishing operations extend in the open Pacific to about 115° West.

The target species of the PFA vessels, jack mackerel (*Trachurus murphyi*), constitutes at least 90% of the total catch. The second species is chub mackerel (*Scomber japonicus*), which makes up 5 – 10% of the total catch. The third species is *Brama australis*, which is taken only in small quantities.

## **4 Development of catches and effort in 2008 and 2009**

### **4.1 Fishing effort**

Following the interim measures agreed by the SPRFMO in 2007, the number of vessels fishing for jack mackerel was frozen as of 31 December 2007. Consequently, the PFA vessels present in the area in 2008 and 2009 were the same as those in 2007 :

PFA vessels active in the South Pacific in 2008 and 2009

Vessel	Flag state	GT
ROS 171 Maartje Theadora	Germany	9082
ROS 785 Helen Mary	Germany	7278
BX 783 Jan Maria	Germany	7646
KL 749 Margiris	Lithuania	9499
KW 174 Annelies Ilena	Netherlands	14055
SCH 54 Franziska	Netherlands	7153

Despite the freeze in number of vessels since 2007, the total number of fishing days of the PFA fleet increased slightly since 2007:

Development of fishing effort by PFA vessels since 2005

year	Number of vessels	Number of fishing days
2005	1	44
2006	1	109
2007	6	401
2008	6	423
2009	6	436

In calculating fishing effort, the number of fishing days by all vessels was simply summed. The amount of data was insufficient to calculate differences in fishing power between the vessels. The number of fishing days corresponds to the number of days for which catches have been reported. Searching days have not been counted, as these cannot be separated from steaming days and days during which the vessels were transshipping catches.

Over the last 3 years, the fishing season has tended to start earlier, and to end earlier too. A possible explanation for this phenomenon is presented in section 7.

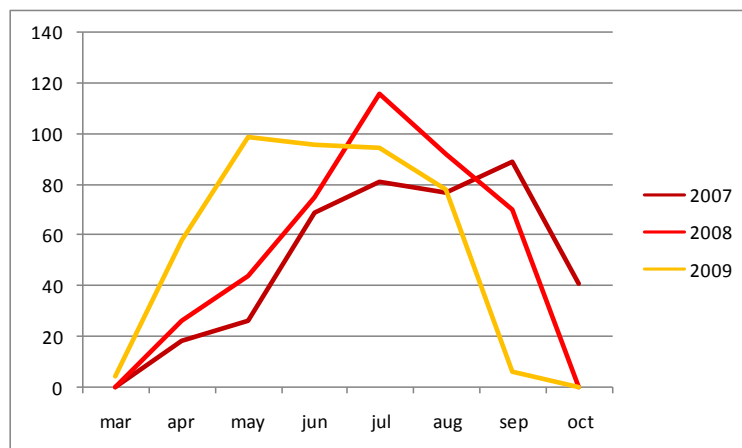


Figure 1. Fishing days PFA vessels per month

## 4.2 Catches and catch-per-unit-of-effort

The text tables below present the development of catches by the PFA fleet by country. At the time of writing this report, official landing data were available only up to 2008.

	catch <b>all species</b> (tons)			
	Netherlands	Germany	Lithuania	total
2005	6187	0	0	5973
2006	36689	0	0	36689
2007	45363	47059	40814	133236
2008	39449	50581	24045	114075

	catch <b>jack mackerel</b> (tons)			
	Netherlands	Germany	Lithuania	total
2005	5973	0	0	6187
2006	33766	0	0	33766
2007	41747	43610	38166	123523
2008	37113	48505	22556	108174

It is seen that both total catches and catches of jack mackerel declined in 2008 compared to the previous year.

The main fishing season is from April to September, as can be seen from the monthly catches in 2008:

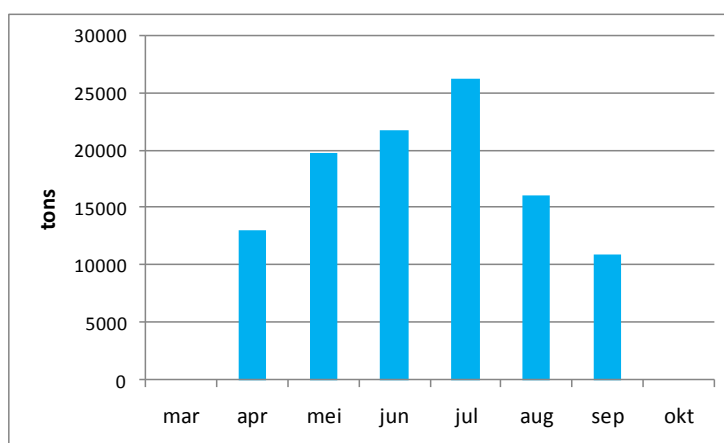


Figure 2. Monthly catches of jack mackerel by the EU fleet in 2008

The catch per day in 2008 showed a steady decline during the fishing season. This pattern was also observed in 2007 (Figure 3). Preliminary data for 2009 indicate that this trend was even more pronounced in this year, which explains the early termination of the fishing season in 2009.

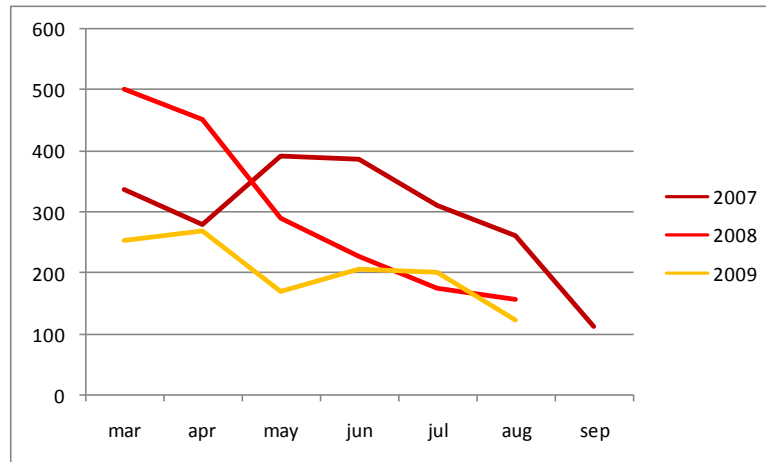


Figure 3. Monthly catch per day (tons) of jack mackerel by the EU fleet in 2007 – 2009. Data for 2009 are preliminary

## 5 Geographical distribution of the fishery

The tow-by-tow information reported by the captains has been used to construct monthly maps of the geographical distribution of the fishery in the years 2007 – 2009. The results of this exercise are presented in figures 4-6.

In general the fishery starts in April between 40° - 45° South just outside the Chilean EEZ. In subsequent months the fleet moves away from the continent in a northwesterly direction. The fishery ends in September/October, normally at the westernmost edge of the fishing area.

However, there are marked differences between the individual years. In 2008, the movement of the fleet was in a northern rather than in a western direction. The last year (2009), in contrast, was comparable again to 2007, be it that the fleet moved still further to the west during the season.

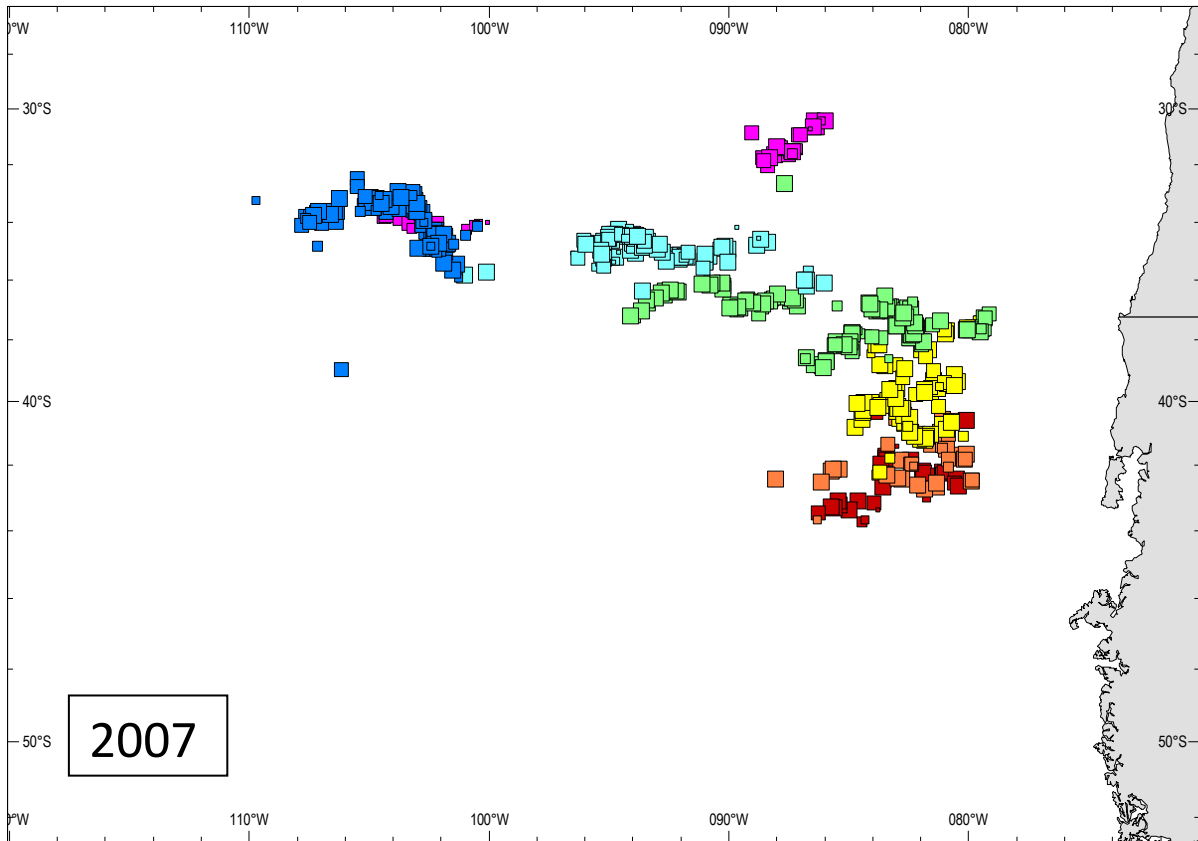


Figure 4. Catch distribution by month of the EU fleet in 2007. Red = April, orange = May, yellow = June, green = July, light blue = August, dark blue = September, purple = October. Size of squares is proportional to catches.

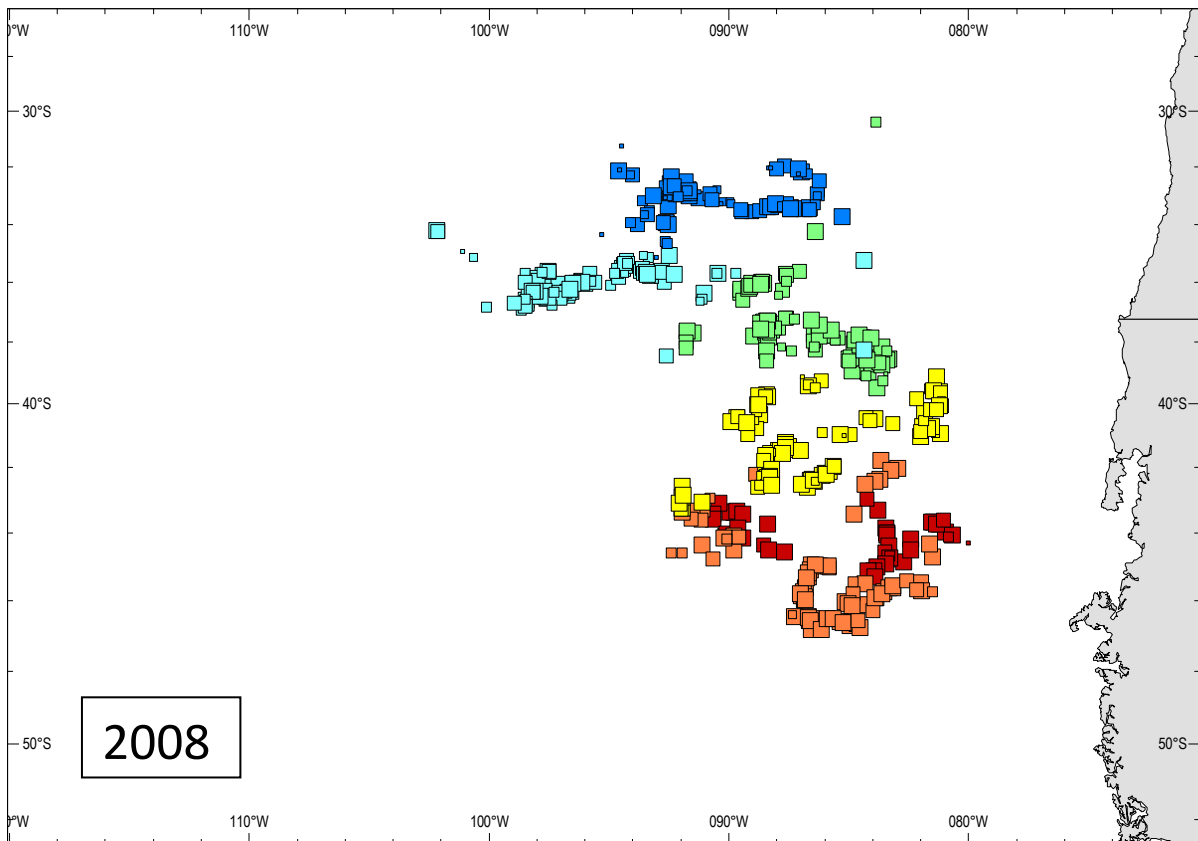


Figure 5. Catch distribution by month of the PFA fleet in 2008. See figure 4 for explanation.

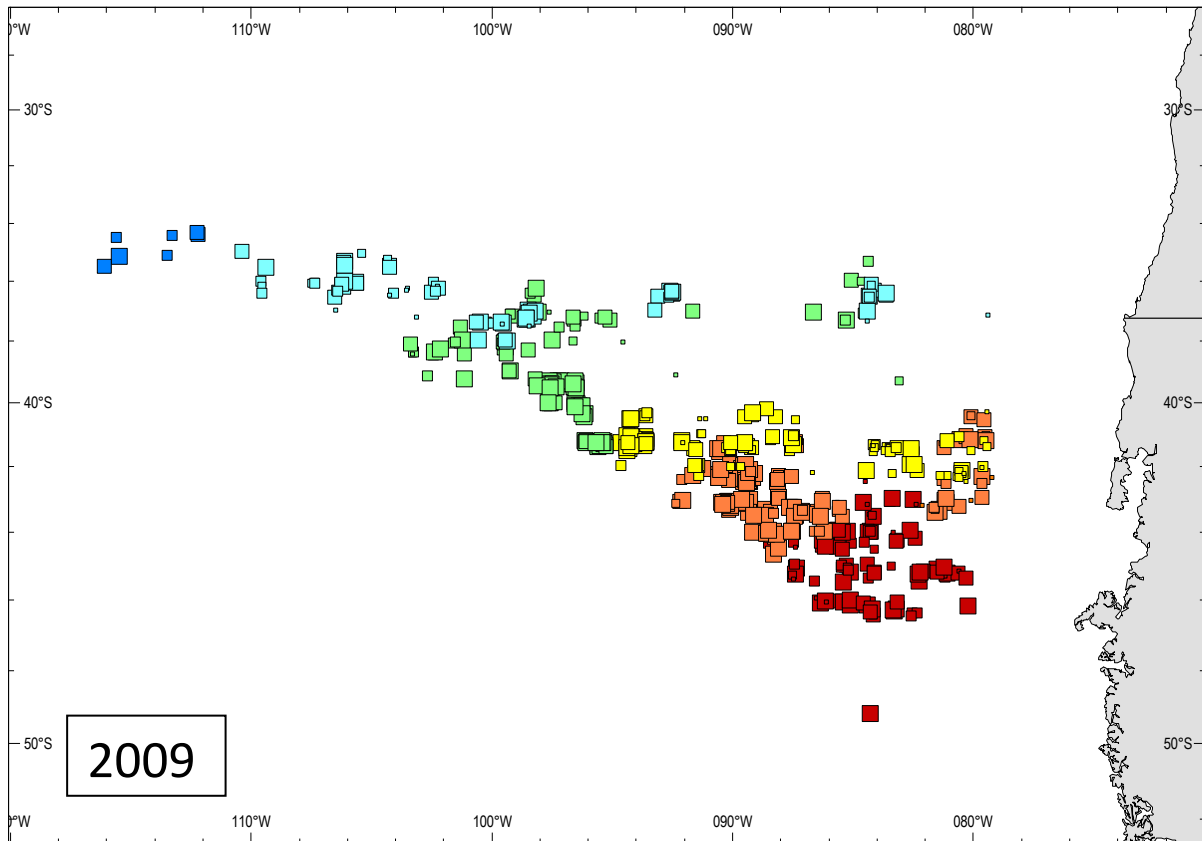


Figure 6. Catch distribution by month of the PFA fleet in 2009. See figure 4 for explanation.

## 6 Length distributions of jack mackerel

Monthly length distributions of jack mackerel in 2008 are compared to data for the same month in the previous year in Figure 7.

It is seen that in both years the largest size group (>45 cm) occurred in the catches only in the first months of the season (March – July). In the last months of the season (August – October), this size group was virtually absent.

In 2007, a new year-class appeared in the fishery in June. These fish, with a length around 30 cm, became the dominant component in the catches from July onwards. In 2008, no such recruitment occurred during the season. Catches always had a modal length of 33-35 cm.

Preliminary data for the year 2009 show no sign of new recruitment either. The fish were still larger than in 2008, with a modal length of 35-36 cm (Figure 8).

Fishery for jack mackerel by European vessels in 2008 and 2009

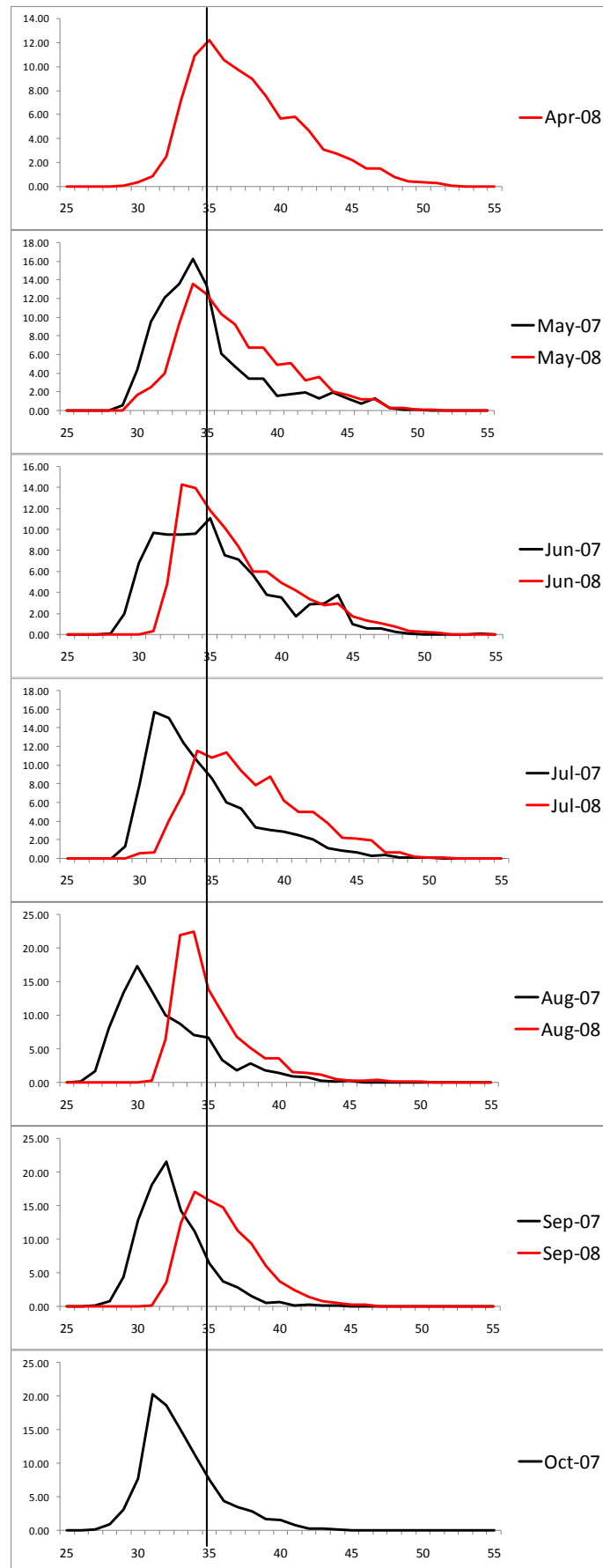


Figure 7. Monthly length distribution of jack mackerel in 2008 compared to 2007

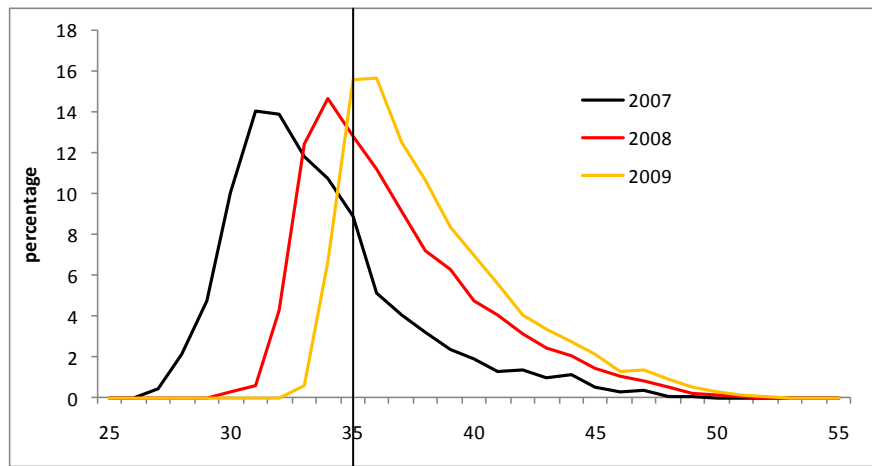


Figure 8. Annual length distribution of jack mackerel compared for three consecutive years.

## 7 Discussion

### 7.1 Stock development

The main conclusion regarding the development of the jack mackerel stock is that no recruitment to the offshore population occurred during the last two years (2008 and 2009). This lack of recruitment must have resulted in a decline of the adult stock.

It is hard to quantify the reduction of the adult stock on the basis of catch per unit of effort data for the pelagic trawl fishery. In general, CPUE data for a directed fishery are not a reliable index of stock size. Because of their searching capacity, pelagic trawlers can locate schools even at low stock sizes, and the CPUE of these vessels tends to mask a decline in overall stock size.

In the jack mackerel fishery, there is another element that affects the CPUE of the vessels, and that is the size of the fish. As the fish grow larger, their swimming speed increases, and they are increasingly difficult to catch for the trawlers. This phenomenon was given as the main explanation by the captains for the low catches in 2009. Schools of jack mackerel were frequently seen on the echo sounder during daytime, but the vessels had no chance of catching the fish during the day. Most fishing was done during the night, when the jack mackerel was distributed in scattering layers.

It is not possible to decide which part of the decline in CPUE in 2008 and 2009 was due to the assumed reduction in stock size, and which part to the decreased catchability of the fish.

### 7.2 Migration pattern

The data on geographical distribution of catches, coupled with the length distributions, provide interesting information on the migration pattern of the jack mackerel.

At the start of the fishing season (April), most of the (offshore) population seems to occur just outside the Chilean EEZ. This is the time of the year when relatively high catches can be made. In subsequent months, the fish move either in a northern or northwestern direction. As the season progresses, the largest fish (> 45 cm) start to disappear from the catches. Finally, the fishery ends in September/October when the schools seem to disperse altogether.

The offshore migration of jack mackerel is generally considered to be a spawning migration. However, the fish taken by the pelagic trawlers are still in a low maturity stage (stage 2 and 3 on a scale of 5). Fish in actual spawning condition (stage 4) or spent fish (stage 5) are not found in the catches. Apparently, the fish disperse during the actual spawning season, which is the reason why the trawlers cannot locate them anymore. In most fish species, the largest and oldest fish are the first ones to spawn. This might explain the disappearance of the larger fish from the catches in the second part of the season (July – October). Presumably these fish change their behaviour prior to spawning, which makes them no longer accessible to the pelagic trawlers.

The early termination of the fishing season in 2009 could have been related to this phenomenon. The population in 2009 consisted of relatively large fish, and it is likely that these fish started to spawn relatively early. This could explain the early disintegration of the schools, and thereby the early termination of the fishery in 2009.

### **7.3 Inter-annual variability**

The charts with monthly distributions of catches in 2007-2009 show pronounced differences in geographical distribution of the fleet from year to year. These variations are most likely related to hydrographic conditions in the area, the nature of which is still unclear.