

Length and recruitment analysis of small pelagics off the Canary Islands

Analyse de la longueur et recrutement des petits pélagiques aux îles Canaries
(English only/En anglais seulement)

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ABSTRACT

Hypothetical geographical segregation by size in the small pelagic populations was studied using a spatial-temporal analysis of mean lengths. Furthermore, to detect the recruitment season and their possible relationship with the satellite-derived sea-surface temperature (SST) and sea surface temperature anomalies (SSTA) values, a fortnightly analysis of the percentage of juveniles in the catches 2005–2006 was carried out.

Individuals of mackerel (*Scomber japonicus* Houttuyn, 1782) smaller than 16 cm, horse mackerel (*Trachurus picturatus* Bowdich, 1825) and round sardinella (*Sardinella aurita* Valenciennes, 1847), and sardine (*Sardina pilchardus* Walbaum, 1792) smaller than 12 cm were used in this analysis. Mean SST by month and oscillations of SSTA data during 2005 and 2006 were used.

No evidence of segregation by size in the population was found. However, the smallest individuals of mackerel, round sardinella and sardine were caught in the northern area of Tenerife, and the mean length of mackerel and horse mackerel were greater in Gran Canaria than Tenerife.

It was observed along the period studied that similar SSTA values could be favourable for the recruitment of horse mackerel, round sardinella and sardine. In the case of mackerel no pattern was found. A summary of possible recruitment seasons for these species in the Canaries waters is presented.

RÉSUMÉ

La séparation hypothétique par taille parmi les populations de petits pélagiques a été étudiée en utilisant une analyse d'espace-temps des longueurs moyennes. En outre, pour détecter la saison de recrutement et sa possible relation avec les valeurs de SST et SSTA, on a développé encore une autre analyse du pourcentage de juvéniles dans les captures de 2005 à 2006.

Pour cette analyse on a utilisé des individus de maquereau (*Scomber japonicus* Houttuyn, 1782), de chinchard (*Trachurus picturatus* Bowdich, 1825) et de sardinelle ronde (*Sardinella aurita* Valenciennes, 1847) de moins de 16 cm; et des sardines (*Sardina pilchardus* Walbaum, 1792) de moins de 12 cm de longueur. Les moyennes de SST et de SSTA sont utilisées de 2005 à 2006.

On n'a trouvé aucune évidence de séparation dans la population. Cependant, les plus petits individus de maquereau, sardine ronde et sardine ont été capturés dans la zone nord de Tenerife, et la longueur moyenne du maquereau et du chinchard était plus grande à Gran Canaria qu'à Tenerife.

On a remarqué au cours de la période étudiée que des valeurs similaires de SSTA peuvent être favorables au recrutement du maquereau, de la sardine ronde et de la sardine. Dans le cas du chinchard on n'a pas trouvé de schéma. On présente un résumé des saisons de recrutement possibles dans les eaux des Canaries.

1. INTRODUCTION

An analysis of the sizes of the main small pelagics caught in the Canary Islands was carried out. The studied areas were: Zones North-East (28°30' N–15°30' W) and South (27°30' N–16°30' W) of Tenerife, and South of Gran Canaria (27°30' N–15°30' W) (Canary Islands). Four species were studied: mackerel (*Scomber colias* Gmelin, 1789), round sardinella (*Sardinella aurita* Valenciennes, 1847), horse mackerel (*Trachurus picturatus* Bowdich, 1825) and sardine (*Sardina pilchardus* Walbaum, 1792).

A total of 10 380 mackerels, 7 585 horse mackerels, 8 131 round sardinellas and 6 489 sardines were measured from January 2005 to December 2006 in Gran Canaria and from March 2005 to March 2006 in Tenerife.

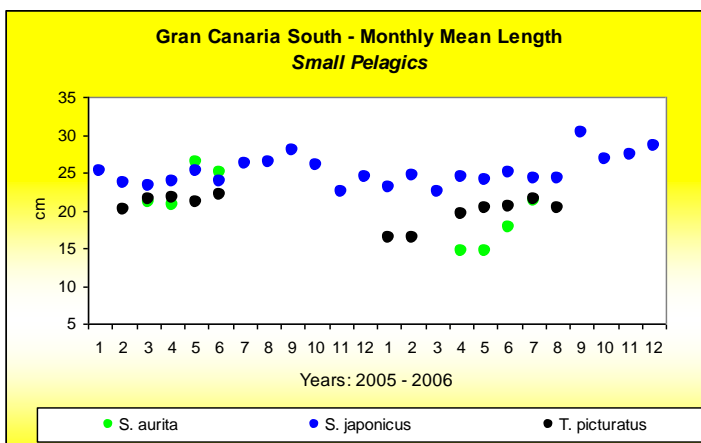
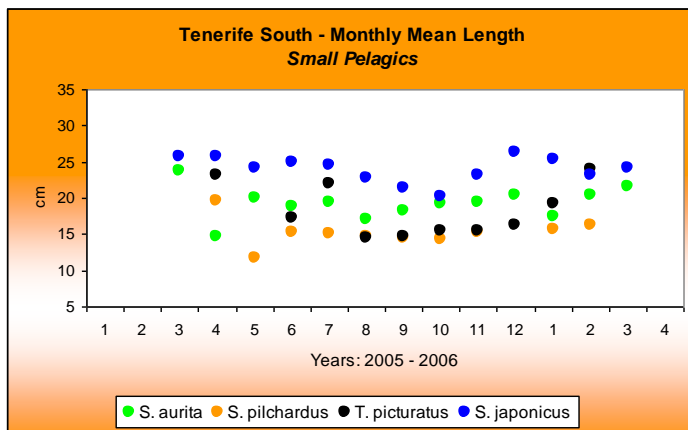
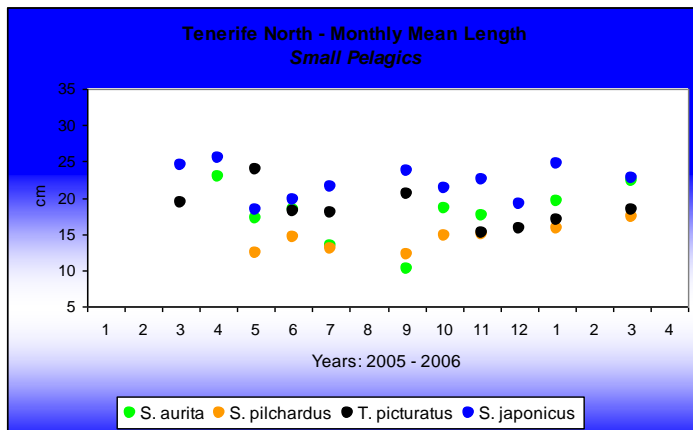
Hypothetical geographical segregation by size in the small pelagic populations was analysed using a graphic spatial-temporal of mean lengths method. On the other hand, in order to detect the recruitment season and their possible relationship with the SST and SSTA values, a fortnightly analysis of the percentage of juveniles in the catches 2005–2006 was carried out. Individuals of mackerel smaller than 16 cm, also horse mackerel and round sardinella, and sardine smaller than 12 cm were used in this analysis.

Mean SST by month and variations of SSTA data during 2005 and 2006 were used. Source: IGOSS-IRI (International Research Institute for Climate Prediction, Columbia University). A summary of possible recruitment seasons for these species is presented for this region.

This study was carried out in the framework of the ConAfrica Project (Cicyt CTM2004-02319).

2. RESULTS

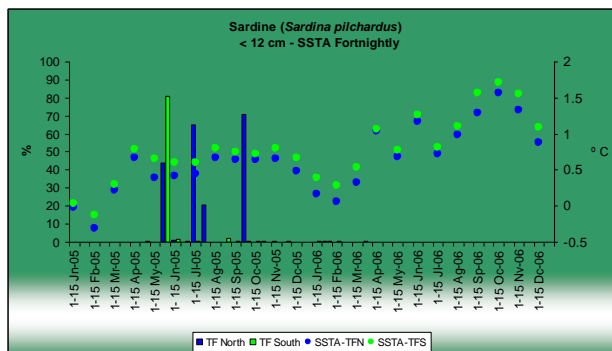
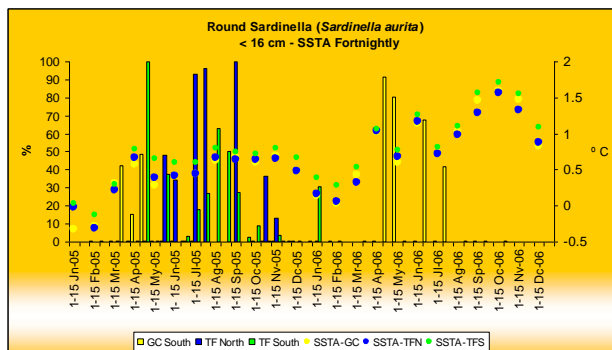
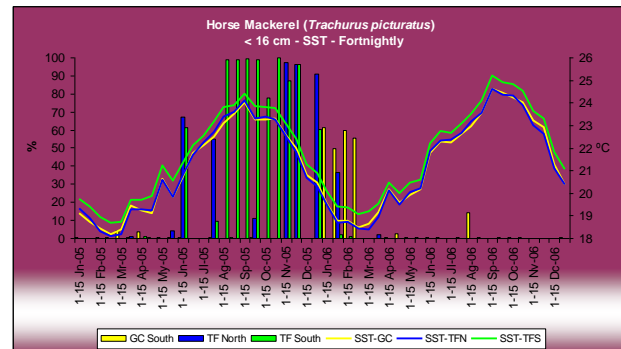
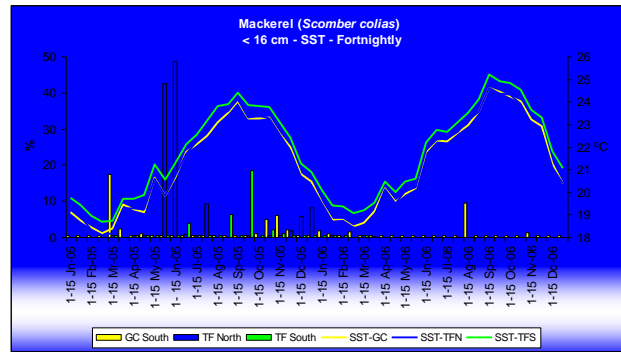
Mean length



- The mean length of mackerel and horse mackerel in Gran Canaria was larger than those from Tenerife.
- The individuals of mackerel, round sardinella and sardine were smaller in the North of Tenerife.
- The fishing zone that showed the most stable mean sizes of round sardinella and sardine was located south of Tenerife.
- In most of the samples, the size of sardine was lower than 19 cm TL. In this respect, in 1982 the percentage of *S. pilchardus* with size larger than 19 cm was 42 percent (Delgado de Molina *et al.*, 1982). On the other hand, Ramos and Santamaría (1998) observed that the greater yields for sardine in Northwest Africa occur between 19.93° C and 21.13° C of SST. The increase of the SST in the Canary waters since the 1990s (López Abellán *et al.*, 2008) could explain the greater amount of juveniles, due to being in waters with more favourable temperatures than for adults.
- Although a statistical analysis would be necessary, apparently, no segregation of the population components by geographical area was observed.

Recruitment – sea temperature

- North Tenerife was the only area with a significant percentage of mackerel juveniles (43% in the second half of May and 49% in the first half of June). This incorporation was preceded by a cooling process of the SST. However, those conditions were also present in the South of Tenerife and Gran Canaria, but this process did not happen in those areas. There does not seem to be any pattern relating the recruitment of this species with certain conditions of SST and/or SSTA during the studied period.
- In Gran Canaria there was an incorporation of juveniles of horse mackerel in January–February 2006 (50–61%), at the same time a significant decrease of the SST. In the north of Tenerife there were more than 91% of juveniles in November–December 2005, coinciding with periods of lower SST. However, in the first half of June (67%) and in the second half of July (55%), the temperatures increased. South Tenerife showed greater presence of juveniles continuously over the period August to December (60–100%), coincident with the greater values of SST and some stability in the anomalies. The recruitment of this species may be favoured by stable temperature conditions.



- Even if the absence of monthly sampling of round sardinella in Gran Canaria prevents us from determining the precise time of recruitment, the percentages of juveniles were significant from April to July 2006 (91 to 42%) and March to April 2005 (49%), corresponding to periods of increasing SST and some stability of SSTA. This fact was also observed in the north of Tenerife, where it seems that summer could be a good period for recruitment. In the south of Tenerife, 100% of juveniles appear in the second half of April 2005, and over 30% the following months until September. The recruitment could occur in April–May 2005. As a general pattern, the appearance of juveniles was more frequent in the second and third quarters, coinciding with SST increases and SSTA stability.
- In the north of Tenerife, the scarce presence of specimens of sardine (and also round sardinella) less than 12 cm long took place during the second and third quarters of the year, with a maximum of 70% in the second half of September 2005. In the South of Tenerife, their presence only occurs

in the second half of May (81%). In both cases, their presence was related to the increasing SST and some stability of SST. However, in this case it was very difficult to detect recruitments due to the current legislation on minimum commercial sizes for this species.

It was observed along the period studied that similar SSTA values could be favourable for the recruitment of horse mackerel, round sardinella and sardine. In the case of mackerel no pattern was found.

In spite of the lack of sampling during some months, a summary of possible recruitment seasons for these species is presented for this region (in bold are the most important):

Zone	Species	Juveniles	Recruitment
North Tenerife	S. colias	My-Jn-Jl 05	
	T. picturatus	Jn-Jl-Nv-Dc 05 Jan 06	
	S. aurita	My-Jn-Jl-Sp-Oc 05	Summer
	S. pilchardus	My-Jl-Sp 05	
South Tenerife	S. colias	Ag-Sp 05	
	T. picturatus	2º Semester 05 (Ag to Nv 05)	
	S. aurita		April-May 2005
	S. pilchardus	My 05	
South Gran Canaria	S. colias		March 2005
	T. picturatus	Jan-Fb 06	
	S. aurita	Mr-Ap 05 Ap-My-Jn-Jl 06	

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