Recent past and present of the Spanish fishery of anchovy (*Engraulis encrasicolus* Linnaeus, 1758) in Atlantic Moroccan waters

Passé récent et présent de la pêcherie espagnole de l'anchois (*Engraulis encrasicolus* Linnaeus, 1758) dans les eaux atlantiques du Maroc
(English only/En anglais seulement)

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ABSTRACT

The fishery of small pelagic species such as anchovy and sardine in northern Morocco has been a common practice during centuries for vessels coming from the southern region of the Iberian Peninsula. The enforcement of the Law of the Sea firstly led the Spanish Fishery Administration and then the European Union (EU) (from 1988 onwards) to negotiate the access to the Moroccan fishery resources through fishing agreements. Fisheries in Morocco were closed to the European fleet by the end of November 1999. After six years of closure, a new fishing agreement signed in 2006 between the Kingdom of Morocco and the EU has allowed the Andalusian purse-seine fleet based at Barbate (Cádiz, SW Spain) to restart its fishery in the Atlantic Moroccan waters in April 2007. Anchovy is the target species of this fleet on the Atlantic Moroccan fishing ground, due to its high economical value. This species accounted for 88 percent of the total catches for this fleet during the period 1988–1999. The great importance of this fishery is reflected by catch levels as high as more than 12000 t in certain years of higher anchovy's abundance (1998, 1999). This work is a compilation of the existing information gathered by the Instituto Español de Oceanografía (IEO) on the Spanish anchovy fishery before the third Morocco–EU fishing agreement expiration in 1999 (period 1988–1999) and after the renewal of the agreement and re-opening of this fishery in April 2007.

RÉSUMÉ

La pêche des espèces de petits pélagiques, comme l'anchois et la sardine dans le nord du Maroc a été une pratique commune depuis des siècles pour les flottes provenant de la région du sud de la presqu'île Ibérique. L'entrée en vigueur de la Loi de la Mer a permis aux Administrations des pêches, d'abord les espagnoles, puis celles de l'Union européen (UE) (à partir de 1988), de négocier l'accès aux ressources des pêches marocaines à travers les accords de pêche. Les pêcheries marocaines ont été fermées à la flottille européenne à partir du mois de novembre 1999. Après six ans de fermeture, un nouvel accord de pêche signé en 2006 entre le Royaume du Maroc et l'UE a permis à la flottille de seine andalouse basée à Barbate (Cadix), dans le sud-ouest de l'Espagne, de reprendre cette pêcherie dans les eaux de l'Atlantique marocain en avril 2007. L'anchois est l'espèce cible de cette flottille dans les lieux de pêche de l'Atlantique marocain étant donnée sa grande valeur économique. Cette espèce représentait 88 pour cent des captures totales de cette flottille durant la période 1988–1999. La

grande importance de cette pêcherie est reflétée dans les niveaux de captures supérieurs à 12 000 tonnes au cours des années de grande abondance d'anchois (1988, 1999). Ce travail est une compilation de l'information rassemblée par l'Instituto Español de Oceanografía (IEO) sur la pêcherie espagnole d'anchois avant l'expiration du 3ème accord de pêche Maroc–UE en 1999 (période 1988–1999) et après le renouvellement de l'accord et la réouverture de cette pêcherie en avril 2007.

1. INTRODUCTION

The fishing activity in Moroccan waters has been a common practice for Iberian fishermen during centuries (Balguerías, 1995). This activity was initiated almost exclusively by vessels fishing for small pelagics, particularly anchovy (*Engraulis encrasicolus* Linnaeus, 1758) and sardine (*Sardina pilchardus* Walbaum, 1792). These vessels used to follow the fish schools in their migrations across the narrow sea strip separating the Iberian and the African coasts (Santamaría, 1995). At the beginning, the Spanish fleet was mainly composed of sail vessels coming from the southern region of the Iberian Peninsula (Andalusian fleet) which fished in northern Morocco. During the 1930s, the introduction of engines allowed this fleet to expand to southern waters. In the 1960s, the Canarian purse-seine fleet joined the Andalusian one, but specializing in fishing sardine (*Sardina pilchardus*) destinated to canning and fishmeal factories in the Canary Islands. This fact involved the expansion of the Spanish fishery to the region between Sidi Ifni (29º30'N) and Cape Bojador (26ºN) (Santamaría, 1995).

Moroccan waters were free access fishing grounds for the Spanish fisheries until the enforcement of the Law of the Sea. Accordingly, from 1979 onwards, Spanish purse-seine fishing has been managed by fishing agreements between the Kingdom of Morocco and either Spanish or EU Administrations.

The Andalusian purse-seiners benefited from quarterly licences within the frame of these agreements previous to the current one, signed between the EU and Morocco (2006), with a gap during the closure of the fishery from November 1999 to April 2007.

The vessels which have benefited from this licence system belong to a fleet segment of heavy-tonnage purse-seiners based at Barbate (Cádiz, SW Spain), the so-called Barbate's "Traíñas". These vessels have traditionally alternated the small pelagics fishery (mainly anchovy) in the north west Moroccan fishing ground and in the Spanish waters off the Gulf of Cádiz (Millán, 1992).

This work presents the different management measures of the Spanish purse seine fishery regulated by the fishing agreements. Furthermore, a revision of the statistical information of the anchovy fishery by the Barbate's purse seine fleet in Moroccan fishing grounds from 1988 to present is also provided.

2. MATERIAL AND METHODS

Management measures of the Spanish purse seine fishery from the beginning of the agreements in 1979 to the current one in 2006, were collected from the legislation of both the Spanish Administration <www.boe.es/g/es/> and the EU <http://eur-lex.europa.eu>.

Information about the fleet characteristics and fishery statistics (species composition, landings, effort, length distributions of landings) have been gathered and analysed by the Instituto Español de Oceanografía (IEO) from 1988 to present, from data collected by IEO's sampling and information network.

3. RESULTS AND DISCUSSION

Management and regulation measures of the Spanish purse-seine fishery in Moroccan waters

From the enforcement of the Law of the Sea, Spanish fisheries in Moroccan waters have been regulated by different agreements (see Table 1). The first two (1979, 1983) were bilaterally negotiated between the Spanish Fishery Administration and the Kingdom of Morocco. Since the integration of Spain in the EU, the access to the Moroccan fishery resources was conditioned by the Fishing Agreements signed by Morocco and the EU (1988, 1992, 1995 and 2006). These agreements became more restrictive for the Spanish fleet over the years. There was a closure of the fisheries in Morocco to the European fleet (exclusively composed of Spanish purse seiners) by the end of November 1999, when the third Communitarian Fishing Agreement of 1995 expired. This fishery was not re-opened until April 2007, with the signing of the current Fishing Agreement in 2006.

Agreement	Category	Zone	Distance to coast	Gear dimensions	Number of vessels	Close season	GRT	Observations
1979 (transitory)	Seiners/ Northern Cape Noun	Between Tanger and Larache (35°48N')					3 500	
1983			Beyond 1 mile	500 m x 90 m			3 500–>1 088	
1988			1 mile (N of 35°48') 2 miles (S of 35°48')	500 m x 90 m			1 088	
1992	Seiners/ North Atlantic	North of 35°12N'	1 mile (N of 35°48'N) 2 miles (35°12N'–35°48')	500 m x 90 m	36 (10%)	2 months February and March	1 088	
1996	Seiners/ North	North of 34°18N'	1 mile (N of 35°48') 2 miles (34°18N'–35°48')	500 m x 90 m	26 (10%)		1 300	
2006	Small-scale fishing/ North seine nets	North of 34°18N'	Beyond 2 miles	500 m x 90 m	20			Ban of fishing with lampara nets. Requirements of landings in Morocco

The Barbate's purse seine fleet was included in the categories: "Seiners-Northern Cape Noun/North Atlantic/North" of the different agreements. The management measures of this Andalusian purse seine fleet regulated by the agreements mainly consist of an effort control (through GRTs limitations) and technical measures such as the limitation of the fishing areas, closed seasons and gear size (see Table 1). Figure 1 shows the fishing zones allowed to this fleet by the different agreements.

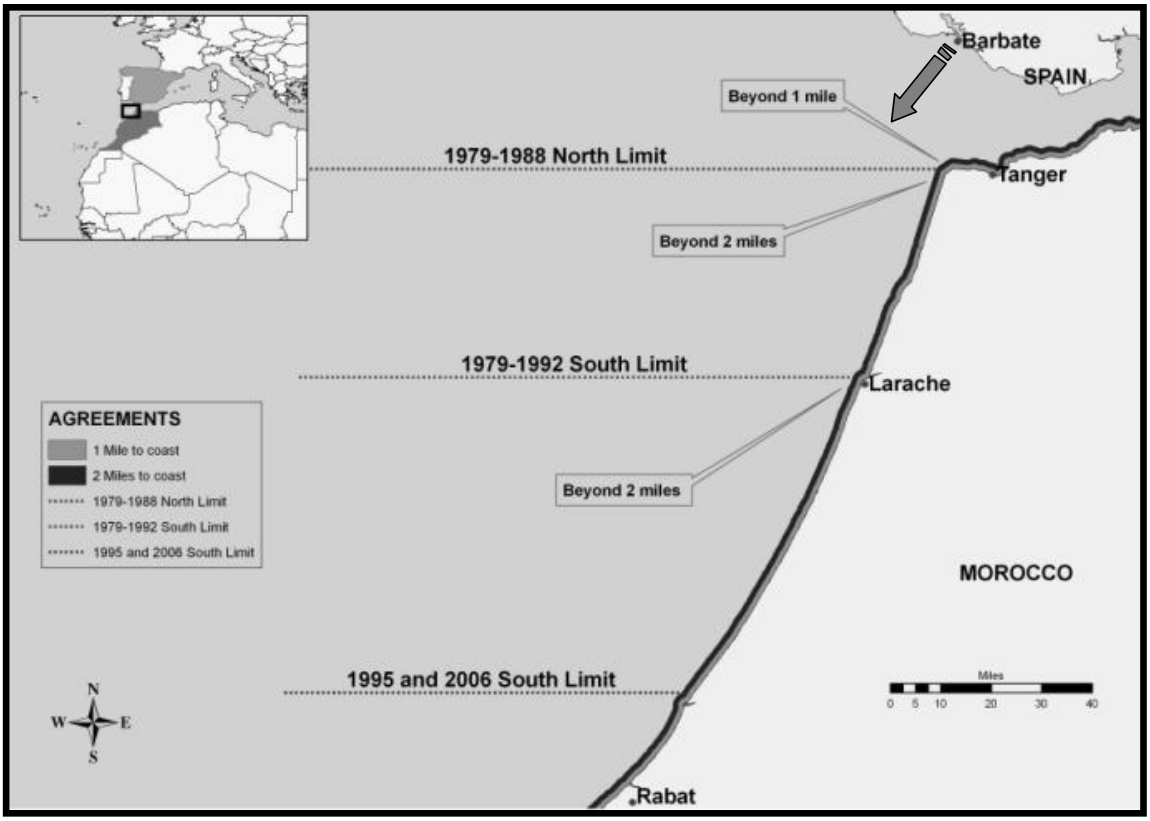

Figure 1: Map of the fishing zones allowed to the purse-seine fishery in the North-Atlantic Moroccan waters by the different fishing agreements

The general trend throughout the Fishing Agreements shows a decrease of the GRT of the vessels that composed the Barbate's purse seiners fleet (with the exception of 1991) until minimal values in 1993. The following years, it softly increased because of the lower restricted conditions of the 1995 Agreement (see Table 1).

The total number of Andalusian purse-seiners fishing in the Moroccan fishing ground decreased to minimum of 22 vessels in 1992. From then onwards, the number increased, reaching a maximum of 47 vessels fishing prior to the last Agreement in 1999.

The trends of the total quarterly and annual number of vessels do not coincide because of the rotating licence system deployed by the Barbate's fleet. Through this system, different vessels rotated the licences from one quarter to another. In this way, all the licensed vessels of this fleet were able to fish in Moroccan waters throughout one year. In 2007, the Barbate's fleet re-incorporated into the Moroccan fishing ground with 19 vessels of the 20 allowed in the last Agreement. The GRT and number of vessels (total and monthly) showed the lowest values of the analysed historical series.

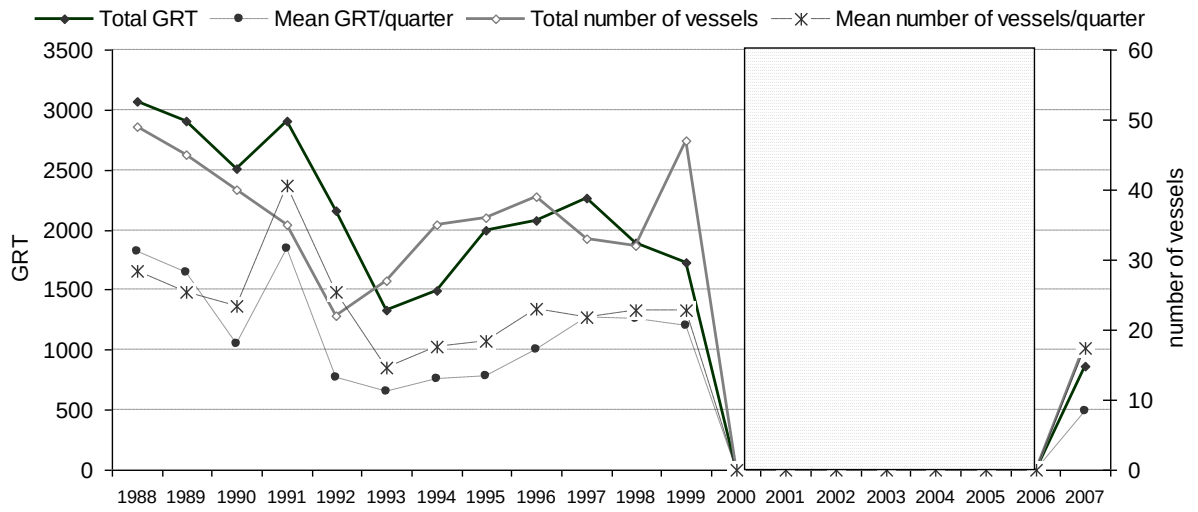

Figure 2: Annual evolution of GRT and number of vessels of the Barbate's purse-seine fleet in the Moroccan fishing ground (period 1988–2007)

Landed species

Anchovy (*Engraulis encrasicolus*) constitutes the target species for the Barbate's purse-seine fleet off north west Moroccan waters. It accounts for more than 77 percent of the total landings in average, its contribution being higher than 85 percent in most of the analysed years (Figure 3). The lower percentages of anchovy were landed during the period 1992–1995.

Sardine (S*ardina pilchardus*) represents the second species in landings, accounting for less than 20 percent of the landings in most of the years. Only in 1993, the contribution of sardine landings (49.8 percent) was higher than the anchovy's, which recorded the lowest value in the series (see Figure 4).

The rest of the species show a low relative importance in the landings. These species belong, in order of importance, to the groups *Trachurus* spp. and *Scomber* spp. The horse-mackerel species group represents 3.4 percent in landings as an average in the whole series and only in 1994 and 1996 accounted for more than 12 percent. The average percentage of the mackerel species group in the total landings was lower than 1.4 percent, this relative importance showing a decreasing trend along the analysed historical series.

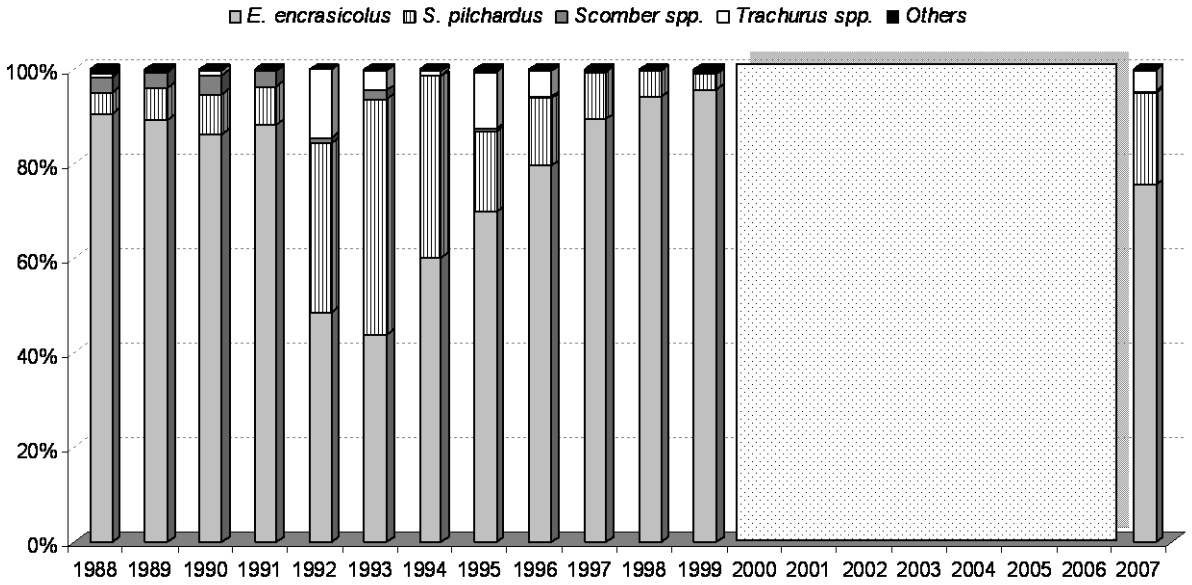

Figure 3: Species composition in landings (period 1988–2007)

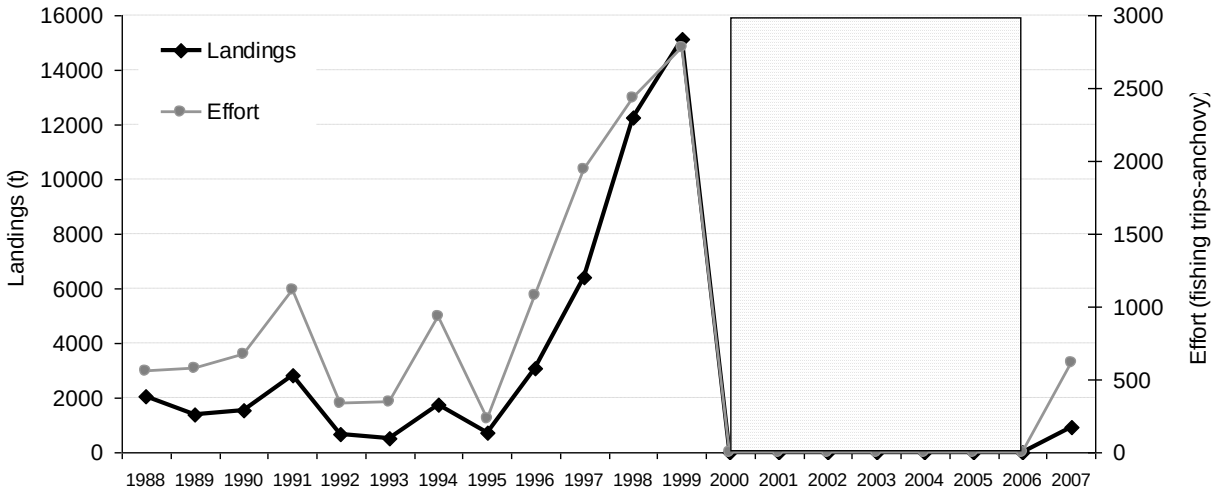

Figure 4: Spanish anchovy fishery in Atlantic Moroccan waters: annual evolution of landings (tonnes) and nominal species-specific effort (fishing trips with positive anchovy catch) (period 1988–2007)

Anchovy landings and effort evolution

Anchovy landings of the Spanish fleet in Moroccan waters oscillated between 520 tonnes in 1993 and more than 15 000 tonnes in 1999. These great variations in landings may result from the different effort levels applied by the fleet in this fishing ground, which oscillated between 230 fishing trips (1995) and a maximum of 2 781 fishing trips in 1999. A sharp increase of landings and exerted effort took place in the last four years prior to the end of the Agreement, reaching the maximum values in 1999. In fact, such peaks corresponded to an important decrease of the anchovy landings in the Gulf of Cadiz (ICES, 2007), the alternative fishing ground for the Barbate's fleet. The landings of this fleet, after its re-incorporation in 2007 have only represented 6 percent of the 1999 landings although by exerting the 22 percent of the effort applied that year.

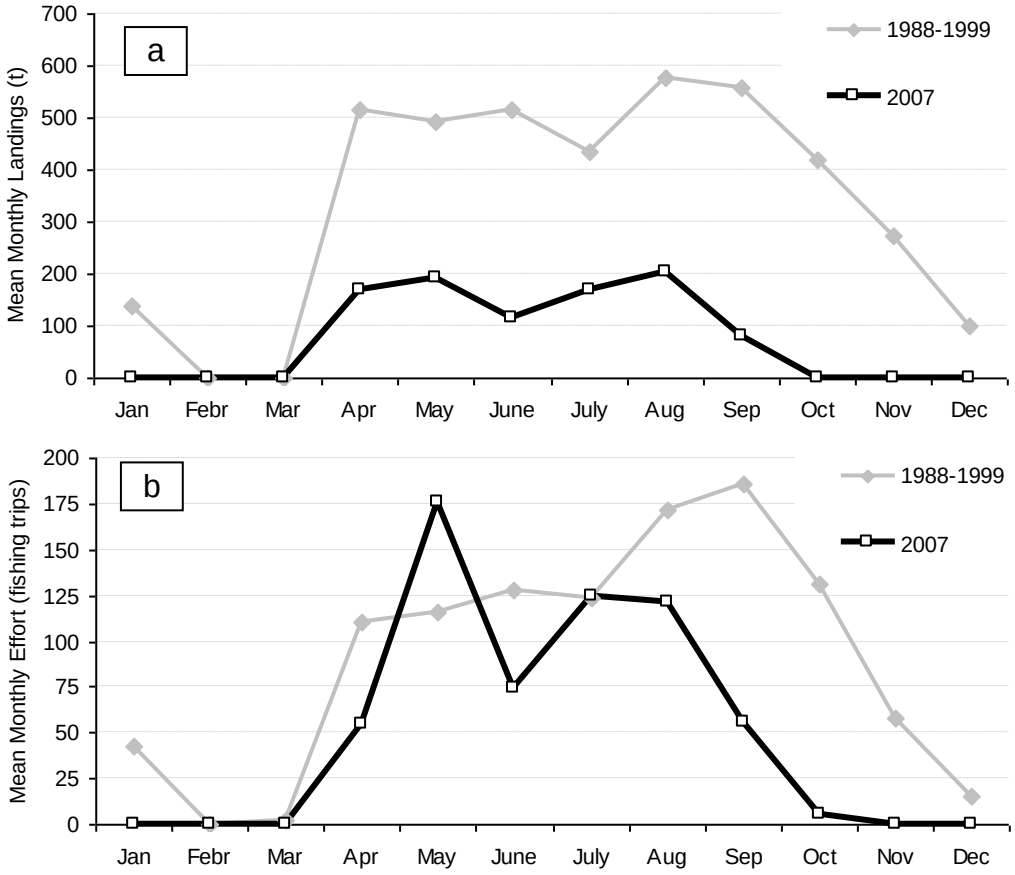

Figure 5: Spanish anchovy fishery in Atlantic Moroccan waters: (a) monthly evolution of anchovy mean landings (tonnes); (b) mean nominal species-specific effort (fishing trips with positive anchovy catch) (period 1988–1999 and 2007)

The fleet dynamics varies through the year. During the period 1988–1999, the higher effort of the fleet targeting anchovy was carried out along the third quarter (maximum average value of 186 fishing trips in September). This main fishing season in Moroccan waters occurs just after the main one in the Gulf of Cadiz (spring-summer) (Ramos and Millán, 2006). Higher catches were also obtained during this period, concretely in August and September (mean monthly value of 578 tonnes in August). After this peak, landings progressively decreased until the closed season (February and March). From April to June (second quarter), landings oscillated around 500 tonnes, with mean monthly efforts around 120 fishing trips. The fishing strategy deployed in 2007 has showed some differences because of some punctual circumstances occurring during the year. In this way, higher fishing effort in Moroccan waters was applied in May (176 fishing days), followed by a sharp decrease the following month and a second peak in July and August (around 120 fishing trips). From September onwards, the effort progressively decreased, one month before than in the series 1988–1999. Landings in 2007 showed two peaks (192 and 204 tonnes), which coincided with the effort peaks in May and August.

Length composition of anchovy catches

The size of the anchovies landed by the Spanish fleet during the analysed period oscillated between 8 and 18 cm total length. A progression to smaller sizes was detected during the period 1988–1999 (Figures 6 and 7). Thus, the mean length in landings decreased from 15.4 cm in 1989 to 12.8 cm in 1999, prior to the end of the Agreement. In 2007, the length composition was similar to that found in the beginning of the series, in 1989, with a mean length of 15 cm.

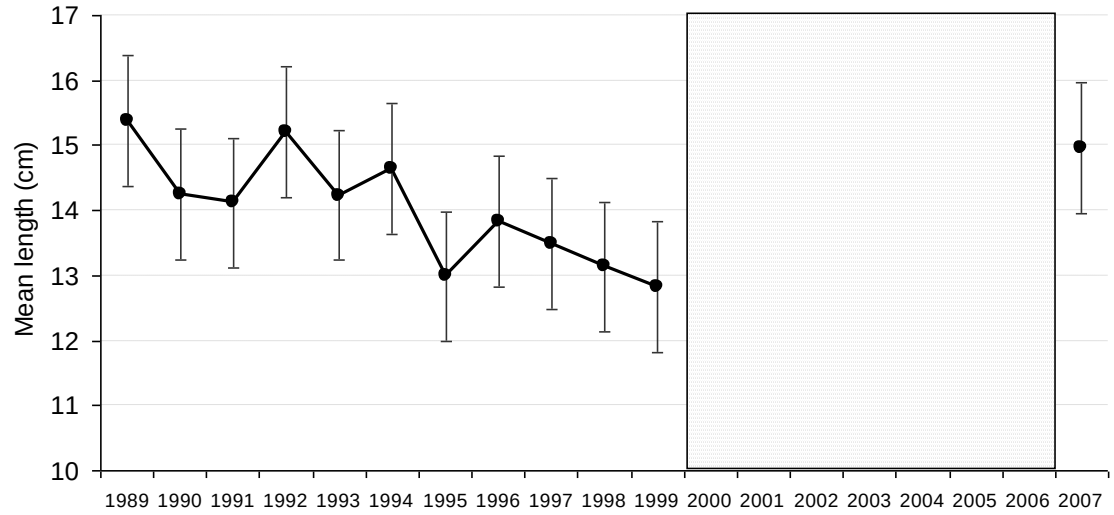

Figure 6: Spanish anchovy fishery in Atlantic Moroccan waters: evolution of anchovy mean length (cm) in landings (period 1989–2007)

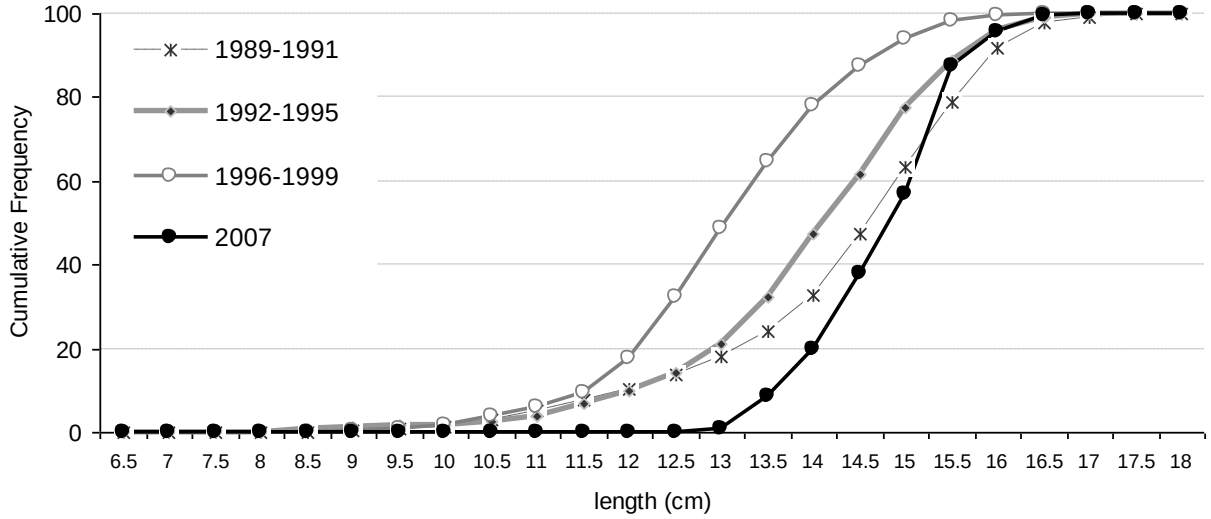

Figure 7: Spanish anchovy fishery in Atlantic Moroccan waters: cumulative size (cm) frequency distribution (%) of landings

The anchovy sizes fished in Moroccan waters were much larger than those of the Gulf of Cádiz for the same analysed period (ICES, 2007). Anchovies fished in the Spanish subdivision of the ICES IXa South (Gulf of Cádiz) ranged from 6.6 cm (1996) to 11.4 cm (2001). The trend of the annual length distributions of both fishing grounds oscillated parallel at the beginning of the analysed series, until 1993, when the trend was the opposite in both fishing grounds.

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