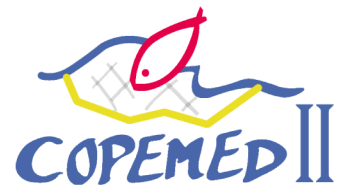




FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS



OCCASIONAL PAPER

16

**ADVANCES IN PREPARING A JOINT ASSESSMENT
OF Anchovy, *Engraulis encrasicolus*, STOCK FOR GSAs
01, 02, 03 AND 04 OF THE GFCM (ALGERIA,
MOROCCO AND SPAIN)**

A CopeMed II contribution to:

GFCM-SAC Sub-Committee on Stock Assessment (SCSA)

Working Group on Stock Assessment of Small Pelagic Species

Split, Croatia, 5-9 November 2012

Málaga (Spain), October 2012

CopeMed II Occasional Paper N° 16 **(GCP/INT/028/SPA – GCP/INT/006/EC)**

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**GENERAL FISHERIES COMMISSION
FOR THE MEDITERRANEAN
COMMISSION GÉNÉRALE DES PÊCHES
POUR LA MÉDITERRANÉE**



GFCM-SAC Sub-Committee on Stock Assessment (SCSA)

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**ADVANCES IN PREPARING A JOINT ASSESSMENT
OF Anchovy, *Engraulis encrasicolus*, STOCK FOR GSAs
01, 02, 03 AND 04 OF THE GFCM (ALGERIA,
MOROCCO AND SPAIN)**

(CARRIED OUT IN THE FRAMEWORK OF THE CopeMed II STUDY
GROUP ON *Engraulis encrasicolus*. Nador, Morocco. 2-4 October 2012)

Advances in preparing a joint assessment of Anchovy, *Engraulis encrasicolus*, stock for GSAs 01, 02, 03 and 04 of the GFCM (Algeria, Morocco and Spain)¹

Kada O*, Giráldez A**, Settih J*, Zahri Y*, Idrissi M.H*, El Arraf S*, Malouli Idrissi M*, Najih M*, Ben Smail S***, Hachemane M***, Álvarez F**, Bernardon M#, Camiñas J.A#, Fernández I.L#

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FAO-CopeMed II

Abstract

Small pelagic species represent an important fishery and economic activity for the countries bordering the Alboran Sea. Among the small pelagic species with great importance in terms of both total landings and economic value are sardine (*Sardine pilchardus*) and Anchovy (*Engraulis encrasicolus*), although other species are taking an important percentage in the production and economic value. Anchovy was identified by the experts participating at the CopeMed II meeting on the definition of priority topics related to shared resources as a priority species for the Alboran Sea region. Algeria, Morocco and Spain were identified as countries sharing this possible stock. The 5th meeting of the Coordination Committee of CopeMed II (Málaga, 3-4 May 2012) agreed that the project should “*hold the first meeting of the WG for stock assessment of Engraulis encrasicolus of the Alboran Sea among Algeria, Morocco and Spain to prepare the national data on E. encrasicolus to define the stocks or stocks in the area and to prepare the evaluation of the stocks*”.

This document prepared in the frame of the FAO-CopeMed II project aims at contributing to reinforce the subregional collaboration for the identification of the most relevant characteristics of Anchovy stock and the national fleets involved in its fishery in Algeria, Morocco and Spain. Although data from Algeria showed many gaps, experts were requested to prepare data according to formats agreed in the framework of the SAC-SCSA. With the aim of carrying out a preliminary joint assessment of the stock among Algeria, Spain and Morocco, the identification of a single Anchovy stock in GSAs 01, 02, 03 and 04 and the election of the most appropriate approach and methodology, as a first result of this joint exercise among national research institutions, were discussed. All this, in order to improve the scientific knowledge of the Anchovy stock in the Alboran Sea and to enhance the fisheries management. Compilation of socioeconomic information of the fishery through the indicators provided by the GFCM and the socioeconomic impact of the management measures was stressed by the experts.

Key words: *Engraulis encrasicolus*, CopeMed II, Alboran Sea, stock assessment, SCSA.

¹ This paper should be cited as follows: Kada O., Giráldez A., Settih J., Zahri Y., Idrissi M.H., El Arraf S., Malouli Idrissi M., Najih M., Ben Smail S., Hachemane M., Álvarez F., Bernardon M., Camiñas J.A., Fernández I.L. Advances in preparing a joint assessment of Anchovy, *Engraulis encrasicolus*, stock for GSAs 01, 02, 03 and 04 of the GFCM (Algeria, Morocco and Spain). Paper presented at the Working Group on Stock Assessment of Small Pelagic Species (SCSA-SAC, GFCM), (Split, Croatia, 5-9 November 2012). GCP/INT/028/SPA-GCP/INT/006/EC. CopeMed II *Occasional Papers* n° 16: 13 pp.

1. Background information

The General Fisheries Commission for the Mediterranean (GFCM) stressed the importance of making common assessments of shared stocks of priority species. Fisheries experts have demanded the exchange of information on fisheries data with the neighboring countries in order to improve knowledge on the status of fisheries shared resources and to propose measures for the sustainability of the fishery resources and its exploitation, but also to share information among south Mediterranean countries. The joint stock assessment of GFCM priority shared stocks is an important step to better agree on management recommendations for the fisheries in the GFCM area.

One of the main roles of the FAO subregional project is to support the scientific community to gather available information on the fisheries to assess the stocks, particularly those shared at least by two countries. CopeMed II emphasis is the reduction of the differences currently existing in the capacity of the participating countries and to promote subregional approach to fisheries research and management. The subregional working groups (WGs) on Mediterranean shared stocks organized by CopeMed II are of major importance for the reorientation of approaches to stock assessments (moving from single country analysis to joint subregional analysis) and to the possibility of implementing scientifically based management plans for the fisheries targeting shared stocks both in each specific country and at subregional level.

Due to its market value, production and its wide distribution in several Mediterranean countries, the Anchovy is a major shared resource in the Alboran Sea (GSAs 01, 02, 03 and 04). The species was identified by CopeMed II meeting on the definition of priority topics related to shared resources in the subregion² as priority for the Alboran Sea region. Algeria, Morocco and Spain were identified as countries sharing this possible stock. Moreover, the 5th meeting of the Coordination Committee of CopeMed II (Málaga, 3-4 May 2012) agreed that the project should “*To prepare the national data on E. encrasicolus to define the stocks or stocks in the area and to prepare the evaluation of the stocks*”.

In 2011 the CopeMed II WG on small pelagic species presented a paper³ during the SCSA WG on Small pelagic in Chania (Crete, Greece) where some preliminary information on the national Anchovy fisheries from Morocco and Spain was included.

To answer the needs expressed by the CopeMed II countries, following the recommendations of the 5th meeting of the CopeMed II Coordination Committee, the CopeMed-MedSudMed Subregional Small Pelagic WG, (SRPWG) and the SAC-SCSA requirements, a first meeting of the *CopeMed II Study Group on Engraulis encrasicolus of the Alboran Sea* was organized, involving scientists from Algeria, Morocco and Spain and the FAO-CopeMed staff. The meeting aimed to compile and discuss the available biological data on distribution and abundance, biological parameters, exploitation patterns, socio-economic indicators and current situation of the Anchovy fisheries in the countries surrounding the Alboran Sea.

² CopeMed II. 2011. Report of the CopeMed II meeting on the definition of priority topics related to shared resources (demersal and pelagic) in the subregion. CopeMed II – ArtFiMed Technical Documents N°22 (GCP/INT/028/SPA-GCP/INT/006/EC). Málaga, 2011. 14pp.

³ Kada O., Álvarez F., Giráldez A., Torres P., Najih M.; Fernández I.L., Bernardon M. and Camiñas J.A. 2011. Preliminary analysis for identification of priority species of small pelagic shared stocks in GSA01 and GSA03 (Alborán Sea). Paper presented at the Working Group on Stock Assessment of Small Pelagic Species (SCSA-SAC, GFCM), (Chania, Crete. Greece, 24-29 October 2011). GCP/INT/028/SPA-GCP/INT/006/EC. CopeMed II Occasional Papers n° 18: 11 pp.

2. Meeting Objectives

The Alboran Sea (GSAs 01, 02, 03 and 04) is bordered by 3 countries (Algeria, Morocco and Spain). The main objective of the SG meeting was to overview the available data and main gaps on biological and fisheries information on the Anchovy of the Alboran Sea, including fishery landings, fishing areas, size at landing distribution and availability of biological data for progressing in the definition of this stock. Additionally, the SG focussed their discussions in defining the national fisheries components (operational units) and the availability of national indicators on the socio-economic aspects of the fisheries and on the methodology for the standardisation of this kind of data and indicators.

Reviewed available information and data on the fishery at national level including:

- Description of the fisheries targeting Anchovy (fleets components, fishing gears, fishing grounds and periods, landing ports, landing statistics, fishing effort, commercialization and transformation of captures).
- Fleets dynamics and fishing strategies.
- Biological and ecological characteristics of the exploited stocks.
- Movements and migrations across the regions: eggs, larvae, recruits and adults.
- Data collection systems: frequency and accuracy.
- Fishery research: Biological sampling of commercial catches; Experimental surveys, e.g. acoustic and DEPM.
- Stock assessment (methods used and results), gaps, etc.
- Socio-economic available data.

3. Methodological information and results

Moroccan data

Mr. Omar Kada, (INRH, Nador) summarized the Anchovy available information on GSA 03: purse seiners are distributed in all ports in the region, representing approximately 20% of the active fleet. The three main ports concentrating the fleet are Béni Nsar (Nador), Al Hoceima and M'diq.

Concentrations of Anchovy are observed in the whole GSA 03. This species is found in high densities in the east of Ras Kabdana and around the islands Jaafariennes.

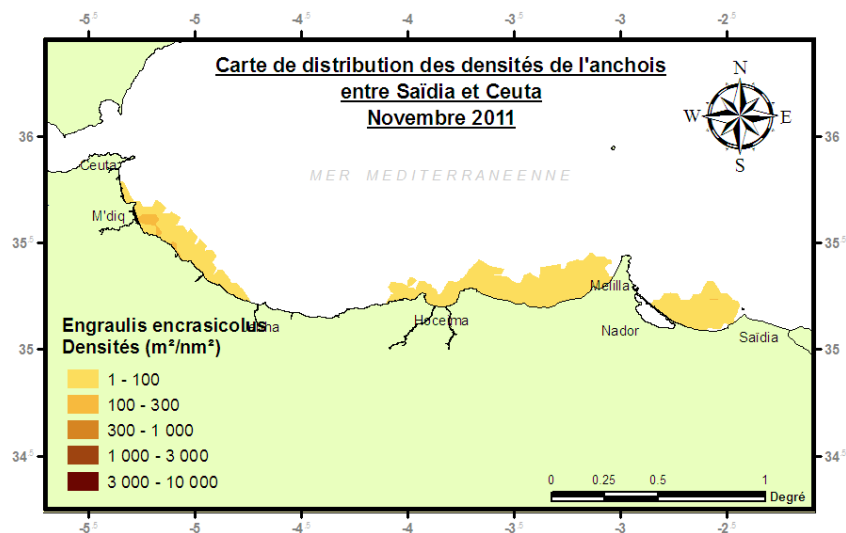


Figure 1. *Engraulis encrasicolus* density in Morocco (Acoumed, INRH survey. November 2011). According to the GFCM fleet classification, there are 2 fleet categories and 4 local operational units fishing for sardine and Anchovy in the Moroccan Mediterranean:

Category 1: The purse seiners

These fishing units are composed by 3 boats (the main and two auxiliary): the main vessel with the gear and the skipper, an auxiliary boat with lights (lamparo) and the small auxiliary boat without engine. The main boat is equipped with hydraulic equipment to facilitate operations on board; the lamparo is equipped with lamps that are used to attract the schools of fish at night and the small rowing boat helps maintaining the proper form of the seine during the fishing operation. Each fishing unit employs between 9 and 40 fishermen (Zahri, 2004).

The fishing gear used by the fleet is a purse seine net composed of a grid of 9 and / or 11 mm side. According to the GT of the vessel and/or the depth of the fishing area, the dimensions of the device differ: its length varies between 300 m and 650 m, and the depth between 50 m and 160 m.

Following the GFCM classification, this category includes two local operational units.

1. Purse Seiners with length between 6 and 12 m (segment G),
2. Purse Seiners over 12 m in length (segment H).

In addition to the sardine and Anchovy, purse seiners target other species of commercial interest as *Trachurus spp.*, bug, mackerel, small tuna and sardine.

Category 2: Small scale purse seiners

This category can be considered as an overlapping between the segment C of "motorized polyvalent boats from 6 to 12 meters long" and the B segment, "polyvalent motorized boats under 6 meters long ". The fishing unit is generally composed of two boats: the main vessel and an auxiliary boat with lights (lamparo). The principal boat (Photo 1 and 2) is not fully equipped as it only has a mechanical winch. The lamparo (Photo 3) is equipped with lamps used to attract the school of fish at night. Sometimes the fishing unit includes a third boat that maintains the purse seine. Each unit includes a fishing crew of 8 people in general.

The fishing gear used by the fleet is a purse seine net composed of a grid of 9 and / or 11 mm side. The length of the seine is over 200 to 300 m, and its depth is about 40 m. The hauling operations are done by hand (Photo 4). The species targeted by this fleet is mainly sardine. Other species are *Trachurus spp.*, *Auxis spp.*, bug, Atlantic bonito and Anchovy. Those units can use hand lines targeting bluefin tuna.

The level of capture of these units is around 4.000 tons per year which represents 22.5% of purse seine catches in Moroccan Mediterranean (APA, 2011).

Photo 1 (Camiñas)



Photo 2 (Zahri)



Photo 3 (Zahri)



Photo 4 (Kada)



Spanish data

Ms. Ana Giráldez (IEO, Málaga) presented a summary of the Spanish fishery essentially developed in GSA 01. Although historically Spanish purse seiners fished in the south of the Alboran Sea under different agreements, currently purse seiners are not able to fish in GSA 02 and GSA 03, by different reasons: distance from the base ports, economic restraints and regulatory or abundance related matters. The main species in the Spanish purse seine fishery in the Alboran Sea GSA 01 are sardine (*Sardina pilchardus*) and Anchovy.

Anchovy has higher prices than the ones of sardine, but it was not always like that. Until the late 1960s the sardine was the most expensive species. The same fleet targets sardine or Anchovy in GSA 01, according the season and abundance. Catches are highly variable.

Both the catches and the fleets that are described below correspond to the Spanish South-Mediterranean area that represents 95 % of the whole GSA01 landings.

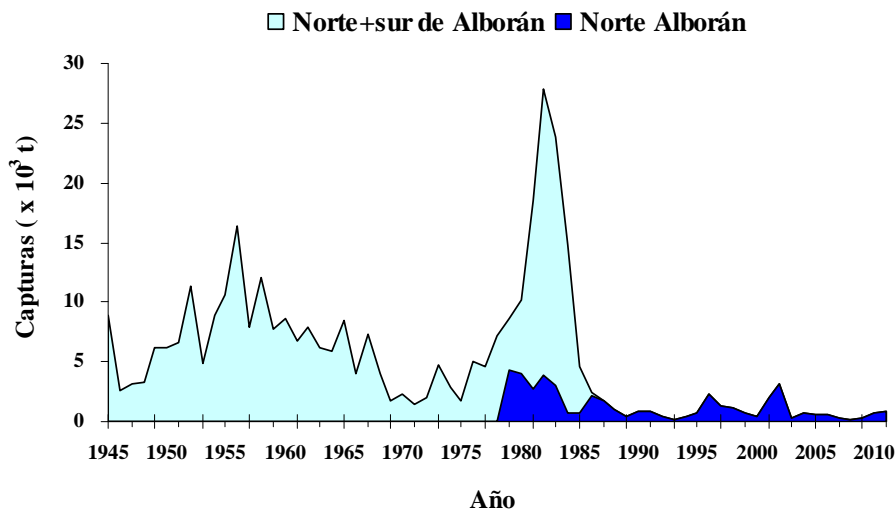


Figure 2. Anchovy landings in Spain (1945-2010).

The purse seine fleet has decreased from 230 vessels in 1980 to 72 in 2011, representing a reduction of 69%. This fleet is made up of small units: 82% are less than 30 GT, with an average of 20.2 GT and an average power of 153 HP. Only 12.5% of the units have length of less than 12 meters. This fleet corresponds to the GFCM categories G (Purse seine 6-12 m) and H (Purse seine 12-24 m).

The most important ports in number of units and landings have been Almería, Adra and Málaga. Currently the port of Málaga is in recession and the port of Vélez Málaga is in expansion.

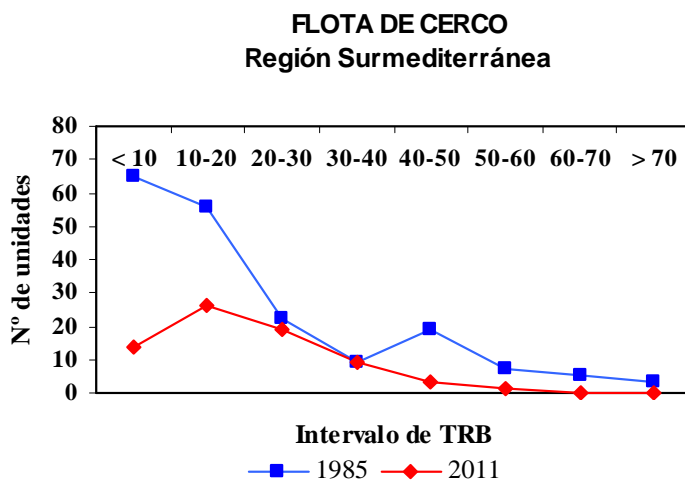


Figure 3. Spanish purse seine fleet.

The Anchovy is fished mainly in the Bay of Málaga (representing 80% of all Anchovy of the South-Mediterranean area). The Bay of Málaga is the only place in the Andalusian Mediterranean where Anchovy is fishing all year round.

Seasonality in the Anchovy catch has changed. Between 1985 and 1998 catches were mainly in autumn, during the recruitment season, capturing mainly juveniles. Since 2004-2008, there are two periods, a peak in summer (reproducers catches) and one in autumn. Until 2009 there was an annually closed season in March and April.

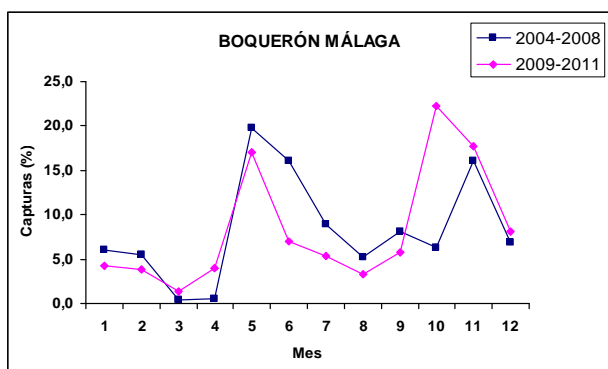


Figure 5. Seasonality in the Anchovy landed in Málaga.

The Spanish fleet has been focused mainly on class 0 individuals, so that high catches are correlated with periods of good recruitment.

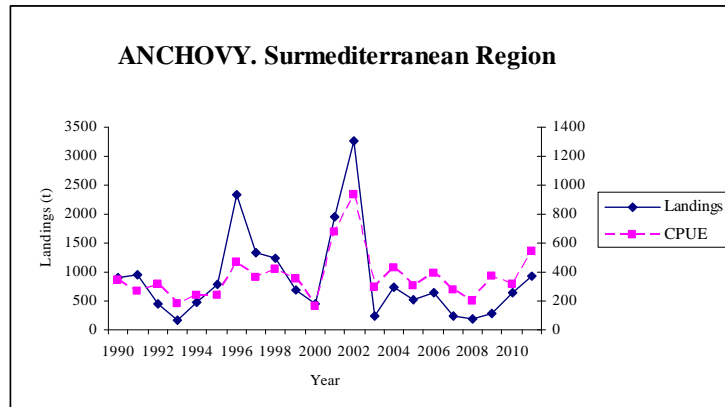


Figure 6. Anchovy landings and CPUE in the Spanish South-Mediterranean area.

Although the stock of Anchovy in GSA 01 has been assessed by the IEO and presented to the SCSA WG on small pelagic, in the Spanish South-Mediterranean area is considered overexploited. However, it should be taken into account that the exploitation rate (E) is very sensitive to the values of natural mortality (M) concerned. Therefore, the SG suggested considering these benchmarks with caution. The exploitation rate in 2011 corresponds to the assessment carried out within the Scientific, Technical and Economic Committee for Fisheries (STECF).

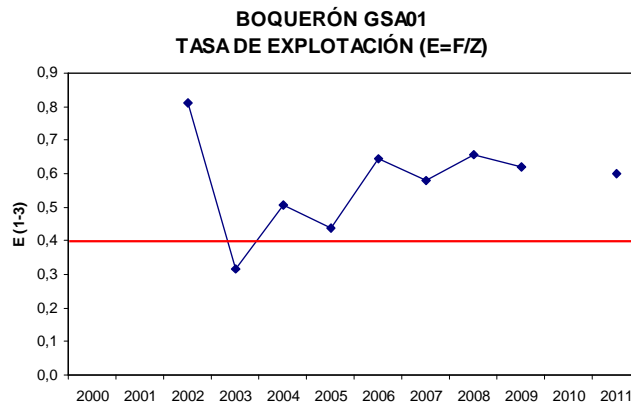


Figure 7. Anchovy exploitation rate (E) in the Spanish South-Mediterranean area.

From an economic point of view the species with the highest value in 2011 was the Anchovy. However sardine is an important support of the fishery, being the most abundant.

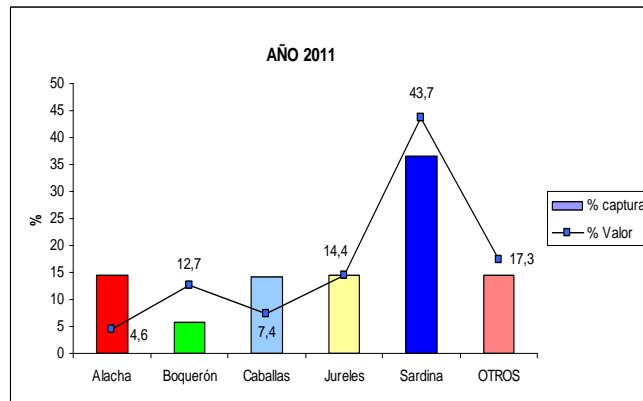


Figure 8. Purse seine landings and value by species in the Spanish South-Mediterranean area.

Algerian data

Considering the whole Algerian coast, small pelagic landings represent around 80% of the total national captures. Main landing ports in the Alboran Sea (a small part of GSA 04) are Ghazaouet, Béni-Saf and Bouzedjar.

Fishing gears targeting small pelagic are in general purse seine and trawl. The trawl was introduced in the early 90s due to the progress in trawl design. According to a survey (CNRDPA, August 2012), 80% of the fleet in Ghazaouet is equipped with trawl, meanwhile in the port of Beni Saf, 12 vessels of a total of 85, are using trawl. This trawl requires a power greater than 430 HP. The different fleet units targeting small pelagic in Algeria are:

Fishing Gear Class	Fleet Segment	Capacity (GT)	Engine power (HP)
Purse seine	G (6-12 m)	14	152
Purse seine	H (12-24 m)	33	308
Pelagic trawler	J (12-24 m)	63	518
Pelagic trawler	J (>24 m)	114	870

Table 1. Algerian Operational units.

The evolution of the mean landing price by target species show the contribution of Anchovy and the increasing values of this species from 2007:

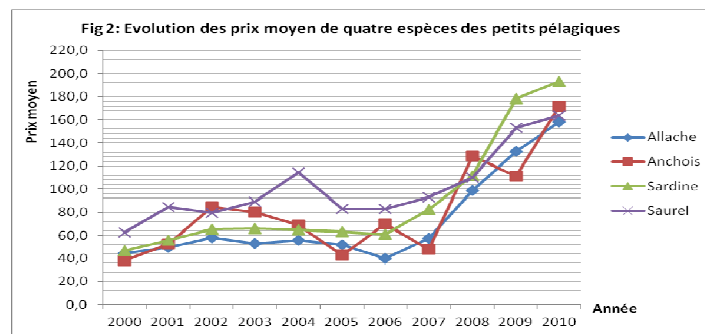


Figure 9. Small pelagic prices evolutions in Algeria, 2010.

According to CNRDPA experts, Anchovy is present at landings in 2012 (January-August) in the ports of Beni-Saf and Ghazouet. Most of the captures during the aforementioned period and ports were surveyed with purse seine. The landing data available for the two species Sardine and Anchovy showed a negative trending in the period 2000-2010. Sardine is the most abundant in the major Algerian ports.

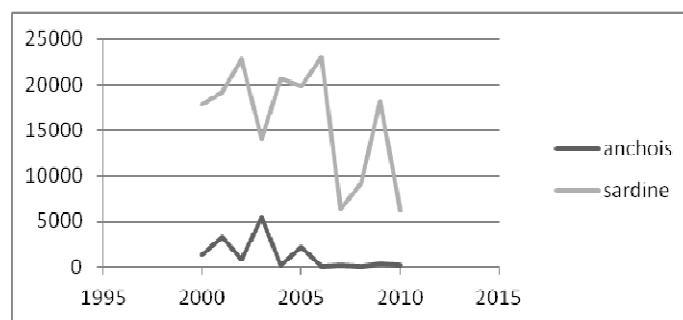


Figure 10. Sardine and Anchovy landings in Algeria during the period 2000-2010.

The Algerian effort data come from a 2004 survey conducted by the CNRDPA. A new survey was initiated in 2012 and the results (fishing effort, landings estimate, employment, investment, fleet characteristics, cost and charges) will be available in early 2013. Landings are recorded by MPRH collectors in all sites with infrastructure (port, guard, hall, etc.).

3.1 Description of the fleets fishing in GSA 01, 03 and 04

The description of the small pelagic fleet in the Alboran Sea was updated and synthesized in a common table for Algeria, Morocco and Spain. Considering that the Local Operational Units (LOU) in the three countries are targeting sardine and Anchovy, it was agreed to present a common table for the description of the small pelagic fleet of the Alboran Sea (Table 2).

Local Operational Units by country	N°	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	N° of boats	Capacity (GT)	Engine power (HP)	Boat size (m)	Catch (T)	Effort (Day/year)	crew
Spain	2	Spain	1	G	6-12 m	purse seine	12	5,19	65,42	9,97		717	
	2	Spain	1	H	12-24 m	purse seine	88	26,7	189,4	17,1		7427	
Morocco	4	Morocco	3	G	6-12 m	purse seine	9	8,84	105,56		189	264	12
	4	Morocco	3	B	6-12 m	Small scale purse seine	132	3,75	31,39				10
	5	Morocco	3	H	12-24 m	purse seine	109	49,06	330,7		12991	7739	31
	6	Morocco	3	H	>24 m	purse seine	4	86	525		492	270	43
Algeria	4	Algeria	4	G	6-12 m	purse seine	6	14	152	9,5		270	10
	9	Algeria	4	H	12-24 m	purse seine	119	32,77	308,84	15,69	4968	1444	20
	10	Algeria	4	J	12-24 m	Pelagic trawler	38	63,4	518,0	20,7		1332	10
	11	Algeria	4	J	>24 m	Pelagic trawler	7	114	870	26	1382	756	10

Table 2. The small pelagic fleet segments operating in the Alboran Sea (CopeMed II, 2012).

Advances in a joint assessment of Anchovy stock

The Study Group was aware of the lack of biological and fisheries data presented to the meeting, mainly from Morocco and Algeria, and of the impossibility to conduct a general analysis of the state of the stock of Anchovy in the GSAs 01, 03 and 04.

Nevertheless, the SG considered that the level of information referred to the abundance of the stocks in GSA 01 obtained by the IEO (where the information is systematically obtained) and the existing information of landings of the Spanish fleet, the Spanish data could be considered for a first approach to the state of the Anchovy stock in the Alboran Sea. Considering this approach, it could be stated that current landings of Anchovy in the Alboran region are at a very low level relative to the available historical landings of the Spanish fleet in GSA 01.

4. Results, conclusions and recommendations

Regarding the monitoring of fishing activity, and socioeconomic data

Algeria: Although the current implementation of a new pilot fisheries statistical system with the support of the FAO⁴, the monitoring of fishing activity for stocks assessment is not regular and systematic. The SG recommended that a monitoring system for small pelagic fishing activity (biological parameters, effort and landings) should be implemented in the main ports of the Alboran Sea or at least in the most representative.

⁴ FAO TCP/ALG/3301 Project « Assistance pour la mise en place d'un Observatoire Socio-Économique et Statistique National des Pêches » relating to the statistical monitoring of fisheries in Algeria.

In order to explore the use of Algerian data in the next SG meeting, the Anchovy fishery should be regularly sampled and the whole monitoring system should be strengthened especially to obtain size distributions at landing and biological parameters. This monitoring system should take information and biological samples from each of the operational units targeting this species (purse seine and trawl).

Morocco: The monitoring for fishery data and biological parameters is already functioning. For small scale fleet targeting small pelagic, the SG recommended that this operational unit should be taken into account in the actual system of fishing activity monitoring. For socio-economic aspects, specific surveys are necessary.

Spain: The monitoring system for fisheries data collection and biological data is already functioning for small pelagic in GSA 01. Socio-economic data are surveyed by the regional authority (Junta de Andalucía) and the national government statistics fishery service in Madrid.

On the socio-economic assessment of the fisheries

Socioeconomic experts participating in the meeting reviewed the available information from Algeria, Morocco and Spain. They also carried out a preliminary work leading to the assessment of the available data in each country and the monitoring systems in place in the country for socio-economic aspects. Finally, they prepared common tables to provide the meeting and to the three countries with a global vision of the small pelagic fisheries in the Alboran Sea. The SG made recommendations to address the identified gaps to strengthen the ongoing work at the GFCM and particularly those concerning Task 1.

In the framework of the ecosystem approach to fisheries management of sardine and Anchovy in the Alboran Sea, the SG considered that bio-economic modelling is an adequate tool for producing scientific recommendations for decision makers when analysing the status of the national fisheries and its evolution before and after the implementation of management measures.

Therefore, socioeconomic experts recommended continuing with the initiated work (joint data preparation and validation of the methodology) in order to:

- ✓ Complete the biological analyses of the resource with a socio-economic appraisal.
- ✓ Complete the scientific recommendations on the state of the stock, with others on economic and social sustainability of fisheries.
- ✓ Perform different scenarios, to analyze the socio-economic impacts of biological recommendations, aimed at reducing the fishing mortality of the affected resources.

General recommendations

Fisheries statistics and biological monitored information of the Anchovy exploited by national fisheries in the Alboran Sea are essential for the understanding of the situation and trends of this species in GSAs 01, 02, 03 and 04. Improvement of the national monitoring systems is highly recommended by the CopeMed SG on Anchovy.

The level of information provided to the SG was not the appropriate to carry out a joint assessment of the *E. encrasicolus* stock in the SG meeting. In order to carry out a joint assessment next year, the SG recommended a bigger effort in Algeria and Morocco to facilitate the data and existing information of the national fisheries targeting Anchovy to the experts of the CopeMed SG.

The SG agreed to advance the process of standardization of the acoustic assessment methodology based on the MEDIAS protocol. Algeria and Morocco were endorsed to prepare a table comparing the MEDIAS protocol with the methods used in each of the two countries.

The SG recommended that the consultation process on socio-economic indicators, started by CopeMed II with the three countries, and the results obtained should be completed and prepared by a socioeconomic expert and CopeMed to present a document to the next meeting of the SAC - Subcommittee on Economy and Social Sciences (February 2013).

The SG requested the support of CopeMed to continue with the task assigned to by the CopeMed Coordination Committee CCC). In relation with this request, CopeMed expressed its willingness to continue supporting the organization of the Anchovy SG meeting and the participation of experts of the SG at international meetings and in campaigns. As well, by facilitating the process of standardization of protocols, methodologies and analysis, according the availability of funds and the extension of the project and the mandate of the CCC.