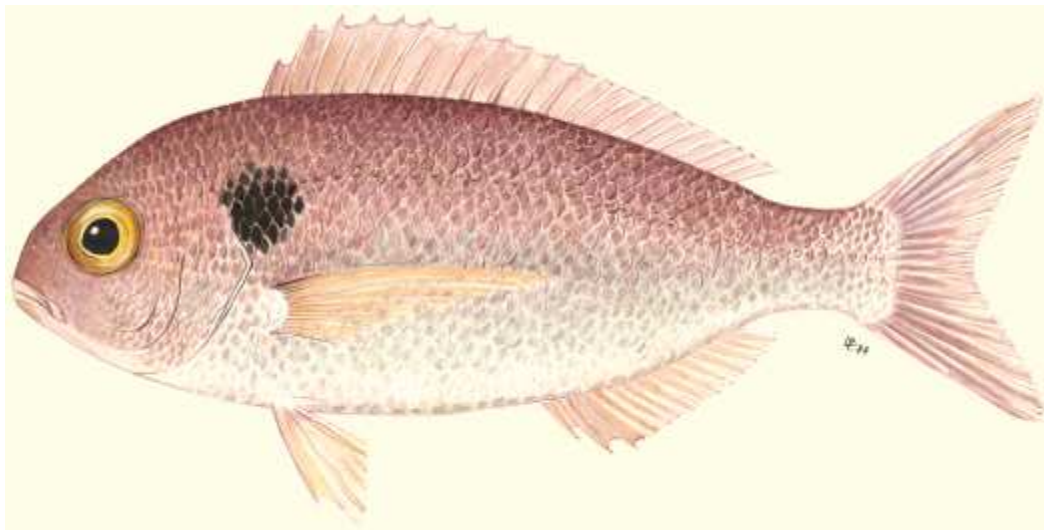


**REPORT OF THE 3rd MEETING OF THE CopeMed II
WORKING GROUP BETWEEN SPAIN AND MOROCCO ON
BLACKSPOT SEABREAM (PAGELLUS BOGARAVEO) OF THE
STRAIT OF GIBRALTAR AREA**

**12-14 November 2014
Tangier, Morocco**



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CopeMed II Technical Documents N° 37
(GCP/INT/028/SPA – GCP/INT/006/EC)

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GROUP BETWEEN SPAIN AND MOROCCO ON BLACKSPOT
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April 2015

The conclusions and recommendations given in this document and in other documents in the Co-ordination to Support Fisheries Management in the Western and Central Mediterranean CopeMed II Project series are those considered appropriate at the time of preparation. They may be modified in the light of further knowledge gained in subsequent stages of the Project. The designation employed and the presentation of material in this publication do not imply the expression of any opinion on the part of Food and Agriculture Organization of the United Nations, FAO, the Government of Morocco, the Government of Spain or the Commission of the European Union concerning the legal status of any country, territory, city or area, or concerning the determination of its frontiers or boundaries. This document has been financed by the European Union and the Government of Spain. The views expressed herein can in no way be taken to reflect the official opinion of the European Union or the Government of Spain.

Preface

The CopeMed II Project, Co-ordination to Support Fisheries Management in the Western and Central Mediterranean is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Government of Spain, represented by the Secretaría General de Pesca, and the European Union, represented by the European Commission (EC).

The objective of the project is to maintain the sustainability of the marine fisheries, including artisanal fisheries, in the central and western Mediterranean Sea and its ecosystem, taking into consideration environmental, biological, economic, social and institutional issues. In addition, the project will continue to reinforce the collaboration among the participating countries of the sub-region by promoting common activities and databases creation, experts' exchange of information, by supporting their participation in joint activities, mainly those related to shared and/or stranded stocks and its fisheries and by facilitating the participation of national experts on the activities of the Scientific Advisory Committee (SAC) of the General Fisheries Commission for the Mediterranean (GFCM).

Regions covered by CopeMed II are the western and central sub-regions of the Mediterranean. Countries participating and with representation in the Coordination Committee of the project are Algeria, France, Italy, Libya, Malta, Morocco, Tunisia and Spain. The main beneficiaries are the fishery policy-makers, managers and fishery administrations in the western and central Mediterranean countries. The project is also contributing to the strengthening of regional collaboration, by cooperating with the other FAO subregional projects, AdriaMed, MedSudMed and EastMed and by supporting capacity-building, standard methodologies, joint stocks assessment and the participation of the countries in relevant regional scientific organizations, such as the FAO's General Fisheries Commission for the Mediterranean (GFCM). Secondary beneficiaries include the national research institutes, fishers and fishers' associations, and industrial organizations.

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CopeMed II (GCP/INT/028/SPA – GCP/INT/006/EC) Publications

CopeMed II project publications are issued in the CopeMed II Technical Documents series and are related to meetings, missions and research organized or conducted within the framework of the CopeMed II Project.

Comments on this document would be welcomed and should be sent to the Project headquarters:

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This document is the final version of the report of the third meeting of the CopeMed II Working Group between Morocco and Spain on *Pagellus bogaraveo* of the Strait of Gibraltar area, prepared by the participants. The finalisation of this document was made by the IEO, the Spanish Institute of Oceanography staff under the Letter of Agreement PO 310944 signed in 2014 between the FAO and the IEO extended in January 2015.

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CopeMed II acknowledges the participation and valuable contributions of all experts from Tangier and Casablanca Centers of the INRH (Morocco), the IEO (Spain) experts from the Centers of Málaga, and Cádiz in the ad hoc CopeMed scientific Working Group between Morocco and Spain on the fisheries and fishery resources of *Pagellus bogaraveo* in the Strait of Gibraltar area.

CopeMed II. 2015. Report of the third meeting of the CopeMed II Working Group between Spain and Morocco on blackspot seabream (*Pagellus bogaraveo*) of the Strait of Gibraltar area. CopeMed II Technical Documents N°37 (GCP/INT/028/SPA – GCP/INT/006/EC). Málaga, 2015. 35pp.

ABSTRACT

The third meeting of the FAO CopeMed II Working Group between Spain and Morocco on blackspot seabream (*Pagellus bogaraveo*) of the Strait of Gibraltar area was held in the INRH Regional Centre in Tangier (Morocco) from 12 to 14 November 2014. The main objective of this meeting was to update the existing data and information on this stock, gather the data and information produced from the second assessment meeting in 2012 and to carry out a new joint assessment of the stock using different methodologies. The results of the second assessment carry out in 2012 were prepared to the CGPM, (General Fisheries Commission for the Mediterranean Working) and to the ICES (International Council for the Exploration of the Sea). The Subcommittee on Stocks Assessment of the GFCM recommended to the CopeMed WG to estimate B_{MSY} instead of catch at MSY to be compared with the current stock biomass.

The WG conducted three different assessment models: the first one was a production model "Biodyn"; secondly an update of analytical assessment made in 2012 with the VIT model, based on a length-cohort analysis (LCA); the third method used was CMSY, a new method for estimating MSY from catch data, resilience of the respective species, and simple assumptions about relative stock sizes at the first and final year of the catch data time series.

The overexploitation status of the stock was shown by two of the three methods Nevertheless to have a complete picture of the environmental and human-induced effects that could better explain the status of the stock and the fisheries situation, the fishery-related data used in the assessment should be completed with new information (life history, predators abundance, oceanographic conditions, etc., including socio-economic drivers.

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Report of the 3rd Meeting of CopeMed II Working Group between Spain and Morocco on Blackspot seabream (*Pagellus bogaraveo*) of the Strait of Gibraltar area

INRH Regional Centre of Tangier (Morocco), 12-14 November 2014

INTRODUCTION

Blackspot seabream (*Pagellus bogaraveo*) is a species belonging to the Sparidae family. They are benthic-pelagic species, inhabiting depth ranges from 300 to 700m throughout the eastern Atlantic and western Mediterranean. They are hermaphrodites, starting life as males but changing into females at 30-35cm when 4 to 6 years old. They grow slowly to a maximum size of 70cm, weight of 4kg and an age of 15 years. Blackspot seabream have a low resilience to exploitation due to their being sequential hermaphrodites and a slow growing species (ICES, 2014).

Since the earliest 1980's a Spanish artisanal fishery targeted to the Blackspot seabream (*Pagellus bogaraveo*, namely "voraz") has been developing along the Strait of Gibraltar area (Gil *et al.*, 2000). In Spain, Blackspot seabream fishery in the Strait of Gibraltar is almost a mono-specific one with one clear target species which represents the 74% from the total landed species which constitutes a métier by itself (Silva *et al.*, 2002). In 1997, the Spanish Oceanographic Institute (Instituto Español de Oceanografía, IEO) began this fishery monitoring (Gil, 2012). Currently the Spanish fishery monitoring is carried out under an agreement between the IEO and the Andalucía Regional Government (Consejería de Agricultura, Pesca y Desarrollo Rural de la Junta de Andalucía). A management plan for this fishery was established by the AAA/1589/2012 Order of July 17, establishing a plan for the blackspot seabream fishery in certain areas of the Strait of Gibraltar regulating the area, gear (voracera) and the fleet. The plan includes the minimum landing size and the annual Total Allowable Catch (TAC) to the EU Regulation and includes an authorized "voracera" fleet, fishing gear technical characteristics, a seasonal fishery closure between February 1st and March 31st and the regulation of the effort by week. Minimum landing size and the annual Total Allowable Catch (TAC) are related to National and EU Regulations.

The most important Moroccan blackspot seabream fishery fleets are the longliners based at the port of Tangier and the artisanal fleet of the Strait of Gibraltar. The number of the longliners fleet in 2013 was 102 vessels. Only 17% of this fleet target blackspot seabream. The first species landed by the longliners are *Lepidopus caudatus* and *Xiphias gladius* (ONP, 2012). The blackspot seabream fishery is carried out at 200-700 m depth and the gear used is the longline known as "voracera". Some artisanal boats are targeting *Pagellus bogaraveo* in the strait of Gibraltar. There are 435 artisanal boats operating in the area and landing seasonally *Pagellus bogaraveo* between many other species, the mean annual catch of this fleet is about 17 tons (ONP statistics, 2011, 2012, and 2013).

CopeMed, following a recommendation by the Scientific Advisory Committee of the GFCM in 2010 (Montenegro) and the mandate by the Coordination Committee of the project, organised in September 2010 the first meeting of the CopeMed working group

(WG) between Morocco and Spain in Malaga (Spain) to advance in the preparation of joint data of the national fisheries and proceed with a joint assessment of the Strait of Gibraltar blackspot seabream stock.

The WG met again in 2011 and 2012 to evaluate the status of the stock. The results of the assessment of the stock obtained during by second meeting of the CopeMed WG (Tangier, Morocco. March 2012), were presented to the WG on demersal of the SCSA (SAC-GFCM) and also to the ICES WG on Deep-sea Fisheries (ICES WGDEEP).

During the second meeting in 2012, CopeMed WG experts proposed to establish a joint landing sampling plan between the two institutions (INRH and IEO) under a regional project funds and to standardise the sampling protocols and improve the knowledge of *P. bogaraveo* biological and economic data. A six months biological sampling data collection in Moroccan landings and a six months biological sampling data collection in Spanish landings under regional project funding were also proposed. The results of the assessment carried out by the joint CopeMed WG presented to the WG on stocks assessment were endorsed by the SCSA (2012).

The two previous meetings of the Working Group (WG) organized by the project FAO-CopeMed II on fisheries and resources of Blackspot seabream (*P. bogaraveo*) in the area of the Gibraltar Strait produced important advances in harmonizing methodologies and approaches among the two national research institutes, INRH (Morocco) and IEO (Spain), charged to collect and analyze the scientific data of the fisheries targeting Blackspot seabream in the Gibraltar Strait fishing area.

The WG produced important results derived from the scientific assessments for the blackspot seabream stock in the Strait of Gibraltar CopeMed WG on Blackspot seabream also promoted sustainable fisheries of this resource proposing scientific recommendations following the assessment results of the state of the stock in the area through the preparation of standard GFCM forms and technical papers (CopeMed Technical and Occasional Papers) presented to the demersal WG of the SCSA_SAC of the GFCM. Moreover the results of the previous meeting were presented by the IEO to the corresponding WG of the ICES (the advisory scientific organization on fishery resources to the EU) where Spain is a member.

Following the recommendations during the second meeting of the WG on training on stock assessment (CopeMed Technical Document N 26), CopeMed organized an "on the job training" for the expert Ms. Sadia Belcaid (INRH) at the IEO centre of Cadiz in September 2012 to harmonize the sampling methodologies, including otoliths reading and the data analysis used by the CopeMed WG.

The main results of the works realized under CopeMed phase II have been prepared as Technical Documents (CopeMed-ArtFiMed Technical Documents). In addition, CopeMed II documents to present partial or preliminary results to the GFCM WGs or other meetings are under the series "CopeMed Occasional Papers". Both Technical Documents and Occasional Papers can be downloaded from the website of CopeMed (<http://www.faocopemed.org/html/publications.html>).

During the last CopeMed meeting on small pelagic and demersal resources of the Alboran Sea area (INRH Tangier, October 2014) the experts on demersal resources recommended to joint again the WG on *P. bogaraveo* and evaluate the current status of the stock. The last

Coordination Committee meeting (Fuengirola, Spain. May 2014) included the organization of the WG on blackspot seabream in the priorities, CopeMed in agreement with the two national institutes INRH and IEO organized the meeting for updating the assessment of the stock.

OPENING OF THE MEETING, ADOPTION OF THE AGENDA

The meeting was opened by Mr. M. El Talbaoui, Director of the INRH Regional Center of Tangier who welcomed the participants of the two institutes and congratulated the organization by CopeMed II of this WG to assess the status of *P. bogaraveo* that complement the previous meeting in October on the small pelagic and demersal WGs for the Alboran Sea at the INRH regional centre of Tangier.

He underlined that the “voraz” is a species of common interest for Spain and Morocco and also raised the dramatic decline in landings in the Spanish fisheries targeting this species. Mr Talbaoui made prayers to prevent the collapse of the stock by adopting urgent decisions to limit the decline and restore this resource because, he said, it is time to act before it is too late.

OBJECTIVES OF THE MEETING AND BACKGROUN INFORMATION

Mr. Camiñas, representing the project CopeMed, thanked Mr Talbaoui for his help in organizing the meeting and to INRH and the IEO for their active participation in preparing the data for the analysis. After presentation of the participants (Annex 1) and the revision and adoption of the Agenda (Annex 2) he summarised the previous activity of the WG:

- In 2010 CopeMed prepared a Technical Document (N° 16) on the situation of the artisanal fisheries targeting *P. bogaraveo* in Dikky (Morocco).
- Málaga (Spain), 22 July 2010. CopeMed organized the first meeting of the *ad hoc* WG, involving scientists from the research institutes and experts from the fisheries administrations in Spain and Morocco. CopeMed prepared the TD N° 21.
- Fuengirola (Spain), 21-22 September 2010. Following the previous meeting, a first joint assessment exercise between Spain and Morocco on *Pagellus bogaraveo* in the Gibraltar Strait area was conducted. CopeMed prepared the TD N° 23. The evaluation was presented to the SCSA Demersal WG and endorsed by the SAC (Marseille, February 2011).
- Tangier (Morocco), 19-21 March 2012. CopeMed organized the Second meeting of the WG. The results of the joint assessment prepared as GFCM assessment forms were presented during the SCSA WG on demersal in Split (5- 9 November 2012, Croatia) and also to the ICES WG on Deep-sea fisheries (28 March – 5 April 2012, Copenhagen).

Mr. Camiñas underlined that following the recommendations of the two Institutes Directors, CopeMed organized this meeting because the blackspot seabream stocks is of great interest for biological and scientific reasons but also represent a stock for a big interest for the two countries. The genetic studies were recommended by the scientists of

both countries in the CopeMed blackspot seabream WGs in order to prove if there is one or more than one stock.

He underlined that, following the request from the two countries to CopeMed and accepting the recommendations of the GFCM, the main objective of the WG is to update the status of the stock of *P. bogaraveo* from the Gibraltar Strait area with new data provided by the two countries. However, the Moroccan scientists underlined that, because of the lack of time, the assessment results should not be presented to the 2014 GFCM Demersal WG and that these results should be validated following an internal national procedure. IEO and CopeMed II agreed on this requirement.

NEW AVAILABLE DATA AND INFORMATION FOR THE ANALYSIS OF THE STOCK

Mr. Camiñas indicated that although the SCSA of the SAC-GFCM recommended reviewing the assessment performed in 2012, there were no meetings of the CopeMed WG on *P. bogaraveo* since then, mainly due to changes in the CopeMed coordination and administrative situation. Other reason afforded by the countries to postpone the meeting is that for Morocco, other species are more proprietary than blackspot seabream.

New national data corresponding to landing by port, fishing effort, and length distributions were provided by INRH and IEO and joint updated Excel tables prepared. After compilation by the national experts, the data was reviewed and the WG agreed to use it as data base (Annex IV) for the analysis of the stock.

TREND OF THE CATCHES, FISHING EFFORT, LENGTH ZISE DISTIBUTION

The trend of the catches shows a big decline in the Spanish fishery, from around 600 tons in 2009 to less than 100 tons in 2013. The catches for the Moroccan fisheries were low, remained more or less stables for the whole series and turned around 100 tons. The Spanish fishing effort was very high in comparison with the Moroccan one (4 to 6 times higher to the Moroccan one) but this fishing effort declined and reached the same level of the Moroccan fishing effort level in the last two years. The length sizes for the Moroccan landings were higher than the Spanish ones for almost the whole data series (Annex IV, Figures IV1, IV2, IV3 and IV4).

ASSESSMENT OF *P. bogaraveo* OF THE GIBRALTAR STRAIT AREA

The WG group prepared the information and data from the two countries and prepared the tables for the assessment. A revision of the data was done for harmonisation and elimination of possible errors. The WG agreed in applying three different methods to evaluate the status of the stock and compare the results.

First method: The Global model (Biodyn)

The red seabream stock in the Strait of Gibraltar area (Spain + Morocco) was assessed with a production model "Biodyn" based on the model of Schaeffer, improved and performed by P. Barros (CECAF, FAO, 2004 and 2007).

The model uses four basic parameters: the virgin biomass K, the intrinsic population growth rate r, the initial depletion D (initial biomass relative to K) and the catchability q. All other parameters estimates derived from these four parameters.

After giving the best estimates of these parameters, the model calculates the reference points MSY, B_{MSY} and F_{MSY} . It also calculates the reference points or Bratios B_{Cur}/B_{MSY} and $B_{Cur}/B_{M0,1}$ (ratio between the estimated biomass for the last year data sets and B_{MSY} or $B_{0,1}$) and Fratios = F_{Cur}/F_{MSY} et $F_{Cur}/F_{0,1}$ (ratio between fishing mortality actually practiced on the stock in the last year data sets and optimal level of fishing mortality F_{MSY} or mortality for target fishing $F_{0,1}$). It also calculates the Fratio = F_{Cur}/F_{SYCur} (ratio of fishing mortality actually practiced on the stock over the last year data series and fishing mortality that would have produced a sustainable yield in the same year).

The absolute values F_{MSY} , B_{MSY} and even K should not be considered, since the model provides a more accurate estimate for Fratios and Bratios. The trends of these ratios and whether they are above / below 1.0 (100%) provide useful information to management.

Bratios: B_{Cur}/B_{MSY} and $B_{Cur}/B_{0,1}$ indicate the current stock status in relation to biomass that should be produced by MSY. The values lower than 100% indicate a stock abundance lower than B_{MSY} or $B_{0,1}$ while values higher than 100% indicate a stock abundance higher than B_{MSY} or $B_{0,1}$.

Fratios: F_{Cur}/F_{SYCur} , F_{Cur}/F_{MSY} and $F_{Cur}/F_{0,1}$ measure the operating level during the last year of available data, as a proportion of the operating level that would have been necessary to extract the sustainable yield, the optimal production or production targets to the estimated biomass levels during the same year. The values lower than 100% indicate a potential stock growth, while values higher than 100% suggest that the stock will decline next year. The indices B_{cur} / B_{MSY} and F_{cur} / F_{MSY} were therefore used as Limited Reference Points (LRP) whereas indices $B_{cur} / B_{0,1}$ and $F_{cur} / F_{0,1}$ were selected as Targets Reference Points (PRC).

This model and its adjustments were recorded on a MS Excel sheet with an observation error model (Haddon, 2001). The model was fitted to the data using nonlinear optimization function introduced in Excel, the solver tool.

Second method: Analytical assessment based on a length–cohort analysis (LCA)

Assessment methodologies and ad hoc software

The analytical assessment was based on a length–cohort analysis (LCA) and was carried out with the VIT software (Leonart and Salat, 1992). The data used in the assessment was the 2005-2013 Moroccan and Spanish length distributions and the biological parameters used come from Moroccan information. This model assumes equilibrium conditions. The use of this software is only recommended when the model is applied to short time series of consecutive annual data and the resulting variation in the estimated stock parameters appears reasonably low. (H.J.Ratz et al, 2010).

Based on the assessment data available at this meeting, the WG decided to update the LCA assessment with the Moroccan and Spanish length frequencies; On the one hand using a pseudo cohort for the (2005-2013), and on the other hand performance simultaneous VIT analysis year by year from 2005 to 2013.

For the length weight relationship and for the von Bertalanffy growth function, the parameters values used are presented in Table 1:

Length weight relationship		Von Bertalanffy	
a	0.008	K	0.162 year ⁻¹
b	3.178	Linf	68.18 cm
		to	-0.964

Table 1.- Length weight relationship and von Bertalanffy growth function parameters values used in the assessment (From Moroccan sampling programme).

Data for catch, length distributions, VIT age distributions, mean weights, maturity ogive and natural mortality used in the assessment are presented in Annex.

Before to start the VPA routine, exploratory data analysis was carried out using the FLEDA package in R. FLEDA is a part of the FLR library, for exploratory analysis of the data available for stock assessment. It includes a combination of simple calculations and graphical representations aiming at data screening (checking for missing data, unusual values, patterns, etc) and inspection of data consistency. Results showed no particular bias in data series. The results of the analysis are presented in Annex.

The WG decided to run a Yield Per Recruit analyses (YPR) (Beverton and Hold, 1957) and Spawning Stock Biomass per Recruit (Gabriel and al, 1989) to calculated the biological reference points F_{max} , $F_{0.1}$ and $F_{40\%}$ with the output results of the VIT, using the NOAA Yield Per Recruits 2.7 software (NOAA Fisheries Toolbox).

Yield per recruit analyses was conducted based on the exploitation pattern resulting from the LCA/VPA 2011-2013 pseudocohort model and population parameters. Minimum and maximum ages for the analysis were considered to be age group 0 and 11. Stock weight at age, catch weight at age and maturity ogive was estimated as mean values between 2011 and 2013. Natural mortality vector values were applied per age group using scalar value (0.2, Djabali and al, 1999). Fishing mortalities were the mean exploitation pattern F between 2011 and 2013. Reference F was considered to be mean F for ages 2 to 9 during the last 3 years (2011-2013).

Results, conclusions and recommendations:

First method: BIODYN

The results show that the biomass of the stock is low but the current production level is lower than the production supported by the actual level of the stock witch means that the stock will increase if we maintain the actual level of the catches.

The fishing mortality is exactly at its optimal ($F_{Cur}/F_{MSY} = 100\%$). If the current fishing mortality is maintained at its current level, the stock could be restored next years.

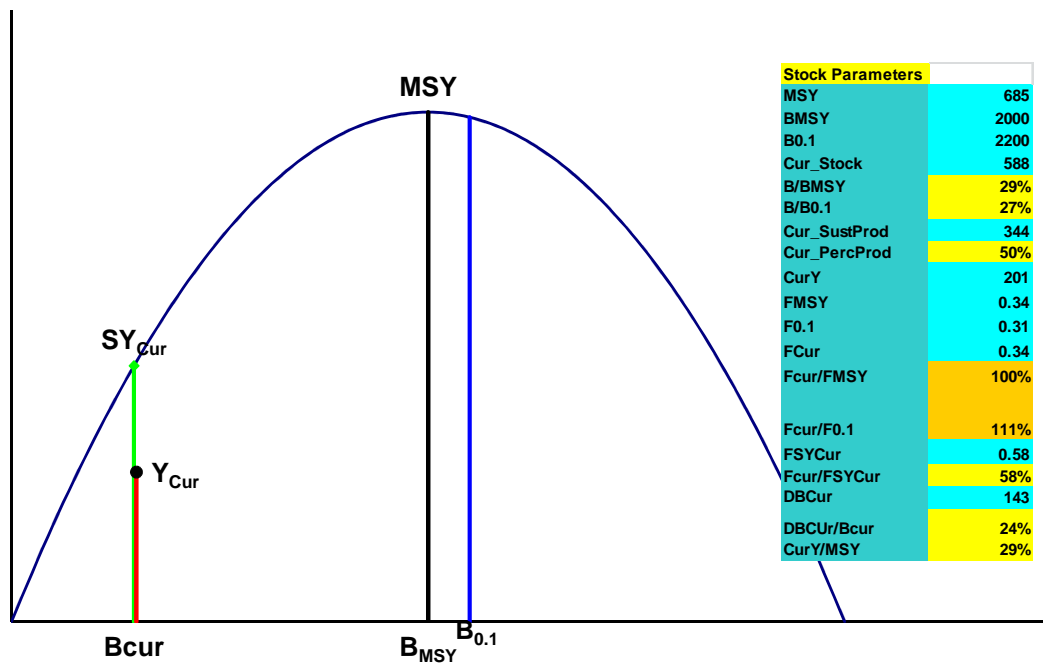


Figure 1. Red seabream evaluations results obtained with the global model

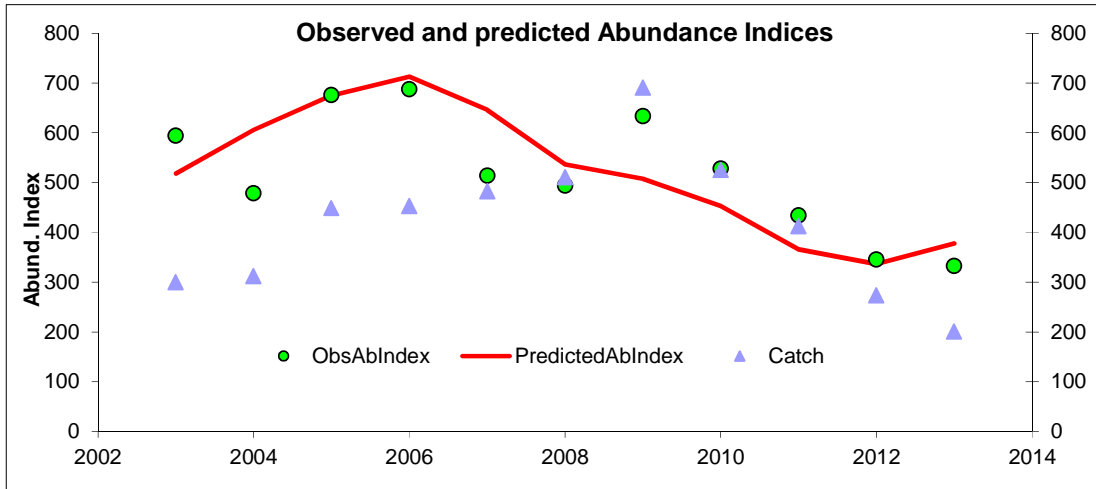


Figure 2. Adjustment of the global model Biodyn with the data used (total catch, CPUE observed and theoretical Spanish longliners)

Second method: VIT

Recruitment (R), Spawning stock biomass (SSB) and Landings (Y) has been decreasing since 2009. Fishing mortality rates (F_{BAR} 2-9), has been stable over the 2005-2010 period, increasing in the last three years. (Figure 3)



Figure 3. LCA/VPA VIT results. (R: Recruitment, SSB: Spawning stock biomass, F_{bar}2-9: fishing mortality and Y: yield).

The 33rd and 66th percentiles of the Yield (Y) and LCA/VPA outputs (B: biomass, R: recruitment and SSB: spawning stock biomass), showed the lowest values for the entire series.

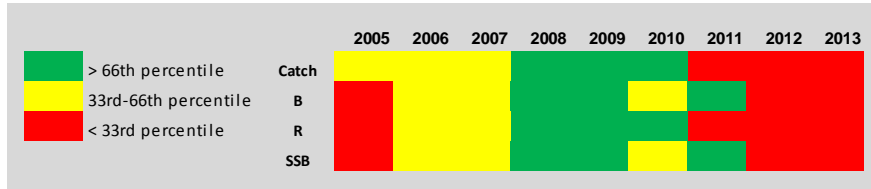


Figure 4: 33rd and 66th percentiles of the LCA/VPA outputs time series (2005-2013).



Figure 5. Yield (g) per Recruit (Y/R) and Spawner (g) per Recruit (SSB/R) curves and the corresponding reference points (F_{ref} and $F_{0.1}$).

Since 2009, when the maximum was observed, the Blackspot seabream stock of the Strait of Gibraltar area has suffered a fairly strong decrease in landings mainly in the Spanish fisheries, spawning biomass, total biomass and recruitment. Current indicators represent respectively 29% (Y), 25% (SSB), 26% (B) and 31% (R) of the values observed five years ago.

The actual level of fishing mortality ($F_{bar} = 0.43$) is higher than the values calculated for the F_{msy} proxy ($F_{0.1} = 0.31$).

Third method: CMSY

CMSY is a new method for estimating MSY from catch data, resilience of the respective species, and simple assumptions about relative stock sizes at the first and final year of the catch data time series (Martell and Froese, 2012). With the help by correspondence, of R. Froese (GEOMAR, Germany, one of the developers of this method for the estimation of sustainable catch for stocks with low information and the R code required for analysis), an

analysis was realized based on the time series of landings (1983 - 2013) and a low level of resilience of the target species.

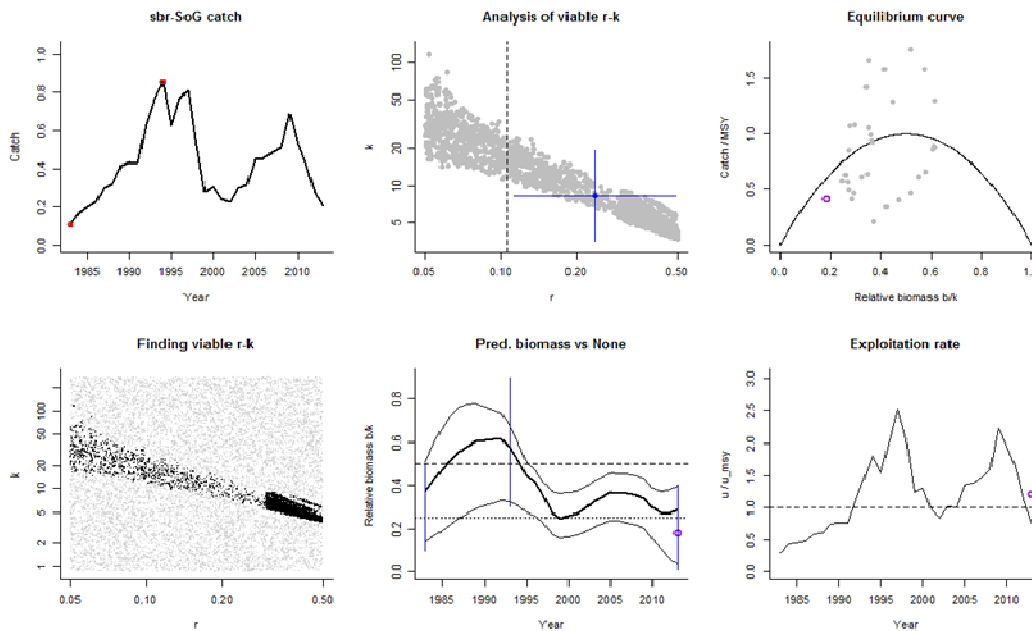


Figure 6. Blackspot seabream Gibraltar Strait Fishery (S+M): Results CMSY

In the production parabola (Figure 6, top right) we see how, under equilibrium conditions, biomass resource (blue point: last year 2013) can be increased with the current level of capture but not enough to achieve maximum sustainable biomass (BMSY) because current levels of exploitation ($\sim F$) are higher than those which would lead to sustainable yield ($\sim F_{MSY}$). Figure 6 (top left) reflects where landings and biomass are in equilibrium and, based on these, if the resource biomass increase or decrease.

METHODOLOGICAL PERSPECTIVE

The WG of experts considered that in the future it will be interesting to explore other alternative assessment methods for the blackspot seabream in the Strait of Gibraltar area such using all the available data for this species (catch, effort data length distributions...). IEO is trying to develop a gadget (Globally applicable Area-Disaggregated General Ecosystem Toolbox; see webpage <http://www.hafro.is/gadget>) model to assess this species stock status: Gadget is a powerful and flexible framework where populations can be split by species, size class, area and time step. The time step adopted is “by quarter”, so the WG recommends the data base recreation in a quarter basis instead of by year to still developing the model.

DISCUSSION OF THE RESULTS OBTAINED BY DIFFERENT METHODOLOGIES

The WG reviewed the different results of the assessment obtained with the three different methods applied.

Global Dynamic model of Schaefer (Biodyn):

The results of the assessment by the global model show that the stock is fully exploited in terms of fishing mortality. The biomass of the stock is very low and it represents only 27% of the target biomass and 29% of the biomass at MSY but the fishing mortality is low and it is at its optimal level showing exploitation at its optimal level. The current production is lower than the sustainable one. The stock can increase next year if the current production and if the fishing mortality are maintained at their current levels.

LCA:

Since 2009, when the maximum was observed, the Blackspot seabream stock of the Strait of Gibraltar area has suffered a fairly strong decrease in landings mainly in the Spanish fishery, spawning biomass, total biomass and recruitment. Current indicators represent respectively 29% (Y), 25% (SSB), 26% (B) and 31% (R) of the values observed five years ago. The actual level of fishing mortality ($F_{bar} = 0.43$) is higher than the values calculated for the Fmsy proxy ($F_{0.1} = 0.31$).

CMSY:

The results obtained of relative biomass (Figure 6, bottom centre) and the rate of exploitation (Figure 6, bottom right) indicates that the catches should be reduced slightly to allow the resources exploited grow beyond the bottom line points Figure 6 below centre (indicating the level of resource that will jeopardize future recruitment) to upper line points (corresponding to BMSY).

After the analysis of the results obtained by the three methods the WG raised other considerations related with environmental parameter affecting the stock, variation and long-term atmospheric oscillations affecting the fisheries, preys of blackspot seabream in the fishing area, quantification of the effects of the stones (used to lower the longline in Spanish fishery) in the bottom ecosystem and its production, the competition for food of blackspot seabream with other big predators in the Gibraltar Strait area (as for example bluefin tuna, other *Scombridae*, marine mammals, etc.) .

In addition of the overexploitation shown by LCA and CMSY model and the fully exploitation shown by the Biodyn model of the stock and by the big decline observed in the landings in the Spanish fishery, the WG considered that, to have a complete picture of environmental and human-induced effects that could better explain the status of the stock and the fisheries situation, the fishery-related data used in the assessment should be completed with information and data at least on:

- Abundance of big vertebrates predators of *P. bogaraveo* in the area
- Competitiveness for the preys/food with other vertebrates (bluefin tuna, swordfish, other tuna, killer whale, other marine mammals): Analysis of stomachs contents in Blackspot seabream and other species
- Oceanographic and Environmental variables affecting on the specie

- Atmospheric oscillations at medium and long term and its effects on the exploited population of Blackspot seabream
- Socio-economic drivers
- Others.

PREPARATION OF THE REPORT OF THE ASSESSMENT

The WG discussed the possibility in preparing the GFCM forms for the assessment of *P. bogaraveo* for presentation during the next WG on stocks assessment of the SAC-SCSA (Rome, 24-27 November 2014). The INRH experts informed to the WG the unavailability of the time to finish the previous internal validation of the WG results by the INRH Direction and by the fishery department.

Mr Camiñas pointed out that according contacts with the GFCM Secretariat, the results of the assessment can still be presented during the Sub Committee on stock assessment that will meet in February 2015 if there is an agreement between the two Institutes but he WG underlined that the current procedure is to present the results is through validation of the results of the assessment prepared by CopeMed WG during the meeting of the WG on demersal of the SCSA-SAC but because of the unavailability of time to validate the assessment results, the results cannot be presented. He mentioned that following this procedure, the results of the assessment could be reviewed and endorsed by the SAC in time to advise the GFCM during the current inter-sessions period 2014-2015 and not later. Considering the status of the stock Mr Camiñas insisted in the need to present the current situation obtained by the joint assessment to the two countries and to the CGFM as soon as possible. The INRH experts insisted that because of the current procedures, the INRH need time to discuss the results with the Moroccan fishery department and that only after that, the decision can be taken.

CONCLUSIONS AND RECOMMENDATIONS OF THE WG

The experts participating in the WG meeting agreed a series of conclusions and recommendations related to the status of the stock and also on the main data needed to improve the future analysis of the stock. Finally the WG commented a series of questions that could have effects on the future of the WG (as the finalisation of the project CopeMed in 2015 by integration in a new single regional FAO project) and on how the report will be transmitted by CopeMed to the national institute INRH and IEO and others.

Conclusions and Recommendations from the results of the assessment performed

Method 1: Biodyn

The current production and the current fishing mortality should be maintained at the actual level in order to ensure the recovering of the stock.

Method 2: LCA

Considering the results of the analyses conducted, the stock is subjected to overfishing and thus it is necessary to consider a reduction of the fishing mortality to allow the achievement of $F_{0.1}$.

The reference point $F_{0.1}$ can be gradually achieved by multiannual management plans that foresee a reduction of fishing mortality through fishing limitations.

The VIT results should be carefully interpreted in the current scenario with a significant reduction in abundance and high exploitation for the last years. In this conditions, the equilibrium assumption made in the VIT model could be compromised (Ratz et al, 2010).

Method 3: CMSY

Based on the relative biomass and the relative exploitation graph, catches shall be reduced slightly to allow the stock to grow away from the dotted half- B_{MSY} line towards the dashed B_{MSY} line (Figure 6, centre bottom).

Recommendations on data needs for future analysis

1. The WG recommend to the two institutions (INRH and IEO) to discuss the possibility in establishing a joint scientific workplan on the biology of Blackspot seabream stock in the Gibraltar Strait area and a genetic aspects studies in order to identify the unit of the stock.
2. The WG underlined the difficulties they have for the collection and analysis of biological, social and economic data of the fisheries targeting *P. bogaraveo* in the Gibraltar Strait area, due to not funding availability to complete the biological studies.
3. The WG suggested to regional projects to provide the necessary funds to establish a scientific program to: i) the follow up of the status of the stock, ii) the local and global environmental conditions affecting the stock, iii) the effects on the bottom ecosystem by the uses of the fishery (as the use of stones by Spanish fishery to lowering the gears), iv) questions related with the predator-prey relationship and v) competition for food of *P. bogaraveo* with other large vertebrates in the fishing area and, the social and economic effects of the management.
4. In relation with the previous paragraph, the experts considered that the involvement of other experts and disciplines (as for example environmental, social and economic experts) in future meeting of the CopeMed WG should be beneficial for improving the knowledge of the biology of the stock.
5. Studies related to the effects of the stones used with the current bottom longline by the fleets in the ecosystem.

Recommendations on future of joint activities on the species

1. As in previous meeting of the CopeMed WG, the experts from the two countries underlined the difficulties in updating biological parameters and other biological and ecological information of the fisheries by each institute, mainly due to funds restrictions, but not only. Lack of funds for sampling and difficulties with fishermen associate to the manipulation of such expensive fish product are reducing the availability of representative biological information from the two national fisheries.
2. CopeMed and the experts of the WG consider that important steps are necessary in the field of research of this resource and its environment.
3. CopeMed and the WG experts believe that regional funding can help the scientist to increase the collection of biological, environmental, social and economic data needed for the assessment of the status of this stock. Considering this, a genetic studies which could show that the sea bream is a probably shared stock within the Gibraltar Strait area, the

support of the GFCM will facilitate the implementation of national funding and the survival of the bilateral CopeMed WG on blackspot seabream.

3. The CopeMed representative informed the WG on the process involving the project aiming to create a single regional FAO project substituting CopeMed and the other sub-regional projects in the Mediterranean. As this new situation is expected will enter into force during 2015, actions between Spain and Morocco to reinforce and maintain the WG on *P. bogaraveo* from the Gibraltar Strait area are necessary before the implementation of the new project, in order to have a common position on this issue in the new project.

After finishing the discussions, the WG requested to CopeMed to finish and facilitate the adoption of the report by correspondence. After the adoption of the report, it will be transmitted by FAO-CopeMed to the Directors of INRH and IEO, the FAO Fisheries and Aquaculture Department and the CopeMed II Coordination Committee representatives, including the GFCM Secretariat after the Moroccan internal validation procedure.

Mr Camiñas informed that CopeMed will send also the report to the FAO-Fisheries and Aquaculture Department, as CopeMed coordination responsible to inform on the results obtained by the WG after their validation by the INRH and Fishery Department. He pointed out that CopeMed will join a letter to the report to request the support of the Directors of the Institutes, the GFCM and the FAO to create some mechanism (project or similar) that could give financial support to the WG to accomplish with the data collection, including biological samples, and biological and socio-economic analysis of the fisheries, as previously mentioned.

FINAL RECOMMENDATION

Taking in consideration the different results obtained by the three assessment methods, the problematic associated to the sampling of the resource and the lack of information on biology, environmental and fisheries issues related to the situation of the stock, the WG considered the convenience in informing the Directors of the two research Institutes in the two countries on the current situation of the stock for eventual scientific actions to be undertaken.

DATA AND PLACE FOR THE NEXT MEETING OF THE WG

The WG agrees to attend the two Directors decision for new meeting of the WG. CopeMed offered the collaboration of the project if the two countries involved and the Coordination Committee agree in continuing the support of the project to the WG for a new meeting when necessary.

CLOSURE OF THE MEETING

Mr Camiñas thanked the presence of the Director Mr. Talbaoui acknowledging the organization of the meeting and the facilities provided to the WG by the INRH. He thanked the group of experts from the two countries for the work done and useful results and called their attention on the finalization of the report in due time to facilitate the mandate given by the WG to CopeMed on the distribution.

Mr. Talbaoui thanked CopeMed for the opportunity given to the WG to meet and exchange of expertise, information and data between scientists from two sides, on a topic of great interest to the two countries. He warmly thanked CopeMed and the Spanish and Moroccan experts for the interest and effort done throughout the 3 days and he also congratulated them for the quality of their cooperation and commitment to produce relevant results of the blackspot seabream status. He finally declared the meeting closed.

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Annex I – Annotated Agenda



Coordination to Support Fisheries Management in the Western
and Central Mediterranean



Third meeting of the CopeMed Working Group between Spain and Morocco on blackspot seabream (*Pagellus bogaraveo*) of the Strait of Gibraltar area

INRH Regional Centre, Tangier (Morocco), 12-14 November 2014

Annotated Agenda

1. Opening of the WG meeting, organisational issues and adoption of the Agenda
The INRH local authority opens the meeting
Election of the chairperson and reporter
Revision and adoption of the Agenda
2. Objectives of the WG meeting and background information
Summary of the Second meeting of the WG, results and recommendations
Recommendation by the GFCM-SCSA to the CopeMed assessment presented in 2012 (see annex)
3. Overview of new available data and progress made on *P. bogaraveo* stock knowledge
Situation of the fishery in each country
New data available on C, f and biological parameters to the WG
Methods available for the assessment and selection of the most appropriate to the data
4. New assessment of the *P. bogaraveo* stock of the Gibraltar Strait area
Data preparation, common data base and selection of biological parameter for the assessment
Assessment exercise using the adopted methodologies, parameters and the available software
5. Main constraints of the assessment; discussion, results and recommendations of the WG
Results of the assessment and main problems encountered
Recommendations for future research
Recommendations for management proposes
6. Follow up of the results and discussion on the transmission of the information
In order to generate confidence in the national fisheries administrations of the two countries and in the RFMOs interested in the status of this resource the procedures

to inform will be discussed. Particularly it should be clear the information to transmit and the transmission procedures' to:

The two institutes and the national fisheries authorities

The GFCM

The ICES

7. Data and place for a new meeting of the WG
8. Closure of the meeting
9. Additional Information: GFCM revision advice in 2012.

GSA	Species	Data type	Years data	Methodology used	Stock status	Fcurr /F0.1	Management advice	WG comments	SC comments
GSA 18	European hake (<i>Merluccius merluccius</i>)	Catch, effort, Lfreq catch, trawl surveys	1996-2011	SURBA, Y/R, LCA	The stock is in overfishing and thus it is necessary to consider a considerable reduction of the fishing mortality to allow the achievement of F0.1	4.4	Consider a remarkable reduction of the fishing mortality. The reference point F0.1 can be gradually achieved by multiannual management plans that foresee a reduction of fishing mortality through fishing limitations. As observed in 2011, the fishing mortality from the Italian bottom trawlers represents about 80% of the total F in the GSA and that of the Italian longlines is accounting for about 9.5%, with an overall percentage of about 90%, while Montenegrin trawlers account only for about 1% of the F exerted on hake in the GSA and Albanian trawlers of about 9.7%. Moreover, the production of hake in GSA 18 is split in 12.5% caught by Italian longlines, 77.2% by Italian trawlers, about 1% by Montenegrin trawlers and about 9.4% by Albania trawlers.	The WG endorsed the assessment and recommendations	The SC endorses the advice. The SC appreciated the effort to develop a joint international assessment under the AdriaMed project framework.
GSA 01-03	Blackspot seabream, <i>Pagellus bogaraveo</i>	Lfreq catch	2009-2011	LCA and Y/R analysis	Stock is in overfishing status (F<0.194 higher than F0.1=0.113 and F40%=MSY=0.120) and overexploited (MSY=331 t lower than Y at F0.1=473 t and Y at 40%=481 t).	1.7	Reduce the effort level to set the fishing mortality level to a more sustainable value. Rationalize the management of this resource by establishing similar management measures in both countries (Morocco and Spain).	Three scenarios on Fterminal were presented for the VIT analysis. The rationale behind the choice of the retained Fterminal could be stated more clearly, even though results were qualitatively similar. It was also recommended to compare the reference points obtained by the Yield per recruit approach with those obtained from the three scenarios using VIT. Finally, it was noted that overexploitation should be assessed based on biomass. The WG endorsed the assessment and recommendations.	The SC endorses the advice. In order to assess if the stock is overexploited the SC recommends to estimate BMSY instead of catch at MSY to be compared with the current stock biomass. Clarification on the methods applied (i.e. DCAC model), terminology and data used for the assessment is required. The SC appreciated the effort to develop a joint international assessment under the Copemed project framework.

Annex II - List of Participants

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Annex III - Mot d'ouverture du 3^{ème} GT d'évaluation du stock de la daurade rose (P. bogaraveo)

El Mostafa Talbaoui, Directeur du Centre Régional INRH à Tanger.

Bonjour Mesdames et Messieurs,

Avant toute chose, je voudrais souhaiter à chacun d'entre vous la bienvenue et à remercier vivement les organisateur de ce 3^{ème} GT que CopeMed II a veillé à sa tenue au Centre Régional de l'INRH à Tanger, nous en sommes très honorés.

Je suis très ravi de prendre la parole à l'ouverture de cette réunion qui fait suite au 2^{ème} GT tenue en mars 2012 à Tanger sur une espèce d'intérêt commun qui est l'une des principales espèces débarquées et/ou ciblées par la pêche palangrière de fond et artisanale des 2 rives, car elle revêt une importance capitale sur plusieurs plans : sa présence au niveau du Détroit de Gibraltar et les mers adjacentes, et sa haute valeur commerciale.

Comme vous le savez pertinemment, ce stock est exploitée par une flottille constituée d'environ 102 palangriers marocains dont 17% ciblent la dorade rose et 99 à Tarifa, ajouté à des barques opérant occasionnellement à Dikky et à Ksar Sghir, ciblant occasionnellement la dorade rose et débarquant de très faibles quantités de cette espèce.

Il s'agit donc d'une activité qui s'opère en Espagne et au Maroc, aussi bien en Méditerranée qu'en Atlantique. Ceci complique l'aménagement de cette pêche car les débarquements et l'effort de pêche sont largement supérieurs du côté espagnol d'autant plus que la flotte espagnole cible cette espèce alors que pour le Maroc, les débarquements de cette espèce par les palangriers et les barques artisanales ne constituent qu'une faible part comparativement à d'autres espèces tels que le poisson sabre et l'espadon.

Actuellement, on note, une tendance à la stabilité des captures marocaines avec une légère tendance à la baisse alors que les captures espagnoles ont chuté dramatiquement durant les cinq dernières années. En effet, on note une chute des captures espagnoles de 600 à 83 tonnes entre 2009 et 2015, soit une chute de presque 70% alors qu'au niveau marocain, les captures ont connu une certaine stabilité au cours de la même période et ont oscillé autour d'une moyenne de 132 tonnes. On assiste donc à un exemple particulièrement spectaculaire d'une baisse des captures espagnoles liées principalement à une surexploitation du stock par la pêche (déjà annoncée par les GT antécédents). Cette surpêche serait à l'origine d'une baisse du stock qui, si rien n'est fait, risque de s'aggraver et de devenir irréversible, d'autant plus que la demande est en hausse. A cause du risque d'effondrement du stock il s'avère nécessaire de respecter les recommandations et les avis scientifiques du GT selon les résultats des évaluations du stock qui seront obtenus par le GT.

Enfin, je n'ai qu'à vous souhaiter plein succès dans ce que vous allez entreprendre la main dans la main pour produire des résultats pertinents et efficaces, qui soient en mesure de répondre à une exploitation rationnelle et durable de cette ressource et je vous remercie.

Mot de clôture du 3^{ème} GT d'évaluation du stock de la daurade rose (*P. bogaraveo*)

A la clôture de ce 3^{ème} GT qui était aussi une occasion privilégiée de rencontre et d'échange d'expertises, d'informations et de connaissances entre les scientifiques des 2 rives, sur un sujet scientifique d'un intérêt commun pour les 2 pays.

Je saisi cette occasion qui m'est offerte aujourd'hui pour remercier vivement nos amis espagnols et marocains et à leur tête Mr Camiñas pour l'intérêt et les efforts qu'ils n'ont cessé à déployer tout au long de ces 3 journées, je les félicite aussi pour la qualité de leur coopération et leur engagement ferme dont ils ont toujours fait preuve pour arriver à produire des résultats pertinents et formuler des recommandations et des avis scientifiques permettant le redressement du stock de cette ressource d'intérêt commun.

Enfin, je souhaite à tous les participants un bon retour chez eux et je vous remercie.

Annex IV - Landing Spain + Morocco

Year/Port	Tarifa	Algeciras	Conil	Tangier	Other Artisanal Ports	Total
1983	101					101
1984	166					166
1985	196					196
1986	225					225
1987	296					296
1988	319					319
1989	416					416
1990	428					428
1991	423					423
1992	631					631
1993	765					765
1994	854					854
1995	501	124				625
1996	659	110				769
1997	528	280				808
1998	280	239				519
1999	196	82				278
2000	193	111				305
2001	151	69		18		238
2002	147	19	26	35		227
2003	179	33	65	23		299
2004	187	54	38	33		312
2005	261	69	80	39		448
2006	273	73	32	74		453
2007	284	78	31	89		482
2008	291	125	19	76		511
2009	432	147	13	98		690
2010	232	134	13	105	41	525
2011	182	58	18	136	18	412
2012	105	21	1	122	24	273
2013	42	24	17	92	26	201

Effort (N° of sales)

Year/Port	Tarifa	Algeciras	Conil	Tangier
1983	1289			
1984	2173			
1985	2764			
1986	3705			
1987	3909			
1988	4336			
1989	4653			
1990	5573			
1991	6055			
1992	7330			
1993	8974			
1994	9127			
1995	8034	2365		
1996	6354	1059		
1997	7344	3141		
1998	5337	3222		
1999	3506	1506		
2000	5075	1757		
2001	2946	961		938
2002	3121	406		1521
2003	3396	585	679	1127
2004	4007	1144	674	1074
2005	3587	1269	1206	978
2006	3600	1355	546	1904
2007	5707	1357	573	2562
2008	6459	1892	460	2207
2009	6884	2008	451	2452
2010	5416	1529	235	2780
2011	4441	1221	288	4034
2012	3115	523	47	4468
2013	1627	595	271	3474

Spanish total length distribution estimates (Tm/year)

TL/Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
24	2	3	10	9	17	22	20	68	48	75	98	92	154	213	423	170	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
25	10	11	39	37	67	86	81	270	190	301	392	367	616	851	1552	718	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
26	27	31	107	102	184	237	224	743	523	828	1077	1008	1485	1824	9221	6454	527	48	42	91	52	0	0	0	0	0	0	0	0	0			
27	101	116	405	386	696	894	845	2802	1973	3125	4063	3803	18486	19592	33437	25121	2840	717	912	376	599	0	1089	1813	145	0	0	0	0	0			
28	258	295	1029	982	1769	2273	2148	7123	5016	7945	10328	9669	41367	44799	69291	53905	9521	3875	3214	2266	3516	275	7937	12320	1395	172	286	326	861	709	0		
29	522	596	2083	1989	3582	4603	4350	14424	10156	16088	20910	19592	51479	61975	81192	66854	13037	11083	11024	8050	10162	2687	16186	29944	10632	7247	2289	7892	14434	12237	872		
30	754	862	3011	2875	5178	6654	6287	20847	14679	23253	30219	28324	48423	66452	66863	65643	22383	13567	14510	10798	15975	28318	33636	49131	38380	34100	43015	54541	48469	42795	12395		
31	972	1112	3882	3707	6676	8579	8107	26780	18848	29866	38531	37167	59945	81890	87730	87862	34174	17250	17423	11144	16481	47271	42198	50327	44266	60048	62222	49390	41045	22528			
32	1151	1317	4600	4391	7909	10163	9604	31327	22008	34918	43898	46665	65780	85954	92080	91951	33187	24756	16279	9751	13833	46026	43827	46470	46475	47452	55897	51810	38183	31506	24633		
33	1081	1236	4318	4122	7424	9540	9015	28998	20331	32302	39411	46512	56368	69318	82039	81824	30338	35548	17568	9911	10740	40854	45742	48654	41664	43766	58204	48596	26976	22135	20576		
34	1053	1204	4205	4015	7230	9291	8780	28056	19652	31244	37575	46509	52484	62414	76403	65018	31815	47007	23101	10754	9659	27735	38569	48933	32509	37179	54432	51615	20796	18130	13861		
35	877	1044	3345	3221	5704	7256	6976	21560	15128	23965	28800	35751	39978	47444	60563	54316	33462	39489	25642	10300	11266	18386	31201	39807	33634	34363	40937	47214	17852	16215	9566		
36	1045	1375	3495	3452	5802	7135	7260	20047	14157	22133	26605	33062	36266	43018	53397	48897	27354	39188	24298	12138	11984	15047	23091	30715	31915	29735	44571	36923	15623	13741	7574		
37	3731	5982	8416	9138	12496	12994	17217	25027	18637	26052	31405	39297	35816	42391	47077	37775	23781	32770	19872	13898	11929	13111	15256	23743	31171	27260	42763	30205	13564	11808	6694		
38	9762	16322	19481	21918	27554	26194	39606	36369	28806	35032	42412	53531	35169	41460	39280	25282	19012	20981	15883	11445	11038	11342	12459	18184	25312	23411	33457	24644	11110	10030	5239		
39	12678	21345	24749	28033	34669	32323	50256	40902	33071	38290	46428	58817	32919	38690	35387	16991	12886	17648	12435	10810	11387	12015	11869	14801	21637	20584	39434	18674	10040	8890	4562		
40	9943	16750	19366	21950	27101	25216	39319	31585	25598	29469	35739	45294	24828	29169	26999	14200	12730	12791	9289	9992	11200	12072	12285	11662	16109	17981	24311	10205	8757	7953	3877		
41	9494	15995	18480	20952	25866	24079	37530	30087	24445	28178	34172	43258	23632	27773	26675	11655	10547	11293	7951	9026	11271	12591	12420	12863	12836	14999	21855	10288	6746	6332	3021		
42	7333	12355	14278	16185	19978	18583	28989	23239	18841	21671	26282	33312	18199	21380	21711	10954	8008	10942	7139	7356	9828	12778	12602	11804	10600	14797	19284	7086	5945	5415	2996		
43	7745	13045	15050	17079	21107	19737	30610	24548	20185	23557	28558	35902	19608	23098	24156	10199	6437	6968	6695	6145	10774	12028	12176	12203	12066	12308	16746	6397	4865	4438	2561		
44	6067	10193	11615	13292	16570	16090	23933	19251	17457	22303	26975	32265	17586	21073	23318	11174	5561	5604	4683	5570	8870	8962	11862	11008	10732	10205	13230	5738	4722	4320	2088		
45	5351	8923	9777	11492	14713	15887	20992	17038	19826	30031	36179	39602	21501	26603	25280	10783	6289	4726	5114	4595	7420	8962	10574	9826	9300	12213	15510	6200	4710	4456	2063		
46	3462	5697	5789	7169	9632	12225	13447	11091	17908	31316	37620	38408	20784	26410	22029	9573	6109	4587	4691	3746	7025	5459	10022	8902	8983	12663	18322	6813	5646	5392	2591		
47	2967	4844	4694	6011	8311	11448	11457	9539	17883	32769	39333	39296	21242	27224	27360	7425	4709	4099	4465	3115	5673	4975	9166	6929	9258	11393	17079	6083	5099	4816	2713		
48	2168	3536	3402	4379	6080	8469	8366	6976	13338	24576	29496	29394	15887	20382	18901	6819	5277	3502	3619	3138	4672	4343	6585	5400	8464	11464	14317	5346	5350	5089	2549		
49	2125	3468	3354	4302	5955	8231	8205	6834	12889	23659	28397	28348	15323	19645	18484	5441	3409	3486	3576	2513	3560	2987	5850	4150	6507	9121	14541	4923	5599	5311	2554		
50	1508	2460	2367	3047	4230	5892	5820	4853	9279	17097	20519	20448	11052	14179	10092	3306	2809	3569	3062	3359	3890	3946	6033	5151	7713	8892	16641	6906	6175	5814	3320		
51	965	1573	1513	1948	2705	3767	3722	3103	5933	10932	13120	13075	7067	9066	9356	1734	1698	1674	1705	1454	2210	2018	2290	3091	3800	5493	8604	3199	3544	3355	1932		
52	471	769	740	952	1322	1841	1819	1516	2900	5343	6412	6390	3454	4431	4362	988	1402	1415	1316	1416	1580	1658	1616	1409	2729	3891	6246	1668	2240	2093	923		
53	290	473	455	586	813	1133	1119	933	1784	3288	3946	3932	2125	2727	2992	807	618	581	859	741	964	919	1478	845	1885	3422	4730	1558	2390	2254	671		
54	225	367	353	454	630	878	867	723	1383	2548	3058	3048	1647	2113	1405	376	221	402	236	764	706	407	1027	798	1391	1493	3443	1098	1047	986	594		
55	102	166	159	205	285	397	392	327	625	1151	1381	1376	744	954	1001	146	57	177	174	288	259	323	467	597	809	1126	1467	787	764	733	198		
56	29	47	46	59	81	113	112	93	178	329	395	393	213	273	330	13	69	10	79	90	49	123	219	169	553	799	1039	392	155	156	127		
57	7	12	11	15	20	28	28	23	45	82	99	98	53	68	313	3	5	0	0	20	2	25	0	42	313	177	81	60	190	180	44		
58	7	12	11	15	20	28	28	23	45	82	99	98	53	68	6	3	0	0	0	11	44	51	52	51	152	90	79	77	131	122	81		
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Morocco total length distribution estimates

LF	LT (equation)	2005	2006	2007	2008	2009	2010	2011	2012	2013
21	24	0	0	0	254	507	0	0	130	
22	25	0	0	0	398	797	0	14334	261	582
23	26	1401	0	0	1675	3350	0	0	1696	888
24	27	26070	0	18847	11606	4365	662	5103	1696	1451
25	28	3156	0	46527	26523	6518	2758	9931	2479	106
26	29	33109	0	219502	115014	10526	4303	26184	913	181
27	30	46782	0	117894	68515	19136	3723	33533	2841	594
	31									
28	32	133065	0	226949	123654	20358	3089	43543	2545	2221
29	33	79039	40991	374680	201065	27450	5599	47933	5637	4658
30	34	48771	0	638972	332316	25660	8378	70435	7659	8153
31	35	16454	26892	231293	124489	17684	11382	60544	10886	16287
32	36	62005	196361	552094	284908	17721	12356	54410	16639	18568
33	37	42310	166462	271854	141471	11087	8191	38118	14140	18073
34	38	55804	234312	212020	111130	10240	16765	21920	11497	18760
35	39	99339	15181	137429	73385	9342	11888	36946	11921	19079
36	40	80717	185636	152114	79588	7062	6392	46978	6957	10860
37	41	22061	136695	116226	61248	6270	5869	37768	6209	7327
	42									
38	43	33676	86677	212163	108492	4821	7075	9990	4456	5748
39	44	69952	370273	240729	125255	9780	2824	7200	6229	4548
40	45	90540	240962	117474	61848	6221	8138	12527	5519	3512
41	46	79337	117898	76304	40010	3715	6150	3210	5830	4749
42	47	27602	180140	72242	39730	7218	5866	25760	3497	2758
43	48	8043	123649	0	5002	10005	7784	3367	4160	2937
44	49	6895	334327	103661	54127	4593	7284	6890	2491	1759
45	50	4106	297838	48410	28167	7925	8690	10569	2874	1635
46	51	15812	0	49485	27176	4867	2537	0	1207	1674
47	52	6647	0	0	2537	5074	3403	25147	3570	2171
	53									
48	54	3652	138027	0	1442	2883	0	58879	3130	1337
49	55	4694	0	0	1496	2993	3125	7672	2939	3378
50	56	1523	0	0	923	1847	0	3915	4864	1578
51	57	1553	0	0	543	1086	0	5422	1066	654
52	58	0	0	0	0	0	0	0	1999	1970
53	59	0	22989	0	0	0	0	0	2121	1478
54	60	0	0	0	0	0	0	0	310	1190
55	61	0	0	0	0	0	0	0	1634	423
56	62	0	0	0	0	0	0	0	1029	522
57	63	0	0	0	0	0	0	4463	642	0
	64									
58	65	0	0	0	0	0	0	0	0	0
59	66	0	0	0	0	0	0	0	130	206
60	67	0	0	0	0	639	0	4697	370	0

Annex V - Catches, fishing effort, CPUE and average size trends

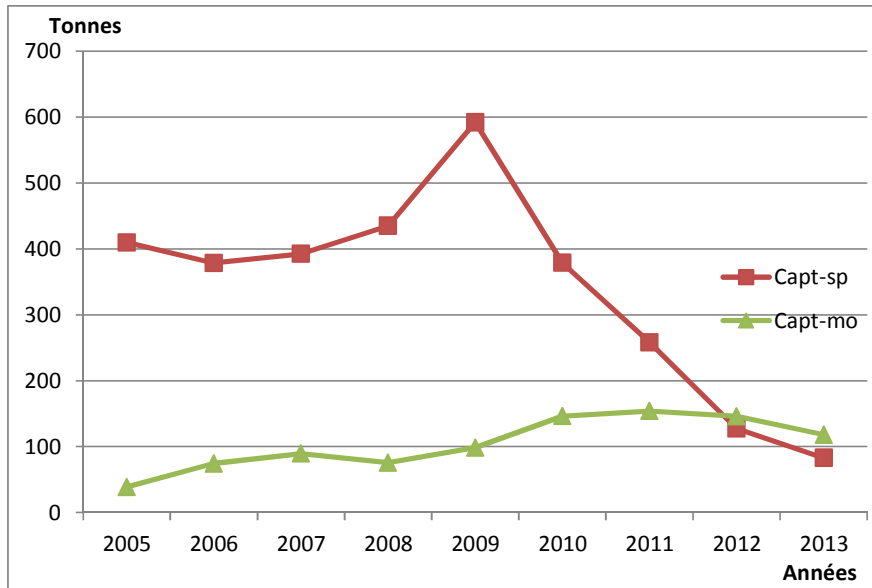


Figure V.1. Evolution of red seabream catches in tonnes

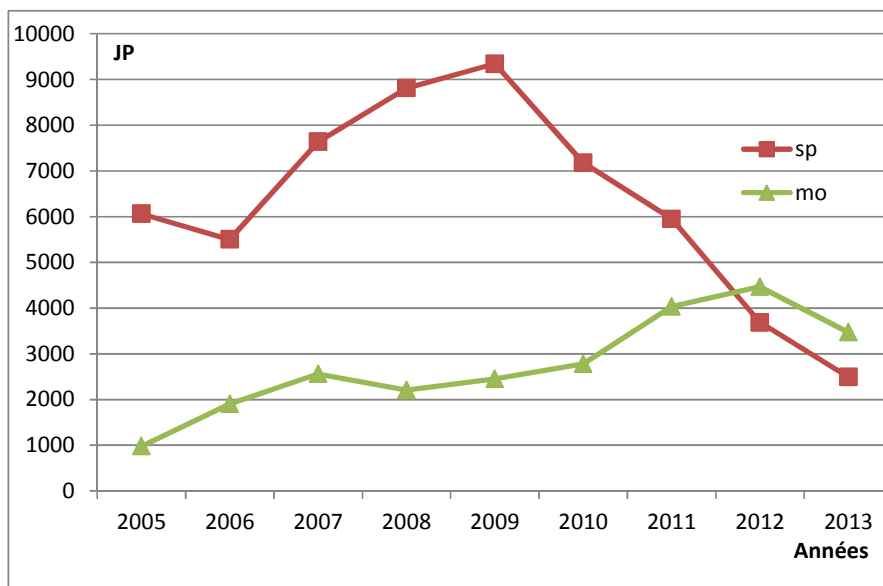


Figure V.2. Evolution of fishing effort (fishing days =jp) practiced on the red seabream

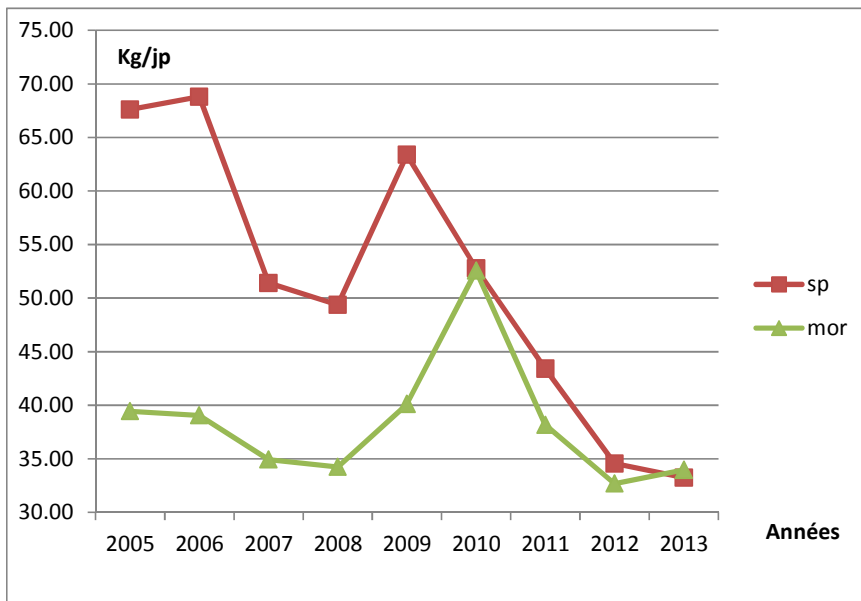


Figure V.3. Evolution of CPUE (kg / jp) for red seabream

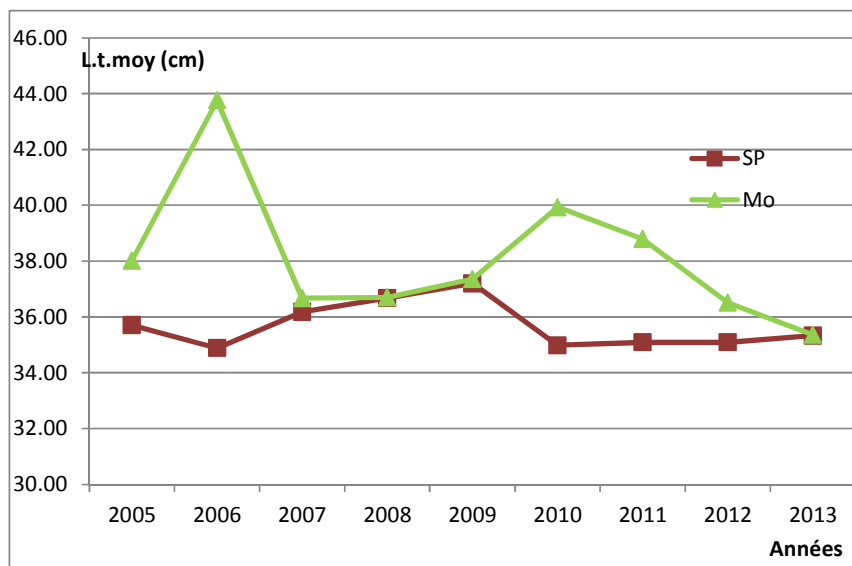


Figure V.4. Evolution of the average size (in cm total length) for red seabream

2_ Evaluations results obtained with the global model (Biodyn):

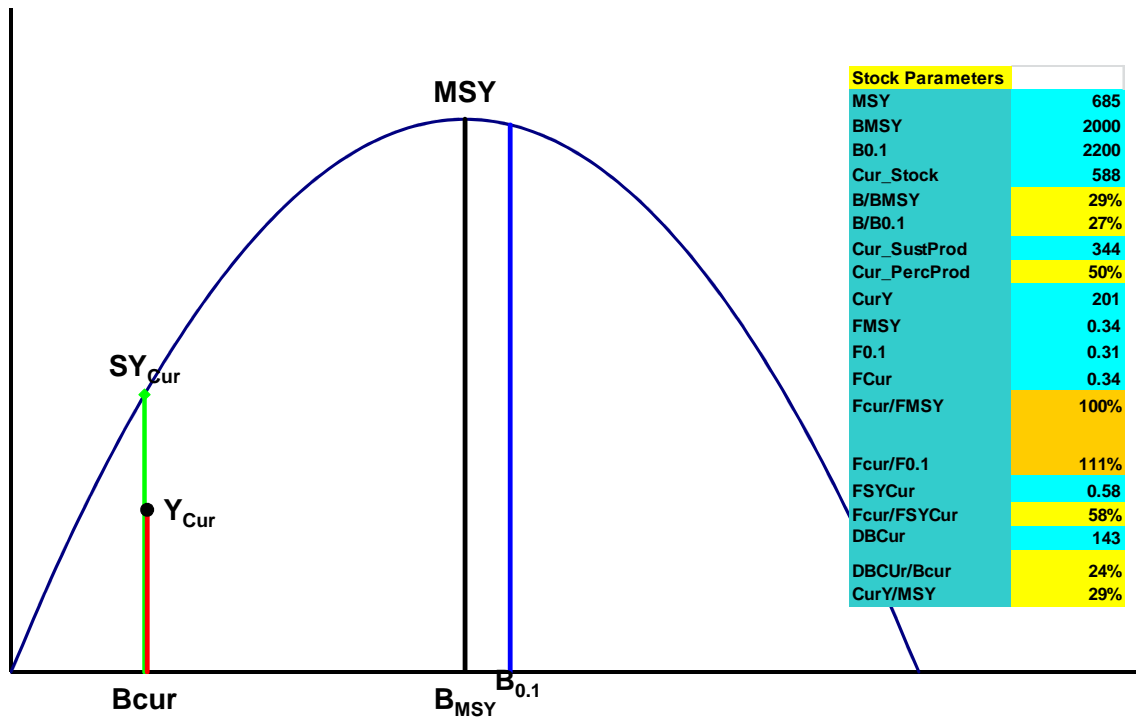


Figure V.5. Red seabream evaluations results obtained with the global model

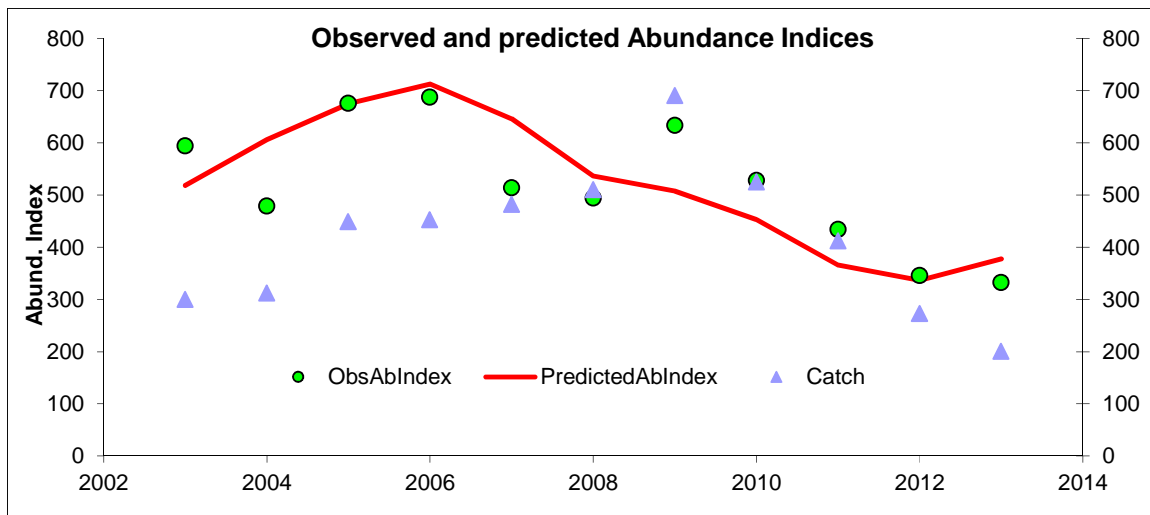
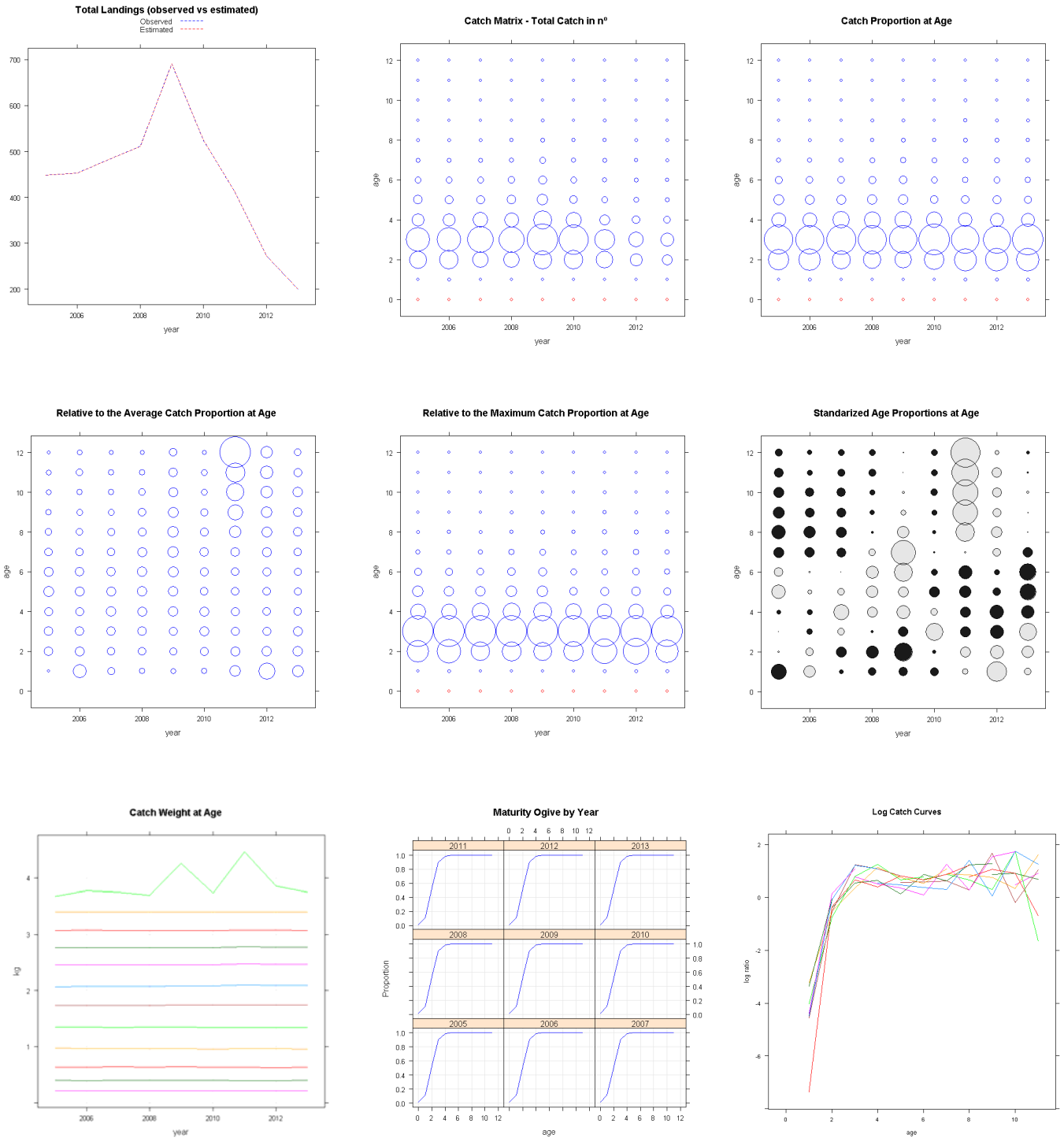


Figure V.6. Adjustment of the global model Biodyn with the data used (total catch, CPUE observed and theoretical Spanish longliners)

Annex VI - Exploratory data Analysis results



Annex VII - LCA/VPA VIT Inputs and results

<i>Class</i>	<i>Catch in Numbers</i>	<i>Catch in Weight</i>	<i>Mean Length</i>	<i>Mean Weight</i>	<i>Maturity ratio</i>	<i>M</i>
0	2860.09	452679.41	22.263	158.274	0.01499804	0.2
1	97002.82	35013917.5	29.021	360.958	0.1143452	0.2
2	123307.74	78512187.81	34.769	636.717	0.5261091	0.2
3	52222.93	50948383.37	39.803	975.594	0.8999523	0.2
4	24392.68	32843735.75	44.072	1346.459	0.985748	0.2
5	16467.18	28427127.97	47.669	1726.29	1	0.2
6	12242.28	25718853.93	50.715	2100.821	1	0.2
7	7631.36	18784399.61	53.312	2461.474	1	0.2
8	4265.9	11946615.98	55.525	2800.488	1	0.2
9	2211.14	6883579.85	57.407	3113.14	1	0.2
10	1560.56	5281242.08	58.937	3384.207	1	0.2
11	178.25	652110.05	60.401	3658.493	1	0.2

Table VII.1. LCA/VPA VIT Inputs. 2011-2013 pseudocohort.

<i>Class</i>	<i>VPA Results-Numbers</i>	<i>VPA Results-Weight</i>	<i>F</i>
<i>0</i>	681006.13	58789010.83	0.005
<i>1</i>	554977.25	139337306.5	0.213
<i>2</i>	367061.6	183812980.8	0.459
<i>3</i>	189979.63	155021071.8	0.359
<i>4</i>	108647.55	127495084.1	0.283
<i>5</i>	67021.8	103992684.8	0.314
<i>6</i>	40074.9	77455277.16	0.408
<i>7</i>	21826.19	50280156	0.482
<i>8</i>	11030.95	29289510.18	0.55
<i>9</i>	5212.7	15542903.66	0.622
<i>10</i>	2290.81	7514402.19	0.622
<i>11</i>	495.7	1759596.06	0.5

Table VII.2. LCA/VPA VIT Results. 2011-2013 pseudocohort.



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