GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN

COMMISSION GÉNÉRALE DES PÊCHES POUR LA MÉDITERRANÉE

GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN
SCIENTIFIC ADVISORY COMMITTEE (SAC)
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DRAFT REPORT OF THE 12th SESSION OF THE SAC SUB-COMMITTEE ON STOCK ASSESSMENT (SCSA) Saint George's Bay Malta, 28 November-3 December 2010

(Draft)

* Available only in English

OPENING, ARRANGEMENT OF THE SUB-COMMITTEE MEETINGS

1. The Sub-Committee meetings of the Scientific Advisory Committee (SAC/GFCM), including the Transversal Session, were held at the San Gorge's Hotel, St George´s Bay, Malta from 29th November to 2nd December 2010.

2. During the general opening, Dr Anthony Gruppetta, Director General of the Maltese Agriculture and Fisheries Regulations Department of the Ministry for Resources and Rural Affairs, welcomed the participants and thanked them for attending this series of meetings. He highlighted Malta's commitment and contribution to the functioning of the GFCM which has clearly been demonstrated throughout the years, not only through the hosting of various meetings, but also through its active participation in activities of its subsidiary bodies. He added that Malta is following closely the developments in fisheries management in the Mediterranean through the GFCM and referred to important Recommendations related to management measures (eg. trawl minimum mesh size, closed seasons, Fisheries Restricted Areas, reduction in fishing effort), MCS (eg. VMS, Authorised Vessels List, logbook, Port State Measures) and data collection schemes (eg. Task 1, Fleet Register) which have been adopted in recent years. He underlined the importance for GFCM countries to strive together to implement a clear strategy for the management of shared resources and stressed that the deliberations and outcomes of the meetings of the SAC Sub-Committees being held during that week were the

vital seeds for the processes leading to the formulation of regional policy and management decisions.

3.   Mr Abdellah Srour, the Acting Executive Secretary of the General Fisheries Commission for the Mediterranean (GFCM), welcomed the participants and thanked the Maltese Authorities for their kindness in hosting and organising the meeting. He further drew the attention of the participants on key issues to be addressed by the Sub-Committees.

4.   Mr Henri Farrugio, Chairperson of the SAC, also thanked the hosting country and the participants for attending the meeting and recalled the mandate of the SAC and its Sub-Committees.

TRANSVERSAL SESSION: REVIEW OF TRANSVERSAL ISSUES

5.   The Transversal session was chaired by Mr Henri Farrugio, Chairperson of the SAC. This session reviewed the outcomes from the following Transversal meetings:

- Transversal Workshop on Red Coral (Italy, September 2010)
- First expert meeting on the status of Elasmobranches in the Mediterranean and the Black Sea (Tunisia, September 2010)
- Transversal workshop on European Eel (Tunisia, September 2010)
- Transversal workshop on Fishing Capacity (FAO HQs, September 2010)
- Workshop on data collection methods (applied to all segments of the Fleet and their coherence with the requirements of the GFCM Task 1) (FAO HQs, September 2010)
- Workshop on algal and jelly fish blooms (Turkey, October 2010)
- Workshop on the monitoring of recreational fisheries in the GFCM area (Spain, October 2010)

6.   The meeting agreed that discussions and comments of the Transversal session be included in the reports of each Sub-Committee under the agenda item corresponding to the review of the above mentioned activities.

INTRODUCTION TO THE SCSA MEETING AND ADOPTION OF THE AGENDA

7.   The Agenda of the Sub-Committee (SC) was adopted (Appendix I) with the addition of a new contribution on methods for elasmobranches stock assessment introduced as point 6. Mr Fabio Fiorentino was the chairperson of the meeting and Ms Pilar Hernández was designated as rapporteur. The list of participants is enclosed in Appendix II.

REVIEW OF NEW STOCK ASSESSMENTS OF DEMERSAL SPECIES AND RELATED SCIENTIFIC ADVICE

Review of diagnosis and management advice emanating from the stock assessments works as validated by the Working Group on stock assessment.

8. 32 assessments and 2 related works were presented and discussed by the Working Group held in Istanbul (18-23 October 2010). The assessments covered 14 Geographical Subareas (GSAs) and concerned 12 Species. 24 of them were validated (Table 1) and 8 were considered preliminary and are not presented here. All the methods and results by stock were discussed and scrutinized by the participants and the advice approved in plenary sessions.

9. Only the assessments validated by the WG are presented in this report. An overview of the stock assessments validated during the demersal working group meeting, with a summary of the resulting scientific advices is provided in Table 1.

Table 1- Assessments for demersal species, validated by the WG.

GSA	Species	Data type	Years data	Methodology used	Stock status	Management opinion	WG comments	SC comments
GSA 3 (southern Alboran sea)	*Pagellus bogaraveo*	Lfreq & catch	2005-2007 (artisanal fisheries from Morocco and Spain)	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited; current F (0.40) higher than F0.1 (0.18) and Fmax (0.37)	Decrease the fishing effort. Adopt the same management measure in GSA 03 and GSA 01. Improve the sampling standardisation. Maintain the joint assessment.	Improve the biological sampling and estimate the importance of the catches of juveniles that occur in more shallow areas by trawlers in order to improve the assessment in the case such removal be assessed as not negligible. The WG endorsed the assessment and recommendations.	No further comments. Endorsed
	Parapenaeus longirostris	Catch & effort	2000-2009	Schaeffer Surplus production	Over-exploited; Fcurr/ $F_{0.1}$ = 392% F curr/ F_{MSY} =353%	It was recommended to decrease the fishing mortality by 60-80%. The abundance indices observed during surveys indicate a decrease of this resource	The WG recommend extending the assessment of the *Parapenaeus* stock including the data from other adjacent areas (Spanish and Algerian areas). The WG endorses the assessment and the related recommendations	No further comments. Endorsed

	Boops boops	Lfreq & catch	2000-2009	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited; current F (0.90) higher than F0.1(0.61) and Fmax (0.75)	Reduce the fishing mortality and control the trawling ban in coastal water.	No sign of depletion is evident. The fishing mortality can be reduced limiting the moving of trawlers from the Atlantic to the Mediterranean. The WG endorses the assessment and the related recommendations	No further comments. Endorsed
	Mullus barbatus	Lfreq & catch	2004-09	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited; current F (0.68) higher than F0.1(0.55) and Fmax (0.56)	Reduce the fishing mortality and control the trawling ban in coastal water.	No sign of depletion is evident. The fishing mortality can be reduced limiting the moving of trawlers from the Atlantic to the Mediterranean. The WG endorses the assessment and the related recommendations	No further comments. Endorsed
GSA 05 (Balearic islands)	*Merluccius merluccius*	Catch, effort, Lfreq catch, Trawl surveys	1980-2009	Extended Survivor Analysis (XSA) & Y/R analysis.	Over-exploited; current F (0.85) higher than F0.1(0.20) and Fmax (0.31)	Reduce fishing mortalities by 30 to 50% trough reducing the effort activity and improving the selection pattern of the fishery.	Explore the parameterisation of XSA (the contribution of each tuning fleet in the model) and run sensitivity analysis on its effects. The WG endorses the assessment and the related recommendations.	No further comments. Endorsed

Mullus surmuletus	Catch, effort, Lfreq catch, Trawl surveys	2000-2009	Extended Survivor Analysis (XSA) & Y/R analysis.	Over-exploited; current F (0.60) higher than F0.1 (0.38) and lower than Fmax (0.74)	Reduce fishing mortalities by 30% to 50% trough reducing the effort activity and improving the selection pattern of the fishery.	The WG endorses the assessment and the related recommendations.	No further comments. Endorsed
Mullus barbatus	Catch, effort, Lfreq catch, Trawl surveys	2000-2009	Extended Survivor Analysis (XSA) & Y/R analysis.	Over-exploited; current F (0.82) higher than F0.1(0.33) and Fmax (0.53)	Reduce fishing mortalities by 40% to 60% trough reducing the effort activity and improving the selection pattern of the fishery.	Explore the parameterisation of XSA (the contribution of each tuning fleet in the model). The WG group noticed that while SSB appears increasing, recruitment time series suggest an increasing trend. The WG suggest performing sensitivity tests for defining the influence of input biological parameters in the results. The WG endorses the assessment and the related recommendations.	No further comments. Endorsed
Nephrops norvegicus	Catch, effort, Lfreq catch, Trawl surveys	2002-2008	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited; current F (0.45) higher than F0.1 (0.30) and lower than Fmax (0.63)	Decrease fishing mortality by 20-30% by: - Reducing effort, both in capacity and/or activity - Improving the	Perform a sensitivity analysis. The WG endorses the assessment and the related recommendations	No further comments. Endorsed

					selection pattern of the fishery - Implementing area closures for fishing		
	Aristeus antennatus	Catch, effort, Lfreq catch, Trawl surveys	1992-2009	Extended Survivor Analysis (XSA) & Y/R analysis.	Over-exploited; current F (0.62) higher than F0.1 (0.33) and lower than Fmax (0.76)	Reduce fishing mortalities by 30% to 50% trough reducing the effort activity and improving the selection pattern of the fishery. Implementing area closures for fishing in the nursery areas during the recruitment period.	Evaluate the effect of the biological parameters running XSA with sex combined data. Explore the parameterisation of XSA (the contribution of each tuning fleet in the model). The WG endorses the assessment and the related recommendations	No further comments. Endorsed
	Parapenaeus longirostris	Catch, effort, Lfreq catch, Trawl surveys	2000-2009	Extended Survivor Analysis (XSA) & Y/R analysis.	Over-exploited	The problems found with the residuals and the retrospective analysis makes not possible to provide a full management advice.	The WG agrees that the stock is overfished but some uncertain do not allow to suggest an available value to reduce the actual fishing mortality. The WG endorses the assessment as a source of general information of the stock.	The assessment must be considered as a rough estimation of the stock status to be verified.
GSA 06 (northern part of northern Spain)	*Merluccius merluccius*	Catch, effort, Lfreq catch, trawl survey	1995-2009	Extended Survivor Analysis (XSA) & Y/R analysis.	Over-exploited; current F (1.70) higher than F0.1(0.60)	Reduce growth overfishing through: - Reduce the effort of trawl. - Improve the fishing pattern of the trawl fleets.	The stock show dangerous signals of recruitment overexploitation due to the decreasing trend in recruitment and	No further comments. Endorsed

					To avoid recruitment overfishing: - Reduce effort in trawl 70% - Especial surveillance in the use of 40 mm square mesh size in the cod end in trawl gears. - Encourage studies to allocate area closures to fishing (Fishing Reserves).	very low levels of the spawning stock. The WG endorses the assessment and the related recommendations	
Mullus barbatus	Catch, effort, Lfreq catch, trawl surveys	1998-2009	Extended Survivor Analysis (XSA) & Y/R analysis.	Over-exploited; current F (0.76) higher than F0.1 (0.39)	Decrease the fishing effort 70%. More effective control in shelf areas above 50 m depth to reduce the catch of small individuals under the minimum legal size. The use of the 40 mm square mesh in the cod-end should improve trawl exploitation pattern and Y/R by 24%, but a close supervision of the observance of this measure is needed.	Co-occurrence of SSB increasing and recruitment decreasing. The WG endorses the assessment and the related recommendations.	No further comments. Endorsed
Parapenaeus longirostris	Catch, effort, Lfreq catch, trawl surveys	2001-2009	Extended Survivor Analysis (XSA) & Y/R analysis.	Over-exploited; current F (1.37) higher than F0.1(0.30) and lower than Fmax (2.73)	Reduce growth overfishing: - Reduce the effort of trawl by 70%. - Improve the fishing pattern of the trawl.	Since there are some evidences of synchronous oscillation of abundance of the species in the western Mediterranean, environmental factors (*e.g.* water	No further comments. Endorsed

| GSA 07 (Gulf of Lions) | *Merluccius merluccius* | Catch, effort, Lfreq catch, trawl surveys | 1998-2009 (French and Spanish data from trawlers, gillnetters and longliners) | Extended Survivor Analysis (XSA) & Y/R analysis. | Over-exploited; current F (0.87) higher than F0.1(0.20) and Fmax (0.29) | Reduce fishing mortality by 60% to 70% to reach the Fmsy proxy F0.1. To reduce growth overfishing: - Improve the fishing pattern of the trawl - close nursery areas at least temporally - Reduce the effort of trawl, from reducing time at sea, number of fishing boats, engine power, Bollard pull and/or trawl size To avoid recruitment overfishing: - Reduce the effort of longline and gillnets in order to increase (or at least maintain) the SSB. - Establish temporal closures for longline and gillnet during the period of maximum spawning | temperature) are thought can notably affect the stock dynamics. The WG endorses the assessment and the related recommendations.

The trend of the SSB does not show any risk of stock depletion or collapse. The parameterization of the XSA model may have an impact on the results obtained. To identify the extension of such decisions, further work must be done to explore different parameterizations of the model and run sensitivity analysis on its effects. The WG endorses the assessment and the related recommendations. | No further comments. Endorsed |

	Mullus barbatus	Catch & Lfreq of catch	2004-2009	Pseudocohort (LCA, VIT), Y/R	Slightly over exploited	Current F has to be reduced by 30-40% to reach F0.1.	The WG endorsed the assessment and recommendations	Since the current F (0.7) is higher than F0.1 (0.4) and Fmax (0.5), the Sub-Committee recommends to not use the attribute "slightly" in identifying the stock status. Endorsed
GSA 09 (Ligurian and north Tirrenian)	*Merluccius merluccius*	Lfreq Catch Surveys data	1994-2009	LCA – Pseudocohort analysis (VIT) Y/R ; SURBA	Over-exploited; current F (1.40) higher than F0.1 (0.22) and Fmax (0.35)	The stock appears to be highly overexploited with a need of F reduction of about 40-80%.The current SSB is estimated as 5% and 10% of the virgin SSB, nevertheless, the stock productivity does not appear to be impaired and able to still produce relatively large year classes.	The group noticed a decreasing trend of the SSB for both assessments performed with SURBA on 2 different surveys (MEDITS and GRUND). The WG endorses the assessment and the related recommendations.	No further comments. Endorsed
	Mullus barbatus	Catch , effort & trawl surveys	1995-2009	Non-equilibrium production model	Over-exploited; current F (0.73) higher than FMSY (0.64)	A reduction of about 10% is considered necessary in order to reach the Fmsy level.	The WG endorsed the assessment and recommendations	No further comments. Endorsed

| | *Parapenaeus longirostris* | Catch, effort, Lfreq Catch & trawl survys | 1990-2008 | LCA – Pseudocohort analysis (VIT) Y/R ; SURBA | Fully -exploited | Not increase the fishing mortality | This stock could be strongly driven by environmental and ecological factors (*e.g.* water temperature, predatory release effect) that can make difficult to evaluate the effect of fishing on the stock. The WG endorses the assessment and the related recommendations but notes that only the reference points computed by VIT should be considered for management. | No further comments. Endorsed |

| GSAs 12,13,14, 15&16 (Strait of Sicily) | *Parapenaeus longirostris* | LFD of catch | 2007-2009 | LCA – Pseudocohort analysis (VIT & ANALEN) Y/R ; | Over-exploited; current F (1.13) higher than F0.1 (0.90) and lower than Fmax (1.23) | A reduction of about 20% is considered necessary in order to reach the F0.1 level. In addition the exploitation pattern of the fishery should be improved. A protection of the stable nurseries on the Adventure and Malta Banks in the Strait of Sicily is advised | A change in M and k has pronounced effect on Y/R when the variation was applied in opposite directions. On the other hand B/R and SSB/R are not strongly affected when the change is in the same direction. Alternative methods such as global production methods and trawl survey based approach should be used in the future to make the assessment more robust. The WG endorses the assessment and the related recommendations | No further comments. Endorsed |

GSA 17	*Solea solea*	Catch, effort, LFD, rapido surveys	2005-2009	Extended Survivor Analysis (XSA), LCA – Pseudocohort analysis (VIT) & Y/R ; SURBA	Over-exploited; current F (0.61) higher than F0.1 (0.29) and Fmax (0.42)	A reduction of F of 50-80%, especially by rapido trawling, would be recommended. A two–months closure for rapido trawling inside 11 km off-shore along the Italian coast, after the biological fishing ban (August), would be advisable to reduce the portion of juvenile in the catches. The safeguard of spawning area is also advised	Include in the future assessments biological samples data from the eastern fishery as well as to extend the rapido trawl survey inside the 12 nm from the Croatian coast, as was performed in 2005 and 2006. Such requirements could be attained in the framework of ADRIAMED regional project.	No further comments. Endorsed
GSA18 (Southern Adriatic)	*Merluccius merluccius*	Trawl surveys and commercial catch	Medits (from 1996 to 2009 for Italian and Albanian coasts and 2008 only for Montenegro). LFD of catch only for the west side in 2009	SURBA, ALADYM and VIT	Over-exploited Fcurrent(year) = 0.57-0.58 F0.1=0.2 Fmax=0.3	- the current yield in long term is maintained if F0.1 is reached - the value in yield in long term increases if the exploitation pattern is improved	The WG discuss the use of the slow or fast growth parameters to assess the hake stock and of the sensitivity analyses. Results from VIT (only one year data) are consider as indicative.	No further comment. Endorsed.

GSA 26 (South Levant)	*Solea solea*	LFD of catch	2006-2007	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited; current F (0.66) higher than F0.1(0.41) and lower than Fmax (0.81)	Reduce fishing mortality by about 40-60% to achieve F0.1. Improve the trawl selectivity. Identify and protect the nursery grounds. Improve the fishery data collection system.	As the assessment was done at first using three years 2006-2008 and it was found that the length composition of year 2008 is greatly different from the two others, the assessment was redone using the mean number of years 2006-2007. The WG endorses the assessment and the related recommendations	No further comments. Endorsed
	Boops boops	LFD of catch	2007-2008	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited; current F (1.09) higher than F0.1 (0.59) and Fmax (0.94)	Reduce the fishing mortality by 40-60%	The WG endorses the assessment and the related recommendations	No further comments. Endorsed
	Pagellus erytrinus	LFD of catch	2007-2008	LCA – Pseudocohort analysis (VIT) & Y/R	Over-exploited; current F (0.65) higher than F0.1 (0.34) and Fmax (0.57)	Reduce the fishing mortality by 40-60%. Identify and protect nurseries	The WG endorsed the assessment and recommendations.	No further comments. Endorsed

Document n° 1: GSA 03 Stock assessment of blackspotted seabream (*Pagellus bogaraveo*)
Abstract :

Le stock de la dorade rose (*P. bogaraveo*) du détroit de Gibraltar est considéré comme un stock unique et partagé entre le Maroc et l'Espagne. L'exercice de l'évaluation a utilisé les données communes de la pêche en Espagne et au Maroc (distribution de longueurs des débarquements de 2005 à 2007). L'analyse de cohorte de longueur (LCA) et le modèle de rendement par recrue (Y/R), ainsi une analyse de population virtuelle (VPA) ont été tournés par le logiciel VIT (Lleonart et Salat, 1997) pour l'évaluation de l'état du stock de cette espèce. Le résultat du modèle de rendement par recrue montre que l'état de ce stock est surexploité.

WG comments
Decrease the fishing effort. Adopt the same management measure in GSA 03 and GSA 01 since it is a shared stock. Improve the biological sampling standardisation. Maintain the joint assessment.
Estimate the importance of the catches of juveniles that occur in more shallow areas by trawlers in order to improve the assessment in the case such removal be assessed as not negligible.
The WG endorsed the assessment and recommendations

SC RECOMMENDATIONS:
The SC endorsed the WG assessment and accepted the recommendations.

Document n° 2: GSA 03 Stock assessment of deep sea shrimp (*Parapaneaus longirostris*)
Abstract :

The activity of the demersal fishery in the Mediterranean is important in Moroccan socio-economic field. The landings of this activity take place at 7 ports and 86 artisanal fishing sites. The fishing fleet in the region is mixed. It consists of trawlers, longliners and artisanal boats. The deep pink shrimp is exploited by the trawlers; the number of trawlers operating in the Mediterranean in Morocco amounted to 121.

The annual total production of this fishery has averaged 17,011 tons (2009) for an average of 117 million dirham. The main species targeted by these fisheries are *Parapenaeus longirostris*, *Pagellus acarne*, *Mullus* sp., *Merluccius merluccius*, *Boops boops*, *Octopus vulgaris*, *Trachurus trachurus*, cuttlefish, *Pagelus commun*. These species represent approximately 84% of the catches of demersal.

The data of catch and effort used are the official data collected between 2000 and 2009. Noting that, the National Office of Fisheries (ONP) was established since 2003 the MAIA system, this system is the performed for data capture and archiving.

In the last ten years the average annual production in *Parapaneus longirostris* is 574 tons, also the evolution of his capture mounts a decrease from 2000 until 2006, afterwards, it marks a slight increase until 2009. In 2009, production in prawn represents 5.5% of the total production of the demersal fishery.

The evolution of fishing effort shows a trend towards an increase in fishing effort between 2000 and 2002, followed by a slight decrease between 2003 and 2006 and increase again to 12,705 fishing trips in 2009.

The trend of abundance index during the period 2000 to 2006 shows a steady decline, going from 111 kg to 26 kg per fishing trip, to again a slight increase up to 47 kg / fishing trip.

Data used are official Catch - effort - CPUE trawl coastal fishery from ONP and data from INRH. The stock was assessed by Dynamic Schaeffer Production Model. CECAF Schaefer model (FAO, CECAF Schaeffer production model, 2007).

The results show that the model fitted well with the CPUE used (coastal fishery). The current Biomass represents only 17% of the target Biomass B0.1. The current fishing effort is 392% upper than the target fishing mortality F0.1 and 353% higher than the current sustainable fishing mortality (see results and graphs). As a result, the stock is considered Overexploited, with High fishing mortality and Low abundance. The current biomass represents only 17% of the target Biomass. The current fishing mortality is under the sustainable fishing mortality by 36% and exceeds the target fishing mortality by 392%. The abundance indices observed during surveys indicate a decrease of this resource. It was recommended to decrease the fishing mortality by 60-80%.

WG comments
The model fitting to data is good. Schaefer model was the only method which could be used (one year of length frequencies).
The group underline that this stock is a shared stock but with partial data (Spanish and Algerian data not included) and that there is a necessity of performing a joint assessment between the different partners and recommends extending the assessment of the *Parapenaeus* stock including the data from other adjacent areas (Spanish and Algerian areas).
The WG endorses the assessment and the related recommendations

SC RECOMMENDATIONS:
The SC endorsed the WG assessment and accepted the recommendations.

Document n° 3: GSA 03 Stock assessment of bogue (*Boops boops*).
Abstract :

Les données de fréquences de tailles utilisées dans cette étude proviennent de l'échantillonnage des débarquements de la bogue réalisé par la flotte chalutière opérationnelle en Méditerranée marocaine, et plus particulièrement, les chalutiers opérants à partir des ports de Nador et d'Al-Hoceima.
Une matrice de données annuelles a été constituée puis les données annuelles sont regroupées pour la construction d'une pseudocohorte.
Il a été retenu une valeur de mortalité naturelle M= 0,59. Cette valeur de mortalité a été supposée constante pour toutes les classes de taille et pendant toute la période considérée.
Plusieurs estimations du stock ont été testées avec différentes valeurs de F terminales (0,4 < F_{term}> 0,7) pour comparer les résultats. La valeur de F terminale adoptée est de l'ordre de 0.5.
Le niveau d'exploitation du stock de la bogue a été déterminé à travers l'analyse de la courbe de rendement par recrue et le calcul des points de référence biologique F max et F0,1.
Les traitements de données ont été réalisés moyennant le logiciel VIT (LEONART & SALAT, 2000) conçu spécialement pour les analyses virtuelles des populations (VPA) et de rendement par recrue (Y/R) à partir de la tailles des pseudocohortes.
Les valeurs des points de référence biologique Fmax et F0,1 obtenues indiquent une situation de surexploitation de cette ressource. Toutefois, cette situation ne présente aucun signe de dégradation ou d'effondrement.
La mortalité par pêche est exercée particulièrement sur les individus dont la taille est comprise entre 15 et 24 cm.
L'analyse des données des campagnes de prospection en mer obtenues durant les 4 dernières années indiquent que les indices d'abondance de cette ressource sont stables. Néanmoins, il est recommandé une réduction de la mortalité par pêche ainsi qu'une application de la réglementation existante concernant les zones de pêche et le maillage de l'outil de pêche utilisé. En effet, la

réglementation impose la pêche dans les zones au-delà de 3 miles à l'est d'Al-Hoceima et au delà de 80 mètres de profondeur à l'ouest

WG comments
No sign of depletion is evident. The fishing mortality can be reduced limiting the moving of trawlers from the Atlantic to the Mediterranean. The WG endorses the assessment and the related recommendations
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorsed the WG recommendation and accepted the assessment.

Document n° 4: GSA 03 Stock assessment of red mullet (*Mullus barbatus*).
Abstract :
D'une manière générale, l'évolution des captures demersales a connue une augmentation, passant de 7,680 tonnes en 2000 à plus de 17,000 tonnes en 2009. Les débarquements de rouget de vase ont montré une tendance à la stabilisation autour de 350 tonnes avec un pic enregistré en 2005 de l'ordre de 795 tonnes. La valeur annuelle moyenne de la capture est de l'ordre de 405 tonnes.
Les données de fréquences de taille utilisées dans cette étude proviennent de l'échantillonnage des débarquements de rouget de vase réalisés par la flotte chalutière opérationnelle en Méditerranée marocaine, et plus particulièrement, les chalutiers opérants à partir des ports de Nador et d'Al-Hoceima.
Une matrice de données annuelles a été constituée puis les données annuelles sont regroupées pour la construction d'une pseudocohorte.
Le niveau d'exploitation du stock de la bogue et de rouget de vase a été déterminé à travers l'analyse de la courbe de rendement par recrue et le calcul des points de référence biologique F max et F0,1.
Les traitements de données ont été réalisés moyennant le logiciel VIT (LEONART & SALAT, 2000) conçu spécialement pour les analyses virtuelles des populations (VPA) et de rendements par recrue (Y/R) à partir de pseudocohortes en taille.
Les valeurs des points de référence biologique Fmax et F0,1 obtenues indiquent une situation de surexploitation de cette ressource avec une individus dont la taille est comprise entre 13 et 18 cm. La mortalité par pêche, exercée particulièrement sur les 4 dernières années, indique que l'abondance de cette ressource est en diminution progressive. Les indices d'abondance montrent un tendance decroissante très rapide
On recommande une réduction de la mortalité liée à la pêche ainsi que d'appliquer la réglementation existante concernant les zones de pêche et le maillage de l'engin de pêche utilisé. En effet, la réglementation impose la pêche dans les zone au delà de 3 miles a l'est d'Al-Hoceima et au-delà de 80 mètres de profondeur a l'ouest

WG comments
No sign of depletion is evident. The fishing mortality can be reduced limiting the moving of trawlers from the Atlantic to the Mediterranean. The WG endorses the assessment and the related recommendations
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorsed the WG assessment and accepted the recommendations.

Document n° 5: GSA 05 Stock assessment of hake (*Merluccius merluccius*)
Abstract:

The trawl fishery off Mallorca (Balearic Islands; GFCM-GSA05) is developed by around 40 vessels, which total annual landings are approximately 1,400 tons. The European hake (Merluccius merluccius) is a target species for this fishery, mainly exploited on the deep shelfand upper slope, with annual landings oscillating between 50 and 190 tons during the last decades. The information used for the assessment of the stock consisted in annual size composition of catches (estimated from monthly sampling), official landings and the biological parameters estimated from the Data Collection Programme (2003-2007). The vector of natural mortality by age was calculated from Caddy´s formula, using the PROBIOMExcel spreadsheet. The methodology applied was: (i) a tuned virtual population analysis (VPA), applying the Extended Survivor Analysis (XSA) method on the period 1980-2009 and considering catch per unit effort (CPUE) from commercial trawl fleet (2000-2009) and bottom trawl surveys (2001-2009) as tuning fleets; and, (ii) a yield per recruit (Y/R) analysis based on the exploitation pattern resulting from the XSA model and population parameters for the periods 1980-89, 1990-99 and 2000-09. The software used was the Lowestoft VPA program and Excel.

The stock abundance, biomass and recruitment showed oscillations for the entire data series, without any clear trend.

The stock was assessed as overexploited. It presents Moderate fishing mortality and intermediate abundance. The recommendation for advice was to reduce fishing mortalities by 30 to 50% which can be achieved with reducing the effort activity and improving the selection pattern of the fishery.

WG Comments
Explore the parameterisation of XSA (the contribution of each tuning fleet in the model) and run sensitivity analysis on its effects.
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The Sub-Committee endorsed the WG recommendation and accepted the assessment.

Document n° 6: GSA 05 Stock assessment of striped red mullet (*Mullus surmuletus*).
Abstract:

Striped red mullet (*Mullus surmuletus*) is one of the most important target species in the trawl fishery developed by around 40 vessels off Mallorca (Balearic Islands, GFCM-GSA05). A fraction of the small-scale fleet (~100 boats) also directs to this species during the second semester of the year, using both trammel nets and gillnets. During the last decade, the annual landings of this species have oscillated between 73-117 and 17-29 tons in the trawl and smallscale fishery, respectively. The stock of *Mullus surmuletus* of the GFCM-GSA05 has been assessed using data from both the trawl and the small-scale fishery on a time series covering ten years (2000-2009). The assessment has been carried out applying tuned VPA (Extended Survivor Analysis, XSA) on the cohorts present during 2000-2009 and both VPA and Y/R analysis on a mean pseudocohort from that period. These approaches were performed using monthly size

composition of catches, official landings and the biological parameters estimated within the framework of the Data Collection Programme. The VPA was tuned with CPUE from commercial trawl fleet (2000-2009) and bottom trawl surveys (2001–2009). The vector of natural mortality by age was calculated from Caddy´s (1991) formula, sing the PROBIOM Excel spreadsheet (Abella et *al.*, 1997). The used softwares were the Lowestoft VPA program (Darby and Flatman, 1994) for the XSA and the VIT program (Lleonart and Salat, 1992) for the VPA and Y/R analysis from a mean pseudo-cohort. Results showed that the stock is fully exploited, being the fishery operating close to the optimal yield level since the current Y/R is very close to the maximum. The advice is to reduce fishing mortalities by 30 to 50% trough reducing the effort activity and improving the selection pattern of the fishery.

The WG endorsesd the assessment and the related recommendations.

SC RECOMMENDATIONS:

The Sub-Committee endorsed the WG assessment and accepted the recommendations.

Document n° 7: GSA 05 Stock assessment of red mullet (*Mullus barbatus*).

Abstract:

The two species of red mullet inhabiting the Mediterranean, *Mullus surmuletus* and *M. barbatus*, are present in the Balearic Sea. However, *M. surmuletus* predominates in this area where the species is targeted by both the artisanal and trawl fleet working along the continental shelf. On the contrary, *M. barbatus* is caught as a by-catch species by trawlers operating mainly on the deep shelf. In the Balearic Islands, *M. surmuletus* and *M. barbatus* represent about 80% and 20% of the total red mullet catches respectively. During the 2000- 2009 period, the landings of *M. barbatus* from Mallorca have ranged between 10.5 and 27.8 tons. The stock of *Mullus barbatus* of the GFCM-GSA05 has been assessed using data from the trawl fishery on a time series covering ten years (2000-2009). The assessment has been carried out applying tuned VPA (Extended Survivor Analysis, XSA) on the cohorts present during 2000-2009 and both VPA and Y/R analysis on a mean pseudo-cohort from that period.

These approaches were performed using monthly size composition of catches, official landings and the growth parameters accorded in the SGMED-08-03 meeting. Other biological parameters (length-weight relationships, maturity oogive) were obtained within the framework of the Spanish Data Collection Programme. The VPA was tuned with CPUE from bottom trawl surveys carried out around the Balearic Sea during 2001– 2009. The vector of natural mortality by age was calculated from Caddy´s (1991) formula, using the PROBIOM Excel spreadsheet (Abella et *al.*, 1997). Terminal fishing mortality was obtained from the catch equation using the FLeda package (Jardim and Azevedo, 2004) and the vector of fishing mortality by age from a separable VPA. The software used to run the assessments were the Lowestoft VPA program (Darby and Flatman, 1994) for the XSA and the VIT program (Lleonart and Salat, 1997) for the VPA and Y/R analysis from a mean pseudo-cohort. Results showed that the stock is fully exploited, being the fishery operating close to the optimal yield level since the current Y/R is very close to the maximum. The advice is to reduce fishing mortalities by 40% to 60% trough reducing the effort activity and improving the selection pattern of the fishery.

WG Comments

Explore the parameterisation of XSA (the contribution of each tuning fleet in the model).

The WG group noticed that while SSB appears increasing, recruitment time series suggest an increasing trend.
The WG suggest performing sensitivity tests for defining the influence of input biological.
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The Sub-Committee endorsed the WG assessment and accepted the recommendations.

Document n° 8: GSA 05 Stock assessment of Norway lobster (*Nephrops norvegicus*).
Abstract:

The Norway lobster (*Nephrops norvegicus*) is one of the target species of the bottom trawl fishery developed off Mallorca by a fleet of around 40 vessels, being captured on the upper slope, between 350 and 600 m depth, jointly with other by-catch species such as *Merluccius merluccius*, *Lepidorhombus* spp., *Micromesistius poutassou* and *Lophius* spp. The assessment of this stock has been carried out by means of virtual population analysis (VPA) and yield per-recruit (Y/R), on a mean pseudo-cohort for the period 2002-2009 and for three different years, one at the beginning of the data series (2002), one in the middle (2005) and the last one at the end (2009). It has been used monthly size composition of catches by sex, estimated from on board sampling between 2002 and 2009, and official landings (daily sale bills). The biological parameters for both sexes (growth, length-weight and first maturity) were those computed in GSA 09 (Ligurian and North Tyrrhenian Sea). The vector of natural mortality by age was calculated from Caddy´s formula, using the PROBIOM Excel spreadsheet. Analysis were performed using VIT software (Lleonart and Salat, 1992) and Excel. Over-exploited; current F (0.45) higher than F0.1 (0.30) and lower than Fmax (0.63). The advice is to decrease fishing mortality by 20-30% by: - Reducing effort, both in capacity and/or activity, improving the selection pattern of the fishery and implementing area closures for fishing.

WG Comments
Perform a sensitivity analysis.
The WG endorses the assessment and the related recommendations

SC RECOMMENDATIONS:
The Sub-Committee endorsed the WG recommendation and accepted the assessment.

Document n° 9: GSA 05 Stock assessment of red shrimp (*Aristeus antennatus*).
Abstract:

The assessment of the red shrimp (*Aristeus antennatus*) using data from trawl fishery in the GSA-5 was carried out by length cohort analysis (LCA, VPA and Y/R) for short time series covering the last five years 2005-2009, and by age cohort analysis by a Separable VPA and Extended Survivor Analysis (XSA) performed for the whole time series (1992-2009). The VPA was tuned with CPUE from commercial trawl fleet (1992-2009) and bottom trawl surveys (2001–2009). These approaches were performed from monthly size composition of catches, official landings, effort in trips (days at sea) and the biological parameters estimated for the area in 2003. The assessment analysis of the red shrimp in the GSA 5 shows a slight decreasing trend of spawning and total biomass with an average value for the whole time series of 410 t, and for the last six years of 389 t. Global fishing mortality was estimated at 0.62 increasing for the recent years. Recruitment shows a sinusoidal pattern and was in average of 28 millions of individuals. Yield per recruit analysis and Fishing mortality reference points are close to the maximum

yields. $F_{0.1}$ is about 28 % of the current F, F_{max}, and F35%SPR are close of the current effort. The fishery is considered Overexploited with moderate fishing mortality and low abundance. The advice is to reduce fishing mortalities by 30% to 50% which can be achieved with reducing effort capacity and improving the selection pattern of the fishery. Implementing area closures for fishing in the nursery areas during the recruitment period.
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WG Comments
Evaluate the effect of effect of biological parameters running XSA with sex combined data.
Explore the parameterisation of XSA (the contribution of each tuning fleet in the model).
The WG endorses the assessment and the related recommendations

SC RECOMMENDATIONS:
The SC agreed that given the high value of F_{curr} (0.62) over $F_{0.1}$ (0.33) to change the term "Moderate" by "high" referring to the level of fishing mortality, endorsed the WG recommendation and with this minor change, accepted the assessment.

Document n° 10: GSA 05 Stock assessment of deep sea shrimp (*Parapenaeus longirostris*)
Abstract:

The deep-water rose shrimp (*Parapenaeus longirostris*) is a valuable by-catch species of the bottom trawl fishery developed off Mallorca by a fleet of around 40 vessels, being captured on the upper slope, between 350 and 500 m depth, in which the target species is the Norway lobster *Nephrops norvegicus*. The used information for the assessment of the stock consisted in annual size composition of catches (estimated from monthly sampling) and official landings for the period 2001-2009. Biological parameters used were obtained in previous studies in this area (Guijarro et *al.*, 2009). The vector of natural mortality by age was calculated from Caddy´s formula, using the PROBIOM Excel spreadsheet. The methodology applied was: (i) a tuned virtual population analysis (VPA), applying the Extended Survivor Analysis (XSA) method on the period 2001- 2009 and considering bottom trawl surveys (2001-2009) as tuning fleet; and, (ii) a yield per recruit (Y/R) analysis based on the exploitation pattern resulting from the XSA model and population parameters for the entire period. The software used was the Lowestoft VPA program and Excel. The results suggest that the stock is overexploited, but some problems found with the residuals and the retrospective analysis makes not possible to provide a full management advice.

WG Comments
The WG agrees that the stock is overfished but some uncertain do not allow to suggest an available value to reduce the actual fishing mortality.

SC RECOMMENDATIONS
The assessment must be considered as a rough estimation of the stock status to be verified.

Document n° 11: GSA 06 Stock assessment of hake (*Merluccius merluccius*).
Abstract:

Hake (*Merluccius merluccius*) is one of the most important target species for the trawl fisheries developed by around 650 vessels along the GFCM geographical sub-area Northern SPAIN (GSA-06). In last years, the average of the annual landings of this species, which are mainly composed by juveniles living on the continental shelf, were situated around 3,350 tons in the whole area. The state of exploitation was assessed for the period 1995-2009 by means of a VPA Separable, tuned with CPUE from commercial fleet and abundance indices from trawl survey (MEDITS). Analysis was carried out applying the Extended Survivor Analysis (XSA) method (Lowestoft suite; Darby and Flatman, 1994) over the period 1995-2009. Analysis were performed from size composition of trawl catches (obtained from on board and on port monthly sampling) and official

landings, transforming length data to age data by slicing (L2AGE program). In this assessment, a new set of parameters (fast growth hypothesis; García Rodriguez, 2002) were considered and a natural mortality vector (PROBIOM, Caddy and Abella, 1999) was applied. The general results are similar to those obtained in previous assessments. Exploitation is based on very young age classes, mainly 0 and 1 year old individuals, with immature fraction dominating the landings. A decreasing trend is observed, both in landings and yields along the studied period, with a small recovery since 2007. Total biomass of the stock decreases slowly, being fluctuating at around the 7 300 t. The SSB represents only a 16 % of the total biomass in average, showing a decreasing trend along the period. Recruitments are declining since 1996 onwards, meanwhile F increasing in the last three years especially for the 2- 4 age classes. It can be concluded that the resource is over-exploited (growth over-fishing), with a risk of recruitment over-fishing, that can be avoided by reducing effort. The use of 40 mm square mesh in the cod-end could improve yields and the state of the stock. The management advice is to:
  – Reduce growth overfishing through:
    - Reduce the effort of trawl.
    - Improve the fishing pattern of the trawl fleets.

WG comments
Y/R analysis show a clear status of growth overexploitation, due both to a high fishing mortality and an exploitation of the fishery based on juveniles under the minimum legal size. Also, the stock is in danger of recruitment overexploitation due to the decreasing trend in recruitment and very low levels of the spawning stock.
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorses the assessment and the related recommendations of the WG

Document n° 12: GSA 06 Stock assessment of red mullet (*Mullus barbatus*).
Abstract:
The stock of *Mullus barbatus* in the GFCM-GSA06 has been assessed using a time series data from the trawl fishery covering twelve years (1998-2009). The assessment has been carried out applying tuned VPA (Extended Survivor Analysis, XSA) and Y/R analysis on the pseudo-cohort 1998-2009. Software used was the Lowestoft VPA program for the XSA (Darby and Flatman, 1994) and the VIT program (Lleonart and Salat, 1997) for the Y/R analysis. Catch in number of individuals are based on younger ages (0 and 1). Results suggest a slightly decreasing trend in the average fishing mortality for ages 0-2 along the studied period. Recruitment has remained more or less constant between 1998-2007, but in the last two years recruitment is under the mean for the period 1998-2007. After the minimum observed in 2004 SSB has recovered and in the last three years is above the average for the whole period.
Trends in recruitment, Fbar, stocks biomass and SSB are similar for both set of parameters used (fast and slow growth from SGMED-08-03). The stock is assessed as Over-exploited; current F (0.76) higher than F0.1 (0.39). It is recommended to: Decrease the fishing effort 70%, to implement a more effective control in shelf areas above 50 m depth to reduce the catch of small individuals under the minimum legal size. The use of the 40 mm square mesh in the cod-end should improve trawl exploitation pattern and Y/R by 24%, but a close supervision of the observance of this measure is needed.

WG comments

The WG noted that while SSB appears to increase, recruitment decreases, which is not the expected trends in an overfished stock and may reflect a case of recruitment overfishing.
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorses the assessment and the related recommendations of the WG

Document n° 13: GSA 06 Stock assessment of deep sea shrimp (*Parapenaeus longirostris*)
Abstract:

Deep-water pink shrimp (*Parapenaeus longirostris*) is one of the most important crustaceans species for the trawl fisheries developed along the GFCM geographical sub-area Northern SPAIN (GSA-06). This resource is an important component of commercial landings in some ports of the Mediterranean Northern Spain and occasionally a target specie of the trawl fleet, around 260 vessels, which operate on the upper slope. During the last years, a sharp increase in landings was observed, starting in 1998 and reaching the maximum value in 2000, followed by a decreased trend during the period 2001-2004. During de period 2005-2009 stabilization in catches is observed whit an average of 110 t for this period. In 2009 the annual landings of this species amounts 116 tons in the whole area. The state of exploitation was assessed for the period 2001-2009 for the GFCM geographical sub-area Northern Spain (GSA-06). A VPA tuned with CPUE from commercial fleet and abundance indices from MEDITS trawl surveys, was carried out applying the Extended Survivor Analysis (XSA) method (Lowestoft program; Darby and Flatman, 1994) over the period 2001-2009. This methods were performed from size composition of trawl catches (obtained from on board and on port monthly sampling) and official landings (In this assessment has been used a new catch data set from regional governments) transforming length data to age data by slicing. Available CPUE data series, both of commercial fisheries, from Santa Pola fleet, and scientific survey MEDITS were used. The results show a decreasing trend both in landings and total biomass of the stock from 2001 to 2004 and 2003 respectively. Landings, biomass and SSB values remain stabilized for the last 6 years whit light fluctuations. Although these values are low regarding those of 2001 (the highest in the series). Exploitation is based on very young age classes, mainly 2 and 1 year old individuals, indicating a dependence on recruitments. Fishing mortality shows a decreasing trend from 2001 to 2004 but increasing in the 2005-2009 period. The fisheries of *Parapenaeus longirostris* in the study area show important inter-annual variations in landings, biomass and SSB. Currents indicators represent a 35%, 59% and 54% respectively of the values observed eight years ago,(the highest in the series).The Y/R analysis shows that the Fref (1.37) exceeds the Y/R $F_{0.1}$ reference point (0.30). It can be conclude that pink shrimp in GSA06 is overexploited. The fishery is being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse. Therefore it is recommended to reduce the growth of overfishing: - Reduce the effort of trawl by 70%. - Improve the fishing pattern of the trawl.

WG comments
Since there are some evidences of synchronous oscillation of abundance of the species in the western Mediterranean, environmental factors (e.g. water temperature) are thought can notably affect the stock dynamics.
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The Sub-Committee endorses the assessment and the related recommendations of the WG

Document n° 14: Stock assessment of hake (*Merluccius merluccius*) in GSA 07
Abstract:

Hake (*Merluccius merluccius*) is one of the most important demersal target species of the commercial fisheries in the Gulf of Lions (GFCM-GSA07). In this area, hake is exploited by French trawlers, French gillnetters, Spanish trawlers and Spanish long-liners. Around 230 boats are involved in this fishery and, according to official statistics, total annual landings for the period 1998-2009 have oscillated around a mean value of 2160 tons (2,260 tons in 2009). The fishing capacity of the GSA 07 has shown in these last 10 years a progressive decrease considering the French trawlers. The number of these trawlers decreased of about 30% on the period. Most fleets and catches correspond to French trawlers (49% and 70%, respectively). Trawlers catches range between 3 and 92 cm total length (TL), with an average size of 20 cm TL, followed by French gillnetters (~32% and 15% respectively, ranging 13-86 cm TL and average size 39 cm TL), Spanish trawlers (~12% and 8%, respectively, ranging 5-87 cm TL, and average size 25 cm TL), and Spanish long-liners (~7% and 7%, respectively, ranging 23-96 cm TL and average size 54 cm TL).

Growth parameters used in this assessment, especially the estimation of K, come from tagging experiments developed by IFREMER Sète in the Gulf of Lions (Mellon-Duval et al., 2010.) and considering Linf from Aldebert & Recasens (1996). M vector from PRODBIOM (Abella et *al.*, 1997). Extended Survivors Analysis (XSA) tuned by MEDITS abundance indices. The results show. that the stock is overexploited with a high fishing mortality and low abundance. It is characterized by growth overexploitation and by periodically good recruitments (1998, 2002 and 2008) which ensure the sustainability of the exploitation. The trend of the SSB does not show any risk of stock depletion or collapse.

The effects of reduction of F (by 10%, 20% and 40 % and also to reach the Fmax and F0.1) have been calculated to see the impact on SSB/R and Y/R. A decreasing of the current F by 10 % or 40 % would respectively improve the SSB/R by 36% and 286% and the Y/R respectively by 6% and 26%.

To avoid growth overfishing, the management advice and recommendations are to: improve the fishing pattern of the trawl to arise the minimum length of catches equal the minimum legal landing size; close nursery areas at least temporally (see doc. "Nursery area for hake for the Gulf of Lions" - p33, SAC 2010 report); reduce the effort of trawl, from reducing time at sea, number of fishing boats, engine power, Bollard pull and/or trawl size. To reduce recruitment overfishing, the management advice and recommendations are (i) to reduce the effort of longline and gillnets in order to increase (or at least maintain) the SSB, (ii) to establish temporal closures for longline and gillnet during the period of maximum spawning. It is considered necessary the development of further studies on the biology of hake in the area, to verify the maximum length for males and to estimate new parameters on reproduction (e.g. sex-ratio, length of first maturity, spawning seasons and spawning areas), and to improve national statistics on catches and effort. We reiterate the importance of VMS as a valuable source of data for having precise information on effort distribution.

WG Comments
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorses the assessment and the related recommendations of the WG

Document n° 15: GSA 07 Stock assessment of red mullet (*Mullus barbatus*).
Abstract:

In the Gulf of Lions (GFCM-GSA07), red mullet (*Mullus barbatus*) is exploited by both French and Spanish trawlers. Around 120 boats are involved in this fishery. According to official statistics, total annual landings for the period 2004-2009 have oscillated around a mean value of 193 tons. Most boats and catches correspond to the French trawling fleet (77% and 86% respectively). In French and Spanish landings, modal lengths are 13 and 14 cm, respectively. In GSA 7, the trawl fishery is a multi-specific fishery. In addition to *M. barbatus*, the following species can be considered important by-catches: *Merluccius merluccius*, *Lophius* sp., *Pagellus* sp., *Trachurus* sp., *Mullus surmuletus*, *Octopus vulgaris*, *Eledone* sp., *Scyliorhinus canicula*, *Trachinus* sp., *Triglidae*, *Scorpaena* sp. Length at first capture is about 7 cm. Catch is mainly composed by individuals of age 0 and 1, while the oldest age class (5+ group) is poorly represented. Catch rates decreased slightly along the analyzed period. The number of French boats decreased also about 30 % during that period. The assessment of this stock has been carried out by means of virtual population analysis (VPA) and yield-per-recruit (Y/R), on a mean pseudo-cohort for the period 2004-2009, considering French and Spanish trawl using the software VIT. VPAs were also used for each year of the period, in order to have a first approach of the temporal trends of the results. The information used for the assessment of the stock consisted in annual size composition of French and Spanish trawler landings and biological parameters used by the EU SGMED-08-03 Subgroup on the Mediterranean (June 2008). A vector of natural mortality by age was calculated from Caddy's formula, using the PROBIOM Excel spreadsheet (Abella et al., 1997). Exploitation rate: Moderate fishing mortality. Stock abundance: Intermediate abundance. This stock is slightly overexploited, with no risk of stock depletion or collapse. F shows a slight decreasing trend from 2004. The management advice and recommendation are not to increase the fishing effort. Current F has to be reduced by 30-40% to reach F0.1.To improve the biological and growth parameters. We reiterate the importance of VMS as a valuable source of data for having precise information on effort distribution.

WG Comments
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
Since the current F (0.7) is higher than $F_{0.1}$ (0.4) and F_{max} (0.5), the SC recommends to not using the attribute "slightly" in identifying the stock status.
The SC endorses the assessment and the related recommendations of the WG

Document n° 16: Stock assessment of hake (*Merluccius merluccius*) in GSA 09
Abstract:
The trawl fleet of GSA9 at the end of 2006 accounted for 361 vessels, most of them catch hake. The main landings in the ports of Viareggio, Livorno, Porto Santo Stefano (Tuscany), Fiumicino, Terracina, Gaeta (Latium). Most of bottom trawlers of GSA9 perform daily fishing trips; only in some cases vessels stay out for a maximum of 2-3 days, especially in summer. A little decrease of the mean number of fishing days/year per vessel from 187 to 177 was observed in the last years.
Fishing grounds of bottom trawlers comprise the soft bottoms of continental shelf and the upper part of the continental slope. Some geographical differences on distribution of fishing pressure inside the GSA9 according to the fleets and availability.
The data used are commercial catches, size structure of the catch by gear, trawl surveys size structure and catch rates catch assessment surveys.
The surveys show strange patterns on the last two years due to changes in sampling design that were not possible to identify. These data were considered of poorer quality than the rest of the series.

For the VIT runs the data comes from the European Union Data Collection Framework (DCF) with information on hake landings and the respective size/age structure for 2005-2008; discard size structure was also included. Data were available for the two main fishing gears exploiting hake in GSA9: trawling and set nets (gillnets). Official and adjusted data were used.

Juvenile growth rate from daily growth increments on otoliths (Belcari et al., 2006). This growth rate seems to follow the pattern estimated in the NW Mediterranean (Garcia-Rodriguez and Esteban, 2002) . Reproductive biology and fecundity of hake have been studied in northern Tyrrhenian Sea (Biagi et *al* 1995; Nannini et al., 2001; Recasens et al., in press) by monthly samplings of adults caught by trawling and gillnets. M vector from Probiom. The methods used are: Length cohort analysis; Yield forecasting. SURBA, ICES software for HCR, Yield software, VIT, excel spreadsheets.

Equilibrium YPR reference points for the stock were estimated through the "Yield" software (Hoggarth et al., 2006). The stock was assessed as Overexploited,with High fishing mortality, and Low abundance. Landings per unit effort show an increasing trend in the last 3-4 years in some ports. It is too early for stressing that this phenomenon is a signal of recovering of the stock that was (or is still) almost depleted

The current SSB is estimated as 5% and 10% of the virgin SSB, nevertheless, the stock productivity does not appear to be impaired and able to still produce relatively large year classes. The stock appears to be highly overexploited with a need of F reduction of about 40-80%.

WG Comments

The group noticed a decreasing trend of the SSB for both assessments performed with SURBA on 2 different surveys (MEDITS and GRUND).
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:

The SC endorses the assessment and the related recommendations of the WG

Document n° 17: GSA 09 Stock assessment of red mullet (*Mullus barbatus*).
Abstract:

An assessment of the status of the stock of *Mullus barbatus* was carried out. The species is mainly exploited by bottom trawlers and also with set nets. The assessment was carried out estimating Fmsy using historical data of commercial catch and effort combined with time series of abundance indices running the non-equilibrium Surplus Production Model ASPIC. Reference points as Fmsy and fmsy were estimated. Moreover, a lower value of the proxy of Fmsy ($F_{0.1}$) was estimated with a Yield-per-recruit analysis (0.49). The estimated current F of 0.73 derived from the SPM is slightly higher than Fmsy (0.64) and a reduction of about 12% of the fishing effort is recommended. With such reduction it is likely that the biomass will increase in a medium term at levels close to the Bmsy.

WG Comments

The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:

The SC endorses the assessment and the related recommendations of the WG

Document n° 18: GSA 09 Stock assessment of deep sea shrimp (*Parapenaeus longirostris*)

Abstract:

An assessment of the status of the stock of Parapenaeus longirostris was carried out. The species is exploited by bottom trawlers operating mainly on the depth range 100-400m. Mortality rates were estimated using data of commercial catches by running a Length Cohort Analysis and of trawl surveys using SURBA. Reference point Fmax, F0.1 and F30%Bo have been defined with a Yield-per-recruit analysis. The estimated current F obtained with the LCA (VIT) was F=0.65 that is lower than the estimated F0.1=0.7 derived from a yield-per-recruit analysis. SURBA, on the other hand, suggest a higher value of F of about 1.0, but this result appears less reliable. In conclusion, the stock is considered fully exploited and the recommendation is not to increase fishing mortality.

WG Comments

This stock could be strongly driven by environmental and ecological factors (e.g. water temperature, predatory release effect) that can make difficult to evaluate the effect of fishing on the stock.
The WG endorses the assessment and the related recommendations but notes that only the reference points computed by VIT should be considered for management.

SC RECOMMENDATIONS:
The SC endorses the assessment and the related recommendations of the WG

Document n° 19:   GSA 12, 13, 14, 15 and 16. Stock assessment of deep sea shrimp (*Parapenaeus longirostris*).
Abstract:

The stock status of *P. longirostris* in the Strait of Sicily and adjacent seas (GSA 12, 13, 14, 15 and 16) was assessed analysing the size structure of the landing in 2007, 2008 and 2009. Sex were kept separate and a set of common biological parameters were used. Data were analysed by a steady state Length Cohort and Yield per recruit analyses, as implemented in the VIT and ANALEN packages. In order to verify and approximate the steady state assumption data were processed both keeping separate years and combining them. The Y/R curves were flat, with no clear maximum in males. In order to give advices, results including Fishing mortality (F) estimates obtained by separate sex were combined. In the long-term, an increase of the current F would lead to a sligtly increase of the production when the minimum length limit is not modified. An increase of 50% of current F would lead to an increase only 4% of the long term yield but the SSB decrease significantly 20%. The F variation affects differently the various fleet components. Any increase in F would result in a reduction of the long term yield of larger shrimp trawlers and an increase of the long term catches of small shrimp trawlers; an opposite pattern would be obtained if fishing mortality is reduced. A moderate increasing in the minimum length limit in catches would not have a substantial effect on the long term catches keeping the fishing effort unchanged. If the minimum length limit is increased by 20%, the long term catch would be increased only by around 1% but spawning stock biomass will be increased significantly; the gain in SSB for an increase by 20 and 50% will be respectively 38 and 49%. The moderate increase (20%) in minimum length limit leads to a gain of 6% in sustainable yield for the fleet, constituted by larger trawlers while small trawlers fleet would suffer long-term losses (around 7%). Considering $F_{0.1}$ as target reference point (TRP), the whole stock appears overexploited. In order to reach this TRP the current F should be reduced by around 20%. A moderate reduction (20%) of current F would not lead to a sensitive change in the long term yield. However, this reduction would improve significantly the spawning stock biomass (SSB).

WG Comments

A change in M and k has pronounced effect on Y/R when the variation was applied in opposite directions. On the other hand B/R and SSB/R are not strongly affected when the change is in the same direction. Alternative methods such as global production methods and trawl survey based approach should be used in the future to make the assessment more robust.

The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:

The SC endorses the assessment and the related recommendations of the WG.

Document n° 20: GSA 17 Stock assessment of sole (*Solea solea*).

Abstract:

Sole (*Solea solea*) is one of most important target species of rapido trawl and set net fleets in GSA 17. The stock is shared between the Adriatic countries (Italy, Croatia and Slovenia). The Italian fleets exploit this resource with rapido trawl and set nets (gill nets and trammel nets), while only trammel net is used in the countries of the eastern coast. More than 90% of catches come from the Italian side. Landings fluctuated between 1,000 and 2,300 t in the period 1996-2006 (data source: FAO-FishStat, IREPA-SISTAN time series, ISMEA). Concerning the data used, italian catch at age data were obtained from on board observations (rapido trawlers and set netters) and auction documents of the principal markets of the Italian coast (2005-2009). Slovenian landings were provided by official DCF data for the period 2005-2009. Concerning Croatian fishery, landings of 200 t of *S. solea* per year have been suggested for the period 2005-2008. In 2009, 150 tons were considered a good estimation on the base of the Croatian fishery data presented in the report of the 12th session of the Scientific Advisory Committee (GFCM: XXXIV/2010/Inf.9). The age frequency distributions from 2005 to 2009 of the Croatian and Slovenian catches derived from the demography of common sole observed in the hauls performed close to the eastern waters during the SoleMon survey.

Abundance indices were provided by the fishery-independent SoleMon survey (2005-2009). The survey indices were computed using ATrIS software (Gramolini et al., 2005) which also allowed GIS maps of the spatial distribution of the stock, of spawning females and of juveniles. Underestimation of small specimens in survey catches due to the gear selectivity was corrected using the selectivity parameters given by Ferretti and Froglia (1975).

Several projects carried out in GSA17 highlighted that the discard of sole both by rapido trawl and set net fisheries is negligible as the damaged specimens are also commercialized.

Growth parameters were obtained through the analyses of length distributions obtained during the Solemon survey (2004-2008). A natural mortality vector (M) was estimated using Caddy's method (1991) (PROBIOM Excel spreadsheet; Caddy and Abella, 1999; Abella et al. 1997, 1998). Maturity ogive and length-weight relationship parameters were calculated using biological samples collected in the period 2005-2007.

Three alternative assessment approaches were used:
- eXtended Survivors Analyses (XSA; Lowestoft packages);
- SURBA model;
- VIT model based on the average cathes of the period from 2007 to 2009.

Yield-per-recruit (Y/R) analyses were performed with Yield software (version 1.0, see Hoggarth et al., 2006), FLR scripts and VIT model, in order to estimate the limit and target reference points.

Considering the results of the assessments and $F_{0.1}$ as target reference point it can be concluded that the resource is over-exploited and subject to growth overfishing.

A reduction of F of 50-80%, especially by rapido trawling, would be recommended, also taking into account that the exploitation is mainly orientated towards juveniles and the success of recruitment seems to be strictly related to environmental conditions. Hence, in the case of both increasing fishing effort and yearly bad recruitment, there could be a risk of stock depletion.

A two–months closure for rapido trawling inside 11 km off-shore along the Italian coast, after the biological fishing ban (August), would be advisable to reduce the portion of juvenile specimens in the catches. For the same reason, specific studies on rapido trawl selectivity are necessary.

WG comments

The group underlines that the series is really short for assessing with XSA and SURBA. A general agreement was made about using VIT results for the recommendations. Moreover, the group underlines the need to include in the future assessments biological samples data from the eastern fishery as well as to extend the rapido trawl survey inside the 12 nm from the Croatian coast, as was performed in 2005 and 2006. Such requirements could be attained in the framework of ADRIAMED regional project.

The WG endorses the assessment and the related recommendations.

Document n° 21: Stock assessment of hake (*Merluccius merluccius*) in GSA 18
Abstract:

Merluccius merluccius is a high-score priority species in the GSA 18 that remarkably contribute to the fishery production. This is mainly based on trawlers. Past assessments highlithed an overexploitation condition for the European hake stock. Thus, in the framework of the Adriamed project (Working Group of Demersals) a new assessment was conducted to monitor the stock situation and provide fishery advice. The data used were from the trawl surveys conducted in the whole GSA (time series of Medits from 1996 to 2009 for Italian and Albanian coasts and 2008 only for Montenegro) and from the 2009 structure of landings of the west side (data from Data Collection Framework, DCF). We applied a suite of models and methods to face the uncertainty in the estimation process, hence the assessment was conducted using SURBA, ALADYM and VIT models in a complementary way. Two scenarios of growth rate were tested for sex combined: the slow (L_∞=96 cm, K=0.129, t_0= -0.73) and the fast growth (L_∞=104 cm, K=0.2, t_0= -0.01) scenarios, to account for uncertainty in life history profile. Natural mortality was assumed variable at age, according to the Caddy and Abella paradigm. Estimates of total mortality and recruitment from SURBA were used to feed ALADYM model with a hindcasting approach. ALADYM routines re-estimated the total and fishing mortality using the population parameters and a simulated exploitation pattern from the fishery. Selectivity of the fleet was simulated using an ogive (Lc=12cm; SR=1 cm) coupled with a deselection ogive with 50% deselection size at 40 cm and a deselection range of 1 cm. The size at first maturity was set at 33.2 (±0.27 cm), according to recent estimates gathered in the GSA within the DCF. A simulation was also performed to forecast the possible effects of the newly enforced mesh size regulation on stock biomass, catches and other relevant population indicators in the medium-term. Outcomes from ALADYM converged with the Z estimates from SURBA and catches simulated using ALADYM well approximated the observed ones. Regardless of the method used a slightly decreasing trends of total and fishing mortality were observed from 1996 to 2005 when increasing mortality values were recorded. These were maintained in 2006, while afterwards mortality went back to the levels before 2005. In this year also a remarkable increase of recruitment was observed that sustained the fishery in the subsequent years, as evidenced by the increasing western landings. However, regardless of the growth scenarios the current fishing mortality notably exceed the level of $F_{0.1}$ and a conspicuous reduction would be necessary to guarantee a more sustainable exploitation in the long-term. This can be partly achieved following the newly enforced regulation on the mesh size. However, spatial and temporal management measures could valuably complement such technical measure.

WG Comments

The WG discuss the use of the slow or fast growth parameters to assess the hake stock. It recommends proceeding usually with a sensitive analysis based on the growth parameters and analyze if they impact or not the result on stock status. The WG highlight that for this assessment, the out puts of SURBA are better than those coming from VIT (only one year data). The results from VIT are used as indicative. The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:

The SC endorses the assessment and the related recommendations of the WG

SC RECOMMENDATIONS:

The SC endorses the assessment and the related recommendations of the WG

Document n° 22: GSA 26 Stock assessment of sole (*Solea solea*).

Abstract:

The Egyptian Mediterranean coast (GFCM-GSA 26) is about 1100 km extending from El-Salloum in the West to El-Arish in the East. The mean annual fish production from this area was about 55 thousand ton (1990-2008). The main fishing gears operated in this region were trawling, purse - seining and lining especially long and hand lining. The number of trawlers operated in the area ranged between 1100 and 1500 during the period from 1990 to 2008. The vessel length varied between 18 and 22 meter and its width varied from 4 to 6 meter. Each vessel is powered by main engine of 100 to 600 hp. Some of them are equipped with echo-sounders. The trawl fishery contributed about 33% of the total fish production from Egyptian Mediterranean. The most dominant fish species in the catch are red mullet, soles, triglid fish, sparid fish, lizard fish, snappers, barracuda and elasmobranches. Invertebrates are represented by shrimp, cuttlefish, squid, crab and bivalves. Based on commercial catch, population dynamics parameters of three important demersal species (common sole, common Pandora and Bogue) were estimated and some reference points were identified. The Egyptian management system of the marine fisheries is mainly based on limitation of licenses, time and area closures, mesh size regulations but unfortunately these measurements still not enough to recovery our fisheries. The stock status is assessed as Overexploitation situation with high fishing mortality

It is recommended to: Reduce fishing mortality by about 40-60% to achieve $F_{0.1}$, to regulate mesh sizes and improve the trawl selectivity and to identify and protect the nursery grounds to improve the fishery data collection system.

WG Comments

As the assessment was done at first using three years 2006-2008 and it was found that the length composition of year 2008 is greatly different from the two others, the assessment was redone using the mean number of years 2006-2007.

The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:

The SC endorses the assessment and the related recommendations of the WG

Document n° 23: GSA 26 Stock assessment of bogue (*Boops boops*).

Abstract:

Based on the biological samples from the commercial catch, the stock of Bogue was assessed and some reference points were identified. Length frequency of two years was used (2007-2008). Based on otolith readings, the age was determined and the growth parameters (K, L_∞, and t_0) were estimated. M was estimated as the geometric mean of two methods. The general power equation ($W = aL^b$) was applied to estimate the length-weight relationship. Maturity ogive was fitted using the biological samples. Methods used were LCA, VIT, Y/R, Excel sheets. The VPA was done using different values for terminal F to choose the most appropriate for this stock.

Also, Yield per recruit analyses using Beverton and Holt model gave F_{max}= 1.05 and $F_{0.1}$= 0.45 (the estimated current F was 1.5). The stock is assessed as overexploited with high fishing mortality. It is recommended to reduce effort about 40-60% of the current effort. Defining nursery areas of important species should be taken into account for recommending closed areas and the link between spawning and recruitment in the area should be studied. Also, using of the surveys data for stock assessment and management purposes should be established, improving the fisheries data recording system and facilitating data and information exchange are highly recommended.

WG Comments

The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:

The SC endorses the assessment and the related recommendations of the WG

Document n° 24: GSA 26 Stock assessment of common pandora (*Pagellus erythrinus*).
Abstract:

Based on the biological samples from the commercial catch, the stock of common pandora was assessed. Length frequency of two years was used (2007-2008). Based on scales' readings, the age was determined and the growth parameters (K, $L\infty$, and t0) were estimated. M was estimated according to Djabali et al. (1993). The general power equation ($W = aLb$) was applied to estimate the length-weight relationship. Maturity ogive was fitted using the biological samples.

Methods used were LCA, VIT, Y/R, Excel sheets. The VPA was done using different values for terminal F to choose the most appropriate for this stock. Also, Yield per recruit analyses using Beverton and Holt model (1957) gave Fmax= 0.55 and $F_{0.1}$= 0.33 (the estimated current F was 0.83). The stock is considered to be in a situation of Overexploitation with high fishing mortality. It is recommended to reduce effort about 40-60% of the current effort. Defining nursery areas of important species should be taken into account for recommending closed areas and the link between spawning and recruitment in the area should be studied. Also, using of the surveys data for stock assessment and management purposes should be established, improving the fisheries data recording system and facilitating data and information exchange are highly recommended.

WG Comments

The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:

The Sub-Committee endorses the assessment and the related recommendations of the WG

GENERAL COMMENTS-CONCLUSIONS AND SCIENTIFIC ADVICE
FROM THE WORKING GROUP ON <u>DEMERSALS</u>

10. Considering that MSY has been adopted in many international for as an agreed reference point for sustainable fisheries, the WG adopted FMSY or its proxy $F_{0.1}$, the fishing mortality corresponding to the 10% of the slope at Y/R curve when F=0, as provisional Target Reference Point and Fmax , the fishing mortality corresponding to the maximum in a Y/R curve, as Limit Reference Point to compare with the current fishing mortality and evaluate the exploitation status of the stock. The SC agreed with these choices and with the suggestion that this decision should be discussed and agreed at higher instances within GFCM.

11. The SC examined the following comments and suggestions raised by the WG on demersals.

Comments

- **WG COMMENTS:** Considering management advice and recommendations, a lot of the stocks were mentioned as growth overfished with a risk of recruitment overfishing. The definition of recruitment and growth over fishing was sometimes misunderstood. The group emphasize the fact that growth overfishing is an overfishing of juveniles and that recruitment overfishing is an overfishing of spawners that can be reflected by a decreasing trend in recruitment.

12. The Sub-Committee recommended to use the word "Overfished" when dealing with Biomass and "Overfishing" when dealing with to fishing mortalities.

- **WG COMMENTS:** Considering recommendations about mesh size. In case of growth over fishing, the group agreed not to put in the recommendations some reference to a size of a mesh (50 mm diamond or 40 mm square mesh cod end), but some general comments about the improvement of the fishing pattern of the trawl to arise the minimum length of catches equal to the minimum legal landing size. This decision is based on the fact that the group did not tackle this issue in the scope of stock assessment and has not the required scientific support to give a precise advice. Some studies about selectivity have been performed (Guijarro & Massutí, 2006, and Ordines et *al.*, 2006). The results shown that a change of diamond to square mesh in the cod-end could produce an increase of length at first capture for hake from 11 to 15 cm, respectively, without a significant decrease in commercial yields. In addition, discards on the deep shelf, where hake it is mainly exploited, could be reduced by 50%.

13. The Sub-Committee suggest to collect information on selectivity curves, including model relating cod-end mesh size to retention at fish size, in future assessment in order to be able to simulate variation in exploitation pattern.

- **WG COMMENTS:** Another comment was made regarding the necessity of introducing in the diagnosis of the assessment form the possibility to define some stocks status as

"**Overexploited without risk of collapse**". This definition of the status would be an intermediate between the two current ones which are:

F - Fully exploited. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion; and

O - Overexploited. The fishery is being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse.

The rationale is that a stock may be overexploited in the sense that it is not exploited at its maximum sustainable yield, but it reached an equilibrium level regarding SSB, which is capable of replacing the biomass removed by fishing and natural mortality. In this case the stock may not be in risk of collapse, it is however in a higher risk situation than being at the SSB level generated by exploring the stock at MSY.

14. The SC recommends to substitute the definition of overexploited in the SAF with the following reported in SAC Glossary:

> *The fishery is being exploited close to F_{max} from Y/R or higher than F_{MSY}. Advices to decrease the fishing mortality must be given*

Proposals for new definitions of the related concepts of "overfished" and "overfishing/overexploitation" were presented and discussed. These proposals are reported in the paragraph on contribution to improve and update the SAC glossary.

- **WG RECOMMENDATION:** The group discussed the effect of dealing with species that have a marked dimorphism in a sex combined assessment. It was recommended to explore the effects such decision may have and try distinct ways of combining these data. Several possibilities were mentioned, (i) combining the biological parameters and aggregate length frequencies, (ii) apply the biological parameters to convert each sex length frequencies to age and aggregate afterwards, (iii) run assessments for each gender and merging the results.

15. The SC recommends to explore the three approaches suggested by the WG through simulation of data in species showing marked dimorphism.

- **WG RECOMMENDATION** Several stocks were submitted for preliminary assessments using the equilibrium model implemented by VIT. The group had dedicated a session to such approach and several analyses were suggested.
    - Check equilibrium in the fishery from residuals of length frequencies by year before using VIT (VIT assumes equilibrium).
    - Catch weight should be compared to weight from L-W relationship.
    - Age readings should cover all length classes.
    - Should try different values of t0 (sensitivity analysis)
    - Recalculate Terminal F by sensitivity analysis (thumb rule: value similar to M).
    - Avoid working with lengths - slice length data to ages.

- Try to replace the last age classes with a plus group, especially where some classes are missing from the catch.
- Check for any subdivisions of each fleet (gear) that target different parts of the stock (case of abnormal trend of total fishing mortality).

In general the Working Group recommended that VIT should be applied for average conditions and not for single year, as such approach assumes an extreme equilibrium situation where each single year could represent the overall fishery and stock dynamics. The opposite should also be avoided. If there are long time series, a period of stable catches may be a better option than using the full time series, depending on the life span of the species. The group suggests that the steady state conditions should be verified before applying the model, namely by looking at yearly residuals of the length frequencies. Such preliminary analysis should be further developed, expanded, and described in guidelines for assessment under equilibrium conditions.

16. On point 4 of the list of bullets above, the SC recommends to use more than one parameter for the sensitivity test. The rest of recommendations are endorsed by the Sub-Committee.

- **WG RECOMMENDATION**: The group recommended to carry out a simulation study to test VIT, with the objective of identifying in which situations the model gives good results and in which it does not. Also it will be important to learn in which conditions the model estimates are biased and in which direction such bias occurs.

17. Endorsed with the following comment: It would be advisable, in the case that the study is carried out, to produce a sort of guidelines for the use of VIT considering pros and cons and suggestions for cases in which other models could be more suitable.

- **WG RECOMMENDATION:** Regarding the usage of XSA the group recommended the parameterization of the model be explored and the effects of the model settings to be evaluated by sensitivity analysis.

18. Endorsed

- **WG RECOMMENDATION** The group discussed the usage of several models applied to the same stock as a method to support the decisions made and evaluate the robustness of the advice being given. In general it was always recommended to support the advice with all the information available, including scientific survey information as source of external information of the biomass trends, in particular to check for possible downwards trends on recent years.

19. Endorsed

- **WG RECOMMENDATION** The group identified some situations, *e.g.* hake stocks, where the definition of the stock units may be not well defined and having impact on the

stock assessment results. It is recommended to do an effort on the correct identification of the stocks units.

20. **The SC** endorsed the recommendation and extended it to the small pelagic species as well.

REVIEW OF NEW STOCK ASSESSMENTS OF SMALL PELAGIC SPECIES AND RELATED SCIENTIFIC ADVICE

Review of diagnosis and management advice emanating from the stock assessments works as validated by the Working Group on stock assessment.

21. 11 assessments and 2 related works were presented and discussed by the Working Group held in Campobello di Mazara, Sicily, Italy, from 1 to 6 November 2010 at the section of CNR-IAMC of Capo Granitola. The assessments covered 7 Geographical Subareas (GSAs) and concerned 2 Species: sardine and anchovy plus a preliminary related work of horse mackerel in the Marmara Sea. Only two of them were validated for management advice and 9 were considered preliminary. An overview of the stock assessments performed during the small pelagics working group meeting, and a summary of the resulting scientific advice is provided in Table 2. The second related work was the biomass estimate of Anchovy in GSA18 by two direct methods: acoustic survey and DEPM that can not be considered an assessment as such but the WG aknowledged its value as the result of collaboration of two countries within the framework of Adriamed Regional Project.

Table 2 – Assessments for small pelagic species validated by WG

GSA	Species	Data type	Years data	Methodology used	Stock status	Management opinion	WG comments	SC comments
GSA 01 (Alboran Sea)	*Engraulis encrasicolus*	Lfreq & catch	2002-2009	Extended Survivor Analysis (XSA),Y/R analysis & Annual exploitation rate	Moderately exploited Sustainable fisheries	Not increase the fishing effort. The management of anchovy fisheries needs to account the multi-species effects, mainly the interaction with sardine.	The WG considers the analytical assessment as provisional. The WG endorsed the assessment and recommendations.	No further comments. Endorsed
	Sardina pilchardus	Lfreq & catch	2002-2009	Extended Survivor Analysis (XSA),Y/R analysis & Annual exploitation rate	Fully exploited Sustainable	Not increase the fishing effort. The management of sardine fisheries needs to account the multi-species effects, mainly the interaction with anchovy.	The WG considers the analytical assessment as provisional. The WG endorsed the assessment and recommendations.	No further comments. Endorsed

GSA	Species	Data type	Years data	Methodology used	Stock status	Management opinion	WG comments	SC comments
GSA 3 (southern Alboran sea)	*Sardina pilchardus*	Catch, effort, Lfreq catch,	2000-2009	Pseudocohort (LCA, VIT), Y/R	full exploitation; current F (0.6) higher than F0.1/Fc=0.62 and lower than Fmax/Fc=1.86 Uncertain biomass	- Maintain the current fishing effort; - Reduce the mortality of fishing on the spawning fish - Introduce seasonal closure during January which coincides with the peak of the spawning; - Prohibit fishing during May near Short-nap close Kebdana to preserve the young fish.	The WG endorses the assessment and the related recommendations.	No further comments. Endorsed

GSA 06 (northern part of northern Spain)	*Engraulis encrasicolus*	Catch, effort, Lfreq catch,	2002-2009	Extended Survivor Analysis (XSA),Y/R analysis & Annual exploitation rate	The stock abundance is considered as low, while the exploitation rate is uncertain.	Avoid further reduction in SSB	The WG considers the analytical assessment as provisional. The WG endorsed the assessment and recommendations	No further comments. Endorsed
	Sardina pilchardus	Catch, effort, Lfreq catch,	2002-2009	Extended Survivor Analysis (XSA),Y/R analysis & Annual exploitation rate	Overexploited The stock has declined over many years, partly due to reduced recruitment and partly to poor survival of the recruits. Most likely, the stock has been increasingly overexploited in recent years	A substantial reduction in exploitation is advised.	The WG considers the analytical assessment as provisional. The WG endorsed the assessment and recommendations the related recommendations.	No further comments. Endorsed
GSA 07 (Gulf of Lions)	*Engraulis encrasicolus*	Echosurveys and catch	1998-2009	Biomass at sea and harvest ratio (Catch/Biomass)	Fully exploited - moderate harvest ratio. Low biomass	- Reduce fishing effort on anchovy in the Gulf of Lion - Respect the European regulation on minimum length size of catch (> 9 cm, UE 1976/2006) - Consider interactions with sardine fisheries.	The WG endorses the assessment and the related recommendations.	No further comments. Endorsed

	Sardina pilchardus	Echosurveys and catch	1998-2009	Biomass at sea and harvest ratio (Catch/Biomass)	Moderately exploited Severely reduced production capacity	- Strongly reduce fishing effort on sardine in the Gulf of Lion; - Formalize and establish a protocol of "sentinel" activity for fishermen, and produce monthly spatial andtemporal observations to describe the evolution of the system, - Respect the European regulation on minimum length size of catch (11cm, UE 1976/2006. - Consider interactions with anchovy fisheries.	The WG endorsed the assessment and recommendations	No further comments. Endorsed
GSA 16 (Strait of Sicily)	*Engraulis encrasicoluss*	Echosurveys and catch	1998-2009	Biomass at sea and harvest ratio (Catch/Biomass)	Exploitation rate (ratio between total landings and biomass estimates): high fishing mortality. Stock abundance (acoustic biomass estimate): very low abundance.	- Not increase the fishing effort; -Assess the impact of fry fishery may have. - Not extend fry sardine fishery after March to avoid additional mortality on juvenile anchovy.	Negative effects on these populations could result from pressure of other fishing gears on pre-juvenile stages (locally known as "bianchetto" or "neonata"). The WG endorses the assessment and the related recommendations	Since the stock is characterised by both high exploitation rate and low biomass the SC recommends to change "not increase the fishing effort" into "decrease the fishing effort". Endorsed with this modification

	Sardina pilchardus	Echosurveys and catch	1998-2009	Biomass at sea and harvest ratio (Catch/Biomass)	Exploitation rate (ratio between total landings and biomass estimates): moderate fishing mortality. Stock abundance (acoustic biomass estimate): low/intermediate abundance.	- Not increase the fishing effort; -Assess the impact of fry fishery. As the impact of fry fishery on this population is not known, a proper quantification of the catches in the fry fishery is mandatory.	Over the last four years the population appears to be stable though at a relatively low level. However, taking into account the moderate exploitation rates experienced, results would suggest the stock being able to tolerate the current level of exploitation.	No further comments. Endorsed
GSA 17	Engraulis encrasicolus	Catch, effort, LFD, rapido surveys	1975-2009	VPA with Laurec-Shepperd tuning	The stock at the present level of biomass can be considered as moderately exploited	- Not increase the fishing effort. - Consider the interactions with sardine fisheries.	In the present assessment, important improvements were made regarding the echo-survey data used as tuning index for VPA: in particular, for the first time, biological data from the western Adriatic were used to split into age classes only the abundance estimated by the western echo-survey, while biological data from the eastern Adriatic were applied to the eastern echo-survey abundance.	No further comments. Endorsed

	Sardina pilchardus	Catch, effort, LFD, rapido surveys	1975-2009	VPA with Laurec-Shepperd tuning	The stock at the present level of biomass can be considered as moderately exploited	- Not increase the fishing effort. - Consider the interactions with anchovy fisheries.	In the present assessment, important improvements were made regarding the echo-survey data used as tuning index for VPA: in particular, for the first time, biological data from the western Adriatic were used to split into age classes only the abundance estimated by the western echo-survey, while biological data from the eastern Adriatic were applied to the eastern echo-survey abundance.	No further comments. Endorsed

Document n° 1: GSA 01 Stock assessment of anchovy (*Engraulis encrasicolus*).
Abstract:

Anchovy in GSA01 is exploited by purse seine fleet. This exploitation is based on the first age classes (mainly 0 and 1). Purse seine fleet mainly target on anchovy and sardine but other species with lower commercial value as horse mackerel, mackerel and gilt sardine are also caught.

According to official data, purse seine fleet in GSA01 has been continuously decreasing from more than 230 vessels in 1980 to 113 vessels in 2009 (20 smaller than 12 m and 93 between 12 and 24 m). This fleet operates exclusively on the continental shelf, fishing 12 hours per day and 5 days a week, with temporary fishing closures between March and April. The minimum landing size is 9 cm.

Official landings time series 2002-2009 is available from all fishery ports in GSA01. In the commercial landings, length distribution and biological sampling are available from 2003 to 2009 from IEO sampling network and Spanish National Data Collection. For 2002, length distributions estimated in 2003 were applied. Acoustic surveys have been performed, but they are incomplete and fragmented. The natural mortality vector (M) was derived from PROBIOM (Caddy and Abella, 1999). The methods used were Extended Survivor Analysis (XSA), Yield per recruit (Y/R) and Annual Exploitation Rate (E=F/Z).

Catches are quite stable or slightly going down, the stock seems to be in a relatively comfortable situation, with good signs of recruitment and good amount of survivors, according to the size distributions. According to that, the stock is considered fully exploited, with moderate fishing mortality and intermediate abundance and it is recommended not to increase the fishing effort Nevertheless, the management of anchovy fisheries needs to account for the multi-species effect, mainly the interaction with sardine.

WG Comments

The XSA analysis does not provide a reliable assessment due to the lack of reliable tuning data in terms of coverage and age-length keys. Tuning data series from acoustic surveys (ECOMED and MEDIAS) in the GSA01 is incomplete and fragmented: there are no survey data from 2000, 2001, 2002, 2007 and 2009, and incomplete coverage in 2003, 2006, 2008 and 2010. Acoustic estimates by age are not coherent with catches by age due to ALK problems. The WG considers the XSA analysis as provisional and found it unsuitable as basis for advice.

SC RECOMMENDATIONS

The SC endorsed the assessment as provisional, recommends to gather more reliable information and to use all the available data to produce an effective assessment of this stock and accepted the comments of the WG regarding the reliability of the Extended Survivor Analysis results.

Document n° 2: GSA 01 Stock assessment of sardine (*Sardina pilchardus*).
Abstract:

Sardine in GSA01 is exploited by purse seine fleet. This exploitation is based on the first age classes (mainly 0 and 1). Purse seine fleet mainly target on sardine and anchovy but other species with lower commercial value as horse mackerel, mackerel and gilt sardine are also caught. According to official data, the purse seine fleet in GSA01 has continuously decreased from more than 230 vessels in 1980 to 113 vessels in 2009 (20 smaller than 12 m and 93 between 12 and 24 m). This fleet operates exclusively on the continental shelf, fishing 12 hours per day and 5 days a week, with temporary fishing closures between March and April. The minimum landing size is 11 cm.

Official landings time series 2000-2009 is available from all fishery ports in GSA01. In the commercial landings, length distribution and biological sampling are available from 2003 to 2009 (combined for 2000-2002) from IEO sampling network and Spanish National Data Collection. Acoustic surveys have been performed, but they are incomplete and fragmented. The natural mortality vector (M) was derived from PROBIOM (Caddy and Abella, 1999). The methods used were Extended Survivor Analysis (XSA), Yield per recruit (Y/R) and Annual Exploitation Rate (E=F/Z). The total catch has been relatively stable along the time series (2000-2009) but the fraction of young fish seems to have decreased since 2004.

In the first years covered by the XSA analysis in which the assessment of the fishing mortality is less sensitive to the survey information it appears that the fishing mortality has been in the order of 0.2 to 0.43 suggesting a moderate fishing mortality in those years. The Yield per Recruit analysis indicates F0.1 at 0.23. The change in the age composition in the catches in the last three years may suggest lower recruitment than in the past. Accordingly, the stock is considered Fully exploited, with moderate fishing mortality, intermediate abundance and some concerns about the recruitment. It is recommended not increase the fishing effort and take into account that the management of sardine fisheries needs to account for the multi-species effects, mainly the interaction with anchovy.

WG Comments

The XSA analysis does not provide a reliable assessment due to the lack of reliable tuning data in terms of coverage and age-length keys. Tuning data series from acoustic surveys (ECOMED and MEDIAS) in the GSA01 is incomplete and fragmented: there are no survey data from 2000, 2001, 2002, 2007 and 2009, and incomplete coverage in 2003, 2006, 2008 and 2010. Acoustic estimates by age are not coherent with catches by age due to ALK problems. The WG considers the XSA analysis as provisional and found it unacceptable as basis for advice.

SC RECOMMENDATIONS

The SC endorsed the assessment, recommended to gather more reliable information and to use all the available data to produce an effective assessment of this stock and accepted the comments of the WG regarding the reliability of the Extended Survivor Analysis results.

Document n° 3: GSA 03 Stock assessment of sardine (*Sardina pilchardus*).
Abstract:

For several decades, the sardine constituted between 50 and 70% of the total landings of small pelagic of the Moroccan Mediterranean. However, the production of sardine declined during the last years, because of the increase in the fishing effort exerted by the sardine fleet on this resource. The landings of sardine in the Moroccan Mediterranean varies between 10,000 and 25,000 tonnes/year. In the years 2000 to 2009, the annual average landings of sardine were approximately 14,020 tons. The fishing of small pelagic is by a fleet of approximately 140 units, that is to say 20% of the operational coastal fleet in the Moroccan Mediterranean. The sardine boats of the Mediterranean are based mainly with Me diq (35%), Nador (27%) et al. Hoceima (25%). It should be noted that these units can carry out displacements towards the ports of the Atlantic, in particular the port of Larache. The sardine and the anchovy constitute the target species towards which the fishing effort of the sardine boats is directed; the sardine for its remarkable abundance compared to the other species and anchovy for its high commercial value. The time series of the captures of sardine since the year 2000 has important fluctuations, but with a stable general tendency. The evolution of the captures shows a reduction of the captures between 2000 and 2003, followed by an increase between 2004 and 2006 and then a new reduction in 2007 and 2008 and an increase in 2009.

The fishing effort (expressed as number of positive exits X Tjb) exerted on the sardine stock between 2000 and 2009 was generally stable with peaks in 2002 and 2005, while the CPUE was declining. The CPUE was relatively high in 2000 and 2001, then it fell to the half in 2002. A clear improvement was observed in 2004 and 2006 followed by an important fall in 2008 and a clear rise in the outputs in 2009.

Statistics of the landings of sardine in weight and the fishing effort of the sardine boats (number of exits) are obtained monthly starting from the National office of Fishings (ONP). The biological data obtained for the evaluation of the state of exploitation of sardine are those of the years 2000 to 2009 from the ports of Nador, of Short-nap cloth Kebdana and from Al Hoceima. The data of landings and fishing effort come from the ports from the Moroccan Mediterranean except that from Tangier since the captures of this port are carried out in the Atlantic. Aan analysis of pseudo-cohort was made by means of the Software LIVES (Lleonart and Salat, 2000), on the average of the frequencies of sizes of sardine balanced at the whole zone of the Moroccan Mediterranean during the three last years to know 2007 to 2009

Most of the catches are of large sardine. However, the analysis of the size frequencies also shows a considerable portion of young sardine below the size of the first sexual maturity (13.3 cm). These captures are carried out especially during May and come primarily from the area of Short-nap cloth Kebdana, located at the easternmost part of the Moroccan Mediterranean.

The analysis of the outputs by recruit indicates a state of full exploitation of the sardine stock in the Moroccan Mediterranean. It is recommended to maintain the current fishing effort; to reduce the mortality of fishing on the spawning fish, to introduce seasonal closure during January which coincides with the peak of the spawning and to prohibit fishing during May near Short-nap cloth Kebdana to preserve the stock of the young fish.

The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS
The SC endorses the assessment and suggests to change the expression "*maintain the fishing effort*" by "*not increase*" in the list of recommendations for management given by the WG

Document n° 4: GSA 06 Stock assessment of anchovy (*Engraulis encrasicolus*).
Abstract:

Anchovy in GSA06 is exploited by purse seiners. Three fleet segments, distinguished by vessel size are recorded. The catch (landings) is not split by Fleet segments. It comprises 9814 tonnes in 2009 for the three Operational Units.

The exploitation is based on the first age classes 0, 1 and 2. The number of vessels in the fleet has declined slightly over time, but has been stable at 132 vessels since 2007. Official landings time series 2002-2009 is available from all fishery ports in GSA01. In the commercial landings, length distribution and biological sampling are available from 2003 to 2009 from IEO sampling network and Spanish National Data Collection. For 2002, length distributions estimated in 2003 were applied. Length distributions were converted to age using a combined ALK 2003-2009, for all the years. Biological sampling 2003-2009 was used for Maturity at age and Weight-Length relationships. Acoustic surveys have been performed, but they apparently only cover the youngest age. The natural mortality vector (M) was derived from PROBIOM (Caddy and Abella, 1999). Extended Survivor Analysis (XSA), Yield per recruit (Y/R) and Annual Exploitation Rate (E=F/Z) are the methods used. The catches have had a strong downwards trend throughout the time series (which goes back to 2008. The exception is 2009, where the catches increased markedly. In the length composition in the catches, the balance between

small and large fish has been relatively stable, except in 2009, where the peak in the distribution is at 14 cm, and the distribution stops abruptly above that. The survey appears only to reflect the recruitment (age 0 abundance). According to the survey, the recruitment has declined gradually since 2003, but with a strong year class in 2008 and an intermediate year class in 2009. The evidence points in the direction of the recruitment as the main driving force in the population dynamics, where the stock and catches have declined as a result of a declining recruitment. Hence, the stock abundance is considered as low, while the exploitation rate is uncertain.There is no clear evidence of an expansion of the fishery and exploitation level. The stock biomass in itself is not known, but it seems likely that it has declined in line with the decline in the catches and biomass. The length distribution in the 2009 catches raises some concern, as the large fish are poorly represented in the catch that year. Hence, it is unclear how this fishery has depleted the spawning biomass. In this situation, a precautionary approach to the management would be to avoid depleting the spawning stock to levels below the recent years, since a lower spawning biomass may not be able to respond to favourable environmental conditions.

WG Comments
The WG considers the XSA analysis as provisional and found it unacceptable as basis for advice. The main shortcomings of the analysis were the use of a common ALK for all years, and doubts about the natural mortality.
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorses the assessment and the related recommendations of the WG

Document n° 5: GSA 06 Stock assessment of sardine (*Sardina pilchardus*).
Abstract:

The fleet information and the data and methods used are the same than for anchovy above. The results showed The catches have had a strong downwards trend throughout the time series (which goes back to 1994.) The 2009 catch is the lowest on record. In the length composition in the catches, the balance between small and large fish has been relatively stable, except in 2009, it is strongly skewed towards small fish. According to the survey, the recruitment has declined gradually since 2003, but with a stronger year class in 2009. Fish from age 1 and upwards has been almost absent in the survey since 2007, and has virtually disappeared in 2009.
Recruitment seems to be main driving force in the population dynamics, where the stock and catches have declined as a result of a declining recruitment. In addition, the length distributions and age distributions indicate that older fish is depleted more rapidly in recent years, in particular after 2007. The reason for that is not clear, but the fishery must be at least partly responsible. Migration to other areas is not likely as the same trends are seen in GSA07.
The stock biomass in itself is not known, but it seems likely that it has declined in line with the decline in the catches and survey index. Although the recruitment in 2009 is encouraging, the incoming year class now dominates the stock almost completely. The exploitation rate is not known, but it is likely that it is high, as the year classes are depleted rapidly.

The stock has declined over many years, partly due to reduced recruitment and partly to poor survival of the recruits. Most likely, the stock has been increasingly overexploited in recent years. Therefore, a substantial reduction in exploitation is advised.

WG Comments

The WG considers the XSA analysis as provisional and found it unacceptable as basis for advice. The main shortcoming of the analysis is the lack of reliable tuning data.
The WG also would recommend that further consideration is given to the assumptions about natural mortality.
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:

The SC endorses the assessment and the related recommendations of the WG

Document n° 6: GSA 07 Stock assessment of anchovy (*Engraulis encrasicolus*).
Abstract:

The fishery is almost exclusively by trawlers, targeting anchovy and sardine. Since 2002, the number of vessels targeting anchovy has gone down from 56 to 20. The number of vessels in the whole trawler fleet remains stable at around 100. The catches went down from 8,000 tonnes in 1998 to 2249 tonnes in 2005, and has fluctuated around 2,500 to 4000 tonnes since then. The catch in 2009 was 2460 tonnes .The main source of information is the acoustic survey PELMED performed in July. As evaluation method, the solution chosen for the gulf of Lion is to use direct assessment by echo - integration while completing them with indicators of the fishing activity. PELMED surveys are performed in July. The acoustic assessment results are completed by an analysis of catches and fishing effort to improve the fisheries diagnoses. In the current assessment just a direct comparison of the level catches to the level of biomass of the stock was carried out.

The global pelagic species biomass estimated during Pelmed surveys showed strong fluctuations according to years. Modal length class progressively decrease from 2005 to 2010 to reach to 10-13 cm in 2009-2010 (vs. 13-14.5 cm before). Large anchovy (>15 cm) quasi disappeared in the same period, which was common before 2007 (maximum length observed in the gulf of Lion: 18 cm).In 2009, a lot of fish from age 1 was found and it seems the same happened in 2010 except that age 2+ was poorly represented, or absent.

Fishery exploitation rates of acoustic estimated biomasses were moderate and stable around 10% in the time series, except 18-20% for 2007-2008 years.

Trawlers targeted fishes size >13 cm before 2007, corresponding to age 1+, with annual variability. Current modal class in catches was < 13cm from 2009. Age 0 was not targeted, except in 2007 (25% of landing). Trawlers effort and catches were progressively reduced from 2005 to 2010. Most of them stopped their activity at the end of 2009. Current fishery effort on anchovy was limited to an exploratory activity in 2010. Catches were characterized by stable CPUE. From 2009, low commercial value for anchovy combined with mixed catches (small anchovy with a lot of small sprat) reduce the attractiveness for anchovy. The amount of sprat in the area has increased remarkably in the most recent years.

Population, demographic and biological parameters obtained in 2009 and 2010 periods present some alterations for anchovy: More 80 % of biomasses were composed by age 1. Age 1 in 2008-2009 do not produce abundances as high as expected for age 2 and 3 in 2009-2010 period.

Few fishes had survived after 2 years in 2010 (<1%). Condition index, growth rate, and size at first maturity decrease significantly and quickly these 3 last years. Only small adult anchovy are available to constitute the spawning biomass: low fecundity versus high recruitments levels

observed in this stock since 2008, suggest an external spawning biomass contribution to Gulf of Lions.

Considering the acoustic survey biomass estimate as an unbiased measure of the absolute abundance, the exploitation rate (catch/biomass) is moderate. The current biomass levels are low regarding the total series of acoustic biomass available

The stock seems to be highly unbalanced in 2009 and 2010, with a very low abundance of commercial-sized anchovy (groups 2+). Even if total biomass was not very much lower than the average level of the last six years (20,000 – 30,000 T), most of the recorded biomass consisted of 1-group anchovy, and even these showed a mean size and condition factors appreciably below the values usually found for this stock. These signs indicate that the production capacity of the stock, and its potential to sustain an economic activity, is severely hampered, and it is essential to allow it to recover, by preventing additional sources of mortality to this already depleted population.

The management recommendations are - Reduce fishing effort on anchovy in the Gulf of Lions Fully observe the European regulation on minimum length size of catch (> 9 cm, UE 1967/2006) and consider interactions with sardine fisheries.

The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorses the assessment and the related recommendations of the WG

Document n° 7 :GSA 07 Stock assessment of sardine (*Sardina pilchardus*).
Abstract:

The fleet, the data and the methods used are the same than for anchovy assessment above. The assessment provided here is entirely dependent on the assumption of Acoustic biomass providing unbiased estimates of the absolute level of biomass at sea.

The global species biomass estimated during Pelmed surveys showed strong fluctuations according to years. In 2005, the level of accessible biomass of small pelagic fishes (all species) was around 472,000 tons, highest level of the 1993–2008 period. Mainly, the presence of a rich inshore zone of small sardines and an offshore zone of anchovy and biggest sardines was observed. But for some years this spatial distribution did not occur.

Large sardine biomasses (breeder >12.5 cm) dramatically decrease since 2005 (> 200 000 T) to reach its lower level in 2010 (<5,000 T). Small sardine (<12.5 cm) showed important recruitment since 2008 and they represent in 2009 and 2010 more than 80% of biomasses.

Fishery exploitation rates of acoustic estimated biomasses varied annually between 5 to 25% during the last ten years. Trawlers targeted fishes size >14.5 cm corresponding to groups 2+. Trawlers effort and catches were progressively reduced in the first half of 2009 period, and most of them stopped their activity at the end of 2009, until July 2010. In 2010, fishery effort on sardine was limited to an exploratory activity. Catches were characterized by low CPUE. Quite as the anchovy, small sardines ere mixed with a lot of small sprats. The landings had low commercial values, which limited fishing effort.

Population, demographic and biological parameters obtained in 2009 and 2010 periods present some alterations: Eighty percent of biomasses was composed by age 0. Groups 0 and 1 in 2008-2009 do not produced abundances as high as expected for age 1 and 2 in 2009-2010 period. Few fish survived after 2 years in 2010 (<1%).Condition index, growth rate, and size at first maturity decrease sensitively and quickly these 3 last years. Very low and depleted biomass of adult (age 1+) wasn't in accordance with high recruitments levels observed in this stock since 2008, suggesting an important external spawning biomass contribution to Gulf of Lion.

The stock seems to be highly unbalanced in 2009 and 2010, with a very low abundance (less than 10% of the total biomass) of commercial-sized sardines (groups 1+). Besides, for two years in a row, recruits have almost completely disappeared from the stock, with very few survivors the

following year. The system of the Gulf of Lyons shows important signs of unbalance since 2008, with important reductions and changes in structure of the stocks of sardine and anchovy, and an unusually high abundance of sprat.

These signs indicate that the production capacity of the stock, and its potential to sustain an economic activity, is severely hampered, and it is essential to allow it to recover, by preventing additional sources of mortality to this already depleted population. The management recommendations are - Reduce fishing effort on anchovy in the Gulf of Lion

Fully observe the European regulation on minimum length size of catch (> 11 cm, UE 1967/2006) and consider interactions with sardine fisheries.

Gulf of Lion small pelagic fisheries are multispecies and effort on sardine cannot be separated from effort on anchovy, so that most of the management decisions have to be taken, considering both species.

The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorsed the assessment and the related recommendations of the WG

Document n° 8: GSA 16 Stock assessment of anchovy (*Engraulis encrasicolus*).
Abstract:

Small pelagic fleets in GSA 16 are mainly concentrated in Sciacca port. As a result, catches are mainly landed in this port. Information collected in the framework of CA.SFO. Study project (Patti et al., 2007) showed that landings in Sciacca port account for about 2/3 of the total landings in GSA 16. Two operational units (OUs) are presently active in Sciacca port, purse seiners and pelagic pair trawlers. In both OUs anchovy represents the main target species due to the higher market price.

During the last decade the importance of pelagic pair trawlers has increased compared to the traditional purse seine fishing activity, which in turn showed no significant trend in terms of fishing effort.

Catch (landing) data herein used are from census data for Sciacca port (1998-2009) and from sampling data of DCR program for the landings of the whole GSA16 (2006-2009). Biomass evaluations used for the analysis are from echo-surveys carried out from 1998 to 2009 in the Strait of Sicily. Some DEPM biomass estimates available for the anchovy population in GSA 16 (years 1998, 2000-2001, 2005-2006) were also reported for comparison purposes, in order to show that they are in the same order of magnitude of acoustic biomass estimates.

The present assessment is based on the comparison of acoustic biomass estimates and estimated landings. Specifically, the average value over the last four years (2006-09) of the estimated exploitation rates calculated as the ratio between total landings and acoustic biomass was used.

General trend in landings is slightly increasing for both the OUs. It worth noting that, even though mid-water pair trawlers are present in Sciacca port only, they contribute significantly to the total anchovy landings.

The series of acoustic biomass estimates for the anchovy population show a marked decreasing trend, despite quite large inter-annual fluctuations, from a maximum of about 22,900 t in 2001 to a minimum of 3,100 t in 2008. Latest biomass estimates (2006-2009 surveys) are the lowest of the series. The estimated average exploitation rate over the last four years (2006-2009) is high (0.79). According to this value, the fishing mortality is considered high and stock abundance very low. The latest biomass estimates (2006-2009 surveys) are the lowest of the series. The stock biomass did not recover from the 2006 drop in biomass (-69% from July 2005 to June 2006), and also

further decreased (-53%) in 2008. This fact, along with the quite high and increasing catches and exploitation rates but with high variability experienced over the last years, give a warning about the sustainability of current levels of fishing effort.

Therefore it is recommended that fishing effort should not increase. In addition, - Not increase the fishing effort; -Assess the impact of fry fishery may have. - Not extend fry sardine fishery after March to avoid additional mortality on juvenile anchovy.

WG comments
Negative effects on these populations could result from pressure of other fishing gears on pre-juvenile stages (locally known as "bianchetto" or "neonata"). This fishing activity is allowed for two months during the winter (February-March), so it essentially affects sardine but it may also be relevant for anchovy if seasonal restrictions are not properly enforced.
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
Since the stock is characterised by both high exploitation rate and low biomass the SC recommends to change "not increase the fishing effort" into "decrease the fishing effort". Endorsed with this modification

Document n° 9: GSA 16 Stock assessment of sardine (*Sardina pilchardus*).
Abstract:

The fleet, the data and the methods used are the same than for anchovy assessment above.

The general results are similar to those obtained in previous assessments. Average sardine landings over the period 1998-2009 were about 1,400 metric tons (Sciacca port only), with a general decreasing trend but large inter-annual fluctuations. Biomass evaluations from echo-surveys carried out from 1998 to 2009 in GSA 16 show that sardine population experienced quite large inter-annual fluctuations (Patti et al. 2004), from a maximum of about 36,300 t in 2000 to a minimum of 6,000 t in 2002. Latest biomass estimates (2006-2009 surveys) are at intermediate/low level (on average about 10,000 tonnes, just above the first quartile of the series) compared to the rest of time series. The estimated average exploitation over the last four years (2006-2009) is relatively low (0.20). Accordingly the fishing mortality is estimated as moderate and the stock abundance as low/intermediate. The WG recommended that the fishing effort should not increase. Assess the impact of fry fishery. As the impact of fry fishery on this population is not known, a proper quantification of the catches in the fry fishery is mandatory

WG Comments
Over the last four years the population appears to be stable though at a relatively low level. However, taking into account the moderate exploitation rates experienced, results would suggest the stock being able to tolerate the current level of exploitation
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorses the assessment and the related recommendations of the WG.

Document n° 10: GSA 17 Stock assessment of anchovy (*Engraulis encrasicolus*).
Abstract:

Anchovy are fished by purse seiners, attracting fish by light, and pelagic trawlers belonging to Italy, Croatia and Slovenia. The fishery takes place all year round: a closure period is observed from the Italian pelagic trawlers on August, while from 15th December to 15th January in Croatia. Exploitation is based on all the age classes from 0 to 4+.

The Italian catches of anchovy represent the greater part of the total catches of anchovy, while the eastern small pelagic fisheries concentrate mainly on sardine.

The Italian fleet is composed of about 65 pairs of mid-water trawlers and about 45 purse seiners (with quite different tonnage), with the former being predominant on the latter ones.

In Croatia, small pelagics (mainly sardine) are fished by purse seiners. On the other hand, in Slovenia, mid-water trawlers gradually caused the disappearance of purse seiners since 1991.

The data used for the present assessment derive from the catch recorded for the fleets from Italy, Croatia and Slovenia, from 1975 to 2009. The biological information needed to distribute numbers of caught individuals into age class are available since 1975 for the western side, and from the 2001 for the eastern one.

Echo-survey abundance index was used to tune the VPA. The echo-surveys were carried out for both the western and eastern sides from 2004 onwards. Western echo-survey abundances were split into age classes by means of length frequency distribution coming from the western echo-survey and age-length key coming from the Italian commercial fleet. Eastern echo-survey abundance was distributed into age classes by the means of length frequencies and age-length key coming from the Croatian commercial fleet.

Split year was used, by fixing the birthday date on the first of June, according to the biology of the species in the Adriatic Sea.

The natural mortality rate M was taken as variable over age and was calculated using the Gislason's equation. The growth parameters required by this method were derived from the biological sampling of the Italian catches. Methods used are: Virtual Population Analysis (VPA) with Laurec-Shepherd tuning.

The fishing mortality rates F on the oldest age were fixed to avoid not reliable estimates of abundance in some years. Shrinkage for F was also applied, in order to avoid steep increase in the biomass of recent years.

The exploitation rate F/Z was estimated over the Patterson's threshold 0.4 before the collapse registered in 1987 and in the years of the "apparent collapse" (1999 to 2001), while, recently, was under this threshold. The stock at the present level of biomass can be considered as moderately exploited.

Despite the positive trends showed from the analysis performed, since this stock can have large fluctuations associated with recruitment fluctuations, the advice is to not increase the fishing effort and consider the interactions with sardine fisheries.

The Daily Egg Production Method (DEPM) is being developed to estimate the spawning stock biomass of the entire GSA 17.

WG comments

In the present assessment, important improvements were made regarding the echo-survey data used as tuning index for VPA: in particular, for the first time, biological data from the western Adriatic were used to split into age classes only the abundance estimated by the western echo-survey, while biological data from the eastern Adriatic were applied to the eastern echo-survey abundance.

The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:

The SC endorses the assessment and the related recommendations of the WG.

Document n° 11: GSA 17 Stock assessment of sardine (*Sardina pilchardus*).
Abstract:
Fishery
The fleet, the data and methods are the same than the used for anchovy above.
Echo-survey abundance index was used to tune the VPA. The echo-surveys were carried out for both the western and eastern sides from 2004 onwards.
Echo-survey abundance index was used to tune the VPA. The echo-surveys were carried out for both the western and eastern sides from 2004 onwards. Western echo-survey abundances were split into age classes by the means of length frequency distribution coming from the western echo-survey and age-length key coming from the Italian commercial fleet. Eastern echo-survey abundance was distributed into age classes by the means of length frequencies and age-length key coming from the Croatian commercial fleet.
Calendar year was used, by fixing the birthday date on the first of January, according to the biology of this species in the Adriatic Sea.
The natural mortality rate M was taken as variable over age and was calculated using the Gislason's equation. The growth parameters required by this method were derived from the biological sampling of the Croatian catches. Virtual Population Analysis (VPA) with Laurec-Shepherd tuning from echo surveys data was applied.

The trend in biomass of sardine obtained by VPA method fluctuated over the time interval examined, with a high peak in the middle of the 1980s. After the mentioned peak, biomass of sardine continuously decreased due to a drop in the recruitment, which most likely was caused by environmental influence. A slow but continuous recovery has started since 2000. This trend is also reflected in the biomass estimated by the echo-survey from both the west and east part of the Adriatic.
The fishing mortality is moderate (about 0.3) but higher than before the period with low recruitment. The exploitation rate F/Z was estimated over the Patterson's threshold 0.4 between 2000 and 2002. In recent years, the exploitation rate was under this threshold.
The stock at the present level of biomass can be considered as moderately exploited.
Since this stock can have large fluctuations associated with recruitment fluctuations, the advice is to not increase the fishing effort.
The Daily Egg Production Method (DEPM) is being developed to estimate the spawning stock biomass of the entire GSA 17.

WG comments
It should be noted that Adriatic small pelagic fishery is multispecies and effort on sardine stock cannot be separated from effort on stock of anchovy. Hence, management decisions have to be taken considering both species.
In the present assessment, important improvements were made regarding the echo-survey data used as tuning index for VPA: in particular, for the first time, biological data from the western Adriatic were used to split into age classes only the abundance estimated by the western echo-survey, while biological data from the eastern Adriatic were applied to the eastern echo-survey abundance.
The WG endorses the assessment and the related recommendations.

SC RECOMMENDATIONS:
The SC endorses the assessment and the related recommendations of the WG.

FROM THE WORKING GROUP ON <u>SMALL PELAGICS</u>

22. The WG stated that assessment and management advice for small pelagic in the Mediterranean is still in an early phase of development. However, there is considerable progress on several aspects, in particular there is increasing cooperation between scientists and institutions throughout the area. The WG regarded this as a very welcome development. The future directions that could be taken in this progress were discussed. In all cases, harmonization and coordination among institutes is a key factor. These suggestions to some extent overlap ongoing projects, and the WG emphasizes that the intention with the suggestions here is not to undermine these projects, rather, it would like to see more of that kind.

23. The SC examined the following recommendations raised by the WG on small pelagics.

- **WG RECOMMENDATIONS**:

a) Exchange of comparable data across the Mediterranean as a first step to facilitate understanding of the impact of environmental processes common to the whole area.
b) Assemble information across areas that can improve the understanding of stock identities.
c) Harmonization and coordination of surveys across areas. Coordination in time and space, common standards for instrumentation and interpretation of echograms, general exchange of insight and experience.
d) Representative sampling from catches. (Not only ad hoc on the market). The EU data collection is a good guidance, but nations outside the EU may also need to improve standards.
e) Development of suitable analytic assessment tools to analyze the data, provide a simulation test bench for management strategies and reference points and other guidance for management. Small, short-lived pelagic species with highly variable recruitment are not suited for standard age-based assessment tools.
f) Development of guidance for management suited to short lived species with strong and rapid dynamics, including suitable reference points.

24. The SC endorsed the above WG recommendations, suggesting to make an effort to propose for the next WG a management approach for in order to face with the complex problems of small pelagics' dynamics. These approach should be based on the following considerations included in the WG report:

- Both sardine and anchovy are short lived species with rapid dynamics mainly driven by variable recruitment. Variations in the environment is generally believed to be the main driving force for fluctuations of stock biomass, but the exact environmental factors and the mechanisms by which they influence the stock are still not well understood.

- In small pelagics the role of the stock biomass in determining recruitment success is likely minor in most cases. As recruitment obviously requires a spawning stock, a too strong reduction in the spawning stock, regardless the fishery effect, is bound to have

detrimental consequences for the recruitment. Therefore, a sufficient stock abundance should be ensured for the stock to respond to favourable environmental conditions, once such conditions appear.

• Lacking other evidence, a minimum level of small pelagic biomass should therefore correspond to the lowest level where it historically enabled the stock to produce a good recruitment.

25. The SC recommends that, in absence of formal BRP, an empirical approach combining stock status (Biomass from echosurveys) and pressure indicators (harvest ratio and an adequate proxy of environmental stress), in a Traffic Light scheme, will be explored as a proper assessment framework. In order to identify Biological Reference Points these indicators could be preliminary scaled according to a quartile approach.

REVIEW OF THE CONCLUSIONS AND RECOMMENDATIONS OF THE TRANSVERSAL WORKSHOP ON EUROPEAN EEL

26. The coordinator introduces the conclusions and recommendations of the workshop. The SC suggests that if larvae are finally produced within the framework of the European Research Project (ProEEL) it would be desirable to use the produced eels for aquaculture as well as for restocking.

27. Concerning the proposal for the Constitution of a Permanent Working Group on European Eel, the SC agreed that it is not the proper time given the shortage of scientific information available at present. Instead a network of experts should be established and a tight collaboration with the working group on Eel management of l'EIFAC/ICES is advised.

28. To complete the data gathering and to assemble the scattered information in the countries, the SC suggested the following actions to be undertaken :

1/ Gather and synthesize information on the regulations (Fisheries and Habitat conservation) by countries and on the biological parameters by habitat in coordination with the LAMED project (executed by GFCM Secretariat and funded by Italy)

2/ Collate and analyze main information useful for the Eel MPs as described in the GFCM draft publication on European eel as presented to the sub committee meeting. The raw data shall be transmitted to the GFCM secretariat.

3/ Initiate the setting up of a network of Mediterranean experts on eel fisheries in collaboration with the working group on Eel management of EIFAC/ICES;

29. The conclusions and recommendations of the WS on European Eel are endorsed by the SC, with the above comments.

FUTURE ACTIVITIES RELATED TO THE STOCK ASSESSMENT OF SELECTED ELASMOBRANCHS.

30. A presentation by A. Abella: "Suitable Methods for Stock Assessment of Elasmobranchs" is introduced to the SC.

Abstract

Elasmobranches are characterized by low growing rates, they are relatively long lived, show a late age of maturity and a reduced fecundity. On the other hand they are characterised by relatively low natural mortality rates after hatching.

Over-exploitation on predators at the top of marine food webs is observed worldwide. This is particularly true for many shark and rays species which are characterized by high longevity and low fecundity. Elasmobranches are seldom the target of a fishery, but may form an important part of the by-catch.

Statistics on catch, landings, age composition of the commercial catch of elasmobranches are in many areas lacking or are incomplete, and this fact make difficult or impossible the use of many traditional approaches for stock assessment of species belonging to this group. As an alternative, life history features have proven potentially useful means to accomplish stock assessment for such species. Such life history traits that are relatively easy to measure have been successfully used for the assessment of the stocks status and the likely response to exploitation rates. In this contribution, the potential use of traditional and/or alternative approaches for the assessment of chondrichtyans is discussed, and some examples of application of some methods are reported.

31. Given the wide range of methods presented, the SC encourages to progress on the evaluation of elasmobranches stock by using the less data demanding ones. Productivity and Susceptibility Analysis (PSA), "Composite" models, Non equilibrium Biomass Dynamic Models as well as Yield per recruit Beverton & Holt type model have been proposed as more suitable. Some participants stressed the fact that in the Mediterranean, several series of data from trawl surveys are available for wide areas that could be used for assessment by simple global or analytical models to get an assessment of some priority species.

32. A certain agreement should be attained at the SC level to establish common methods according to the data available for all species being assessed not only for the elasmobranches, but also for the rest of species both demersal and small pelagic.

REVIEW OF THE RECOMMENDATIONS OF THE ELASMOBRANCHS WORKSHOP

Concerning the Recommendations, the following comments have to be considered. :

- **WS RECOMMENDATION**: For the following areas the meeting agreed to propose applying fishing **area closures** of nursery grounds to trawling operation (considering this measure as the only real effective against the by-catch of elasmobranches juveniles in critical areas of the GSA 22 (Aegean Sea), GSA 14 (Gulf of Gabès) and GSA 9 (North Tyrrhenian Sea).

33. The SC endorses but recommends to evaluate the likely consequences of the closure on the stocks and fisheries.

- **WS RECOMMENDATION:** For the first Stock assessment meeting and the age readings training course foreseen to be held in 2011, seven species have been selected for consideration according to various criteria (existing data on age and growth, abundance, conservation status, economic value, knowledge of biological parameters). The selected species are *Prionace glauca, Raja clavata, Squalus acanthias, Squalus blainvillei, Rhinobatos cemiculus, Rhinobatos rhinobatos, Scyliorhinus canicula.*

34. Concerning the list of 7 priority species selected by the WS, the SC suggests to not limit the number of species but assess those species for which information are available, that are not included in the list.

- **WS RECOMMENDATION**: Launch pilot studies on measures to reduce bycatch by fishing gears and fishing strategies adaptation and/or fishing areas exclusion. Some GFCM GSAs have been proposed as appropriate for the development of pilot small scale implementation based on the present experts knowledge of the fisheries acting and on the species occurring in those areas ;
  - ➢ For the following areas the meeting suggested to adopt the use of circle hooks and nylon snoods in part of the longline fleets to verify the reduction of the pelagic species bycatch: GSA 1 (Northern Alboran Sea); GSA 2 (Alboran Island) and GSA 3 (Southern Alboran Sea); GSA 5 (Balearic Islands); GSA 14 (Gulf of Gabès)
  - ➢ For the following areas the meeting agreed to propose applying fishing area closures of nursery grounds to trawling operation (considering this measure as the only real effective against the bycatch of elasmobranches juveniles in critical areas):- GSA 22 (Aegean Sea); GSA 14 (Gulf of Gabès);- GSA 9 (North Tyrrhenian Sea)

35. In the case of launching some pilot studies on measures to reduce bycatch by fishing gears and fishing strategies adaptation and/or fishing areas exclusion, it is recommended that a study to quantify the effects of the measure adopted, trough the analysis of the situation before and after the application. The SC mentioned that the occurrence of nurseries of *Raja clavata* and *Raja miraletus* were identified in GSA 15 and 16 (Strait of Sicily) within the framework of the FAO regional project MEDSUDMED.

36. SCMEE 2010 Recommendation forwarded to the SCSA: The Subcommittee on Marine Environment and Ecosystems recommends holding an assessment meeting on Mediterranean and Black Sea elasmobranches stocks taking into account the on-going work under the ICCAT/ICES framework, and an age reading training course in 2011. Doubtful species from the taxonomic point of view should not be considered for stock assessment purposes.

37. The SCSA endorsed the recommendation and propose in agreement with SCMEE to carry out assessments on selected Mediterranean and Black Sea elasmobranches stocks. The SC propose to assess, inside the activity of the next WG on demersal species, species such as *Raja clavata, Raja miraletus, Raja asterias* and *Scyliorhinus canicula,* when enough information is available.

38. Concerning the management recommendations of Elasmobranches WS, the SC agreed on the necessity to contemplate both conservation and exploitation aspects to reduce the negative

impact of fisheries on these species. Considering that elasmobranches are not target species for most Mediterranean fisheries, but caught in multispecies demersal fisheries or as by catch by the longliners, an effective strategy to protect these species should be defined, based on these peculiarities and aimed to mitigate the impact of fisheries on elasmobranches. Among the management measures, already available to implement this strategy, the adoption of circular hook in longliners is recommended for protecting pelagic species and the grid and separator for demersals (see selectivities and by catch WS report). The protection of nursery areas is recommended as a general tool to protect both pelagics and demersal elasmobranches.

REVIEW OF THE CONCLUSIONS OF THE TRANSVERSAL WORKSHOP SELECTIVITY IMPROVEMENT AND BYCATCH REDUCTION AND ALTERNATIVE GEARS

- **WS RECOMMENDATION**: To carry out more selectivity experiments (40 mm square and 50 mm diamond) based on the standardized methodology adopted in GFCM-ATSELMED 1. The aim is to get a maximum of information for the maximum GSA's number.

39. The SC endorsed the WS recommendation and advised to perform these experiments not only for comparing square/diamond mesh selectivity, but also using a wider range of square meshes sizes in order to obtain models relating mesh size to retention at size (such the one reported in the work of Bethke E., 2004). A simple general approach to codend selectivity of trawls and its application to the data of Fiorentino et al. (1998) for Hake (*Merluccius merluccius*). Fisheries Research 70 (2004) 113–119).

- **WS RECOMMENDATION**: To carry out experiments on alternative or complementary **technical devices** *e.g.* grids, separator panels, square mesh windows,) in all GFCM areas in order to improve the overall selectivity of trawls, including effects on vulnerable species as marine mammals, turtles and Elasmobranchs.

40. The Sub-Committee endorsed the WS recommendation and advised to consider in these experiments also the effect of separator panels to reduce the occurrence of debris and litters in the trawl net.

- **WS RECOMMENDATION:** To carry out **case studies on the socio-economical impact** of changes of trawl mesh sizes and shapes.

41. The Sub-Committee endorsed this recommendation.

- **WS RECOMMENDATION**: Considering the Ecosystem Approach, it is recommended to encourage using pots and traps instead of towed gears (dredges or trawls) for the fishing of some species as sea snail *Rapana venosa*, norway lobster *Nephrops norvegicus* and cuttlefish *Sepia officinalis*. Estimation of time, economic and social effects and costs taking for the replacement of the new gears should be evaluated.

42. The Subcommittee suggested to change the text of the recommendation in the WS report in order to not being so strong and specific, unless more scientific basis is provided. The phrase *"Passive gears (e.g., traps) can be considered also as alternative technical solutions to reduce impacts of bottom. However, a better knowledge of their selectivity is needed as well as to limit the risks of ghost fishing"*, is proposed as an alternative to reformulate the recommendation and to encourage species selective gears with less impacts.

FOLLOW-UP ON :

ESTABLISHING GFCM PROTOCOLS FOR SURVEYS AT SEA

43. The review done by the Secretariat in 2007 and available at http://151.1.154.86/GfcmWebSite/SAC/SCSA/2010/docs.html is presented with the complementary information.

44. A previous meeting in Libya in 2008 tackled this issue. At that meeting a framework for a common protocol for acoustics surveys was produced and made available to the GFCM members. The conclusion was that the MEDIAS protocol was consistent with this framework. In the two successive SAC meetings the following years, the Committee recommended to: *"Pursue the work aimed to develop a GFCM protocol for undertaking surveys at sea"*.
Concerning the trawl surveys, the Sub-Committee is once again requested to analyze the information provided (working documents of the Sub-Committee posted in the web) and to propose an option to adopt a common GFCM protocol, either here or in another specific workshop.

45. In order to progress on the elaboration of a common protocol, the SC proposes to remake a call for detailed protocols from the different countries, and to engage an expert to analyze them and to prepare a proposal for a standard GFCM protocol for scientific surveys in the Mediterranean.

CONTRIBUTION TO IMPROVING AND UPDATING THE SAC GLOSSARY

46. Some proposals for definition were suggested by the SC participants

> **Overfished** (or overexploited): A stock is considered to be overfished when its abundance is below an agreed reference target point, like $B_{0.1}$ or B_{MSY}. To apply this denomination, it should be assumed that the current state of the stock (in Biomass) arises from the application of excessive fishing pressure in previous years. This classification is independent of the current level of fishing mortality.

> **Stock subject to overfishing** (or to overexploitation): A stock is subject to overfishing if the fishing mortality applied to it exceeds the one it can sustainably stand, for a longer period. In other words, the current fishing mortality exceeds the fishing mortality that, if applied during a long period, under stable conditions, would lead the stock abundance to the target Abundance (Biomass or numbers) reference point.

47. These definitions need to be further discussed.

PROGRESS ON THE USE OF BIOLOGICAL INDICATORS AND DEVELOPMENT OF REFERENCE POINTS.

48. The Coordinator presented the progress on the use of biological indicators and development of reference points. Differences in adopting a proper assessment framework for demersals and small pelagics were debated.

49. Due the availability of yield and biomass per recruit analyses for most of demersal species, the adoption of BRP based on fisheries mortality and the shape of Y/R curve was of common acceptance. While a general agreement was reached on considering F_{max} as Limit Reference Point, the identification of a proper Target Reference Point was debated. Considering that MSY is widely accepted as a sustainable objective for sustainable fisheries, and taking into account the work done in the demersal WG, the SC agreed to use F0.1 as technical target reference point.

50. The absence of an agreed assessment framework based on the use of BRP in small pelagics was evidenced. This is mainly due to the limit to use classical analytic approaches and the strong effects of environmental factor on their dynamics.

51. In order to provide clear assessments and management advice, the SC suggest to explore, in the next small pelagics WG, an empirical approach based on standing stock as stock status indicator, the harvest ratio (catch/biomass from survey) as fishing impact, and some indicators (SST, Chlorophyll, condition factor,…) of environmental stress. These indicators should be ranked and a criterion based on a quartile approach is suggested in order to identify the critical area for which action to reduce fishing pressure should be taken.

LIFE HISTORY, SPAWNING AREA AND BIOLOGICAL PARAMETERS

52. A presentation by P. Hernández: "*Biological Parameters Database: ongoing proceedings***"** is introduced to the SC.

Abstract
The presentation introduced the progress achieved by the GFCM Secretariat on the SAC request for the elaboration of a web based database for the storage and organisation of biological parameters of an agreed list of six species. The list is going to be enlarged in a second phase. At present, the DB is in the state of excel sheets one for each of the species. The process to transform it in web based dynamic and searchable database is still in progress.

53. In order to improve the contents and the usefulness of the Data Base SC recommends to add the depth range on the habitat field, to add the methods used to gather the info (otolith readings, length frequency analyses,…) as well as the size range used to obtain the parameter value.

54. Also it was advised to add filters to contrast the reliability of data. If biological parameters for the species are not available for the Mediterranean, the users may provide those from other areas when the complete reference is provided and always in the surrounding areas, referring it to a certain GSA. One of the next species to be added to priority list could be *P. bogaraveo*.

55. It would be desirable that this database be connected with the SAFs through the operational unit and GSA code in order to make the information available for the stock assessment purposes.

PROGRESS ON THE REVISION OF THE STOCK ASSESSMENT FORMS AND CONNECTION WITH THE TASK 1.5 OF THE GFCM PROTOCOL FOR DATA SUBMISSION

56. The Sc Coordinator presented the proposal for new sheets of the Surveys at sea data. The proposed forms were reviewed by the SC. With minor amendments, the forms were validated by the SC. They are enclosed in Appendix III. The Coordinator will produce a summary document to introduce the approved forms to be presented to the SAC

57. Task 1 scheme of the data submission GFCM protocol has been presented and the situation of the present Task 1.5 (biological information on catch) has been introduced. Two possible options for its future are envisaged: either to be removed from task 1 and transform it and enlarge it as a Task 2 or to do minor modifications and leave it where it is. The suggestion is that in any case a connection through the Operational Units code with the SAFs and likely to the Biological Parameters database be established in order to make their information available for the stock assessment purposes.

58. The option of transforming it to a Task 2 is welcome, but in any case the definition of the data submission format and the way the four information sources (task 1, task 2, SAFs and BiolParam DB) should be connected should be the matter o a specific workshop together with the SCSI.

GENERAL RECOMMENDATIONS AND SCIENTIFIC ADVICE

59. The Sub-Committee recommended the use of an agreed framework, based on stock status and fishery pressure indicators related to adequate biological reference points, to evaluate and furnish advice in transparent and consistent way. In the case of the small pelagics, when knowledge is available, indicators related to the effect of environmental factor on stock dynamics should be included.

60. The Secretariat was requested to further investigate whether additional protocols for scientific surveys existed in national institutions. It was agreed that 2011 would be the deadline for reaction from the institutions.

61. The Sub-Committee recommended to include the new assessment forms for direct methods in the SAFs.

62. The SCSA agreed to update the definition of "overexploited" in the diagnosis sheet of the current SAFs using the first one reported in the SAC Glossary. A proposal of review and other definitions were also presented.

63. Due to the increasing use of Fishery Restricted Areas in management and conservation framework, the SCSA recommended to investigate the role of spatial based approach to fishery management. Since these tools have ecological, economic and social effects the Sub-Committee suggested strong link with SCMEE and SCESS to tackle this issue.

64. Concerning the development of the task 1.5, the Sub-Committee retains that the creation of a specific task 2 containing data on biological characteristic (length, age, sex, maturity) of catch, both in terms of landing and discard, should be more effective. This new task 2 should have the possibility to exchange data and information with the task1, the database on biological parameters and information and the SAFs.

2011 SCSA WORKPLAN

- **Stock assessment of selected elasmobranches**

65. In agreement with the SCMEE the proposal of carrying out assessments on selected Mediterranean and Black Sea elasmobranches stocks possibly during the SCSA assessment Working Groups is accepted by the SCSA.

- Other activities (to be defined by the Sub-Committee)

66. The Sub-Committee proposed to organize a joint Workshop with the SCMEE and SCESS on Spatial based fishery management.

    A provisional Terms of Reference were discussed with the Coordinators of the SCMEE and SCESS.

    1) Review main experiences of Spatial based Approach to Fishery Management (SAFM) in the world.
    2) Examine SAFM in the more wide context of the Integrated Management of the Coastal Zone
    3) Explore methods and propose case studies to assess the impact of Fishery Restricted Area (FRA) on commercial stocks, marine ecosystems and fisheries
    4) Evaluate the role of FRA, Territorial Use Right of Fisheries (TURF) and other SAFM tools in design fisheries management plans.
    5) Analyse the current and future approach to monitoring, surveillance and control in SAFM.

67. The Sub-Committee proposed to organize a joint Workshop with the SCSI to tackle the issue of the separation of Task 1.5 in new Task 2 and its possible connection with the SAFs and the Biological Parameters Database.

68. Working Groups on demersal species and on small pelagic species are proposed to be held simultaneously. The date and venue still to be defined.

5. Any other matters

69. Two contributions related to the Stock assessment work were presented with the titles :

> **The status of the exploitation of the mean stocks in Morocco (GSA 03)**
> (By Benchoucha S.)

ABSTRACT:

The assessment of the Mediterranean species under GFCM supervision and the assessment of shared stocks under COPEMED II project, play a big role in the elaboration of the Management plans of the main fisheries in the Mediterranean countries. Many Moroccan stocks are assessed every year by GFCM working groups. This species are *Merluccius merluccius*, Parapenaeus longirostris, Mullus spp, *Boops boops*, *Pagellus bogaraveo* and *Sardina pilchardus*. In 2010, *Pagellus bogaraveo* was assessed for the first time as a shared stock between Morocco and Spain under COPEMED II supervision. In 2011, COPEMED II will organize other working groups on other shared stocks as *Parapenaeus longirostris*, shared between Morocco, Spain and Algeria. The results of this Working groups will give more consistencies to the recommendations of the GFCM meetings.

> **Are the Balearic Islands (GFCM-GSA05) an individualized area for assessment and management purposes in the western Mediterranean?**
> (By Guijarro B)

ABSTRACT:

The Report of the 12th Session of the Scientific Advisory Committee (SAC) contains a comment on the need of improving knowledge of stock boundary in GSA05 (Balearic Islands) and exploring the possibility to join data of GSAs 05 and 06 (Northern Spain). However, no reason was given to support such comment. We briefly argue in this document why we consider GSA05 should be considered an individualized geographical subarea in the western Mediterranean for stock assessment and management purposes. The main issues supporting our arguments are: 1) Geomorphologically, the Balearic Islands (GSA05) are clearly separated from the Iberian Peninsula (GSA06) by depths between 1000 and 2000 m and minimum and maximum distances of 40 and 180 mn; 2) Physical geographically-related characteristics gives rise to differences in the structure and composition of the trawling grounds which are reflected in the relative abundance of some resources; 3) The assemblages exploited by fisheries differ between GSA05 and 06, giving rise to important differences in the main commercial species landed; 4) Fishing exploitation in GSA05 is much lower than in GSA06; the density of trawlers around the Balearic Islands is one order of magnitude lower than in adjacent waters; and 5) Related to this lower fishing exploitation, the resources in GSA05 are in a healthier state than in GSA06.

70. The Sub-Committee agreed on the conclusions of both presentations

Date and venue of the next SCSA meeting

71. GFCM headquarters in Rome, early October

The report was adopted at 19:45 of the 2 of December of 2010 and the meeting was closed.

<div align="right">**Appendix I**</div>

<div align="center">**Agenda**</div>

- **Opening and arrangement of the Sub-Committee meetings**

- **Transversal session: review of transversal issues**

    2.1. Workshop on Red Coral

    2.2. Transversal Expert meeting on Elasmobranches in the Mediterranean and black sea

    2.3. Workshop on European Eel

    2.4. Transversal Workshop on monitoring recreational fisheries in the GFCM area

    2.5. Transversal Working Group on Selectivity improvement and bycatch reduction and alternative gears.

    2.6 Transversal workshop on fishing capacity

    2.7 Follow up on:

        1. SAC Glossary

        2. *update of the SAC reference frame and future strategic plan*

- **Introduction to the SCSA meeting and adoption of the agenda**

- **Review of new stock assessments of demersal species and related scientific advice***

- **Review of new stock assessments of small pelagic species and related scientific advices***

6. **Review of new stock assessments of small pelagic species and related scientific advices* (Con't)**

7. **Future activities related to the stock assessment of selected elasmobranchs.**

8. **Review of the conclusions of the transversal workshop on European Eel**

9. **Follow-up on :**

    8.1. Establishing GFCM protocols for surveys at sea

    8.2. Contribution to improving and updating the SAC glossary

    8.3. Progress on the use of biological indicators and development of reference points.

    8.4 Life history, spawning area and biological parameters

    8.5 Progress on the revision of the stock assessment forms

10. **General conclusions and scientific advice**

11. **2011 SCSA workplan**

12. **Any other matters**

13. **Date and venue of the next meeting**

14. **Adoption of the report and closure of the meeting**.

* All assessment and related works should be presented only through the SCSA working group on stock assessment

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Proposal for Direct Methods Assessment Forms

SAC GFCM. **Subcommittee of Stock Assessment**	Assessment form Sheet TS1 Direct methods: trawl based abundance indices

Code	
Page	

Survey		Species		Trawler/OV

Sampling season	
Sampling design	
Sampler (gear used)	
Cod –end mesh size as opening in mm	
Investigated depth range (m)	

stratum	Total surface (km^2)	Trawlable surface (km^2)	Swept area (km2)	Number of hauls
Total (… – … m)				

stratum	Years	kg per km^2	CV or other	Relative * biomass All age groups	CV or other	N per km^2	CV or other	Relative * abundance All age groups	CV or other
	……								
	……								
	……								
	……								
	……								
Total (… – … m)	……								

* with catchability coefficient assumed =1

Comments

It must be possible add row for new years to the table Possibility to insert graphs e trends Specify the other index of variability of mean Specify sampling design (for example random stratified with number of haul by stratum proportional to stratum surface; or systematic on transect;…)

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SAC GFCM. Subcommittee of Stock Assessment	Assessment form Sheet TS 2 Direct methods: trawl based length/age structure of population at sea

Code	
Page	

Survey		Species		Trawler/OV	
Total area (km²)					

Length/age (unity)	
Age slicing method	
Maturity scales (females and males)	

N (Total or sex combined) by Length or age class	Year		
	….	….	…..
total			

Maturity by length or age class	Year		
	….	….	…..
total			

Comments

Specify if numbers are per km2 or raised to the area,assuming the same catchability . Specify the ageing method or the age slicing procedure applied, specify the maturity scale used. In case maturity ogive has not been estimated by year, report information for groups of years. Possibility to insert graphs e trends

* All assessment and related works should be presented only through the SCSA working group on stock assessment

* All assessment and related works should be presented only through the SCSA working group on stock assessment

SAC GFCM. Subcommittee of Stock Assessment	Assessment form Sheet TS 3 Direct methods: Trawl based mortality rates

Code	
Page	

Survey		Species	Trawler	
Total area (km^2)				

Z estimation	Report formula, or method and/or reference
F estimation	Report formula, or method and reference
M estimation	Report value (if scalar), formula, or method and reference

M by age per Survey	Report formula, or method and reference				
	Age 0	Age 1	Age 2	Age 3	etc
year					

Surveys values

Years	Total mortality rates (Z)	Years	Total mortality rates (Z)	years	Total mortality rates (Z)

Years	Fishing mortality rates (F)	Survey	Fishing mortality rates (F)	Survey	Fishing mortality rates (F)
year					

Z by age per Survey	Age 0	Age 1	Age 2	Age 3	etc
year					

F by age per Survey	Age 0	Age 1	Age 2	Age 3	etc
year					

* All assessment and related works should be presented only through the SCSA working group on stock assessment

Note: Z, F and M are expressed by year

Comments

Use one sheet for each species; In case of average mortalities specify the age class specify the age class included Specify the units used for length. Possibility to insert graphs e trends

SAC GFCM. Subcommittee of Stock Assessment	Assessment form Sheet TS 4 Direct methods: trawl based recruitment analysis

Code	
Page	

Survey		Trawler/OV	
Total area (km²)	Species		

Survey season	
Cod –end mesh size as opening in mm	
Investigated depth range (m)	
Recruitment season and peak (months)	
Age at fishing-grounds recruitment	
Length at fishing-grounds recruitment	

Years	Area in km²	N of recruit per km²	CV or other	Relative recruitment (N of individuals)	CV or other

Comments

Note on type of recruitment:
1) continuous and diffuse
2) discrete and diffuse
3) discrete and localised
4) continuous and localised.

Specify the method used to estimate recruit indices

Regarding the relative recruitment and the total number of individuals be consistent with the raising procedure adopted in the Sheet TS1

Specify if the area is the total or the swept one

Possibility to insert graphs e trends

* All assessment and related works should be presented only through the SCSA working group on stock assessment

SAC GFCM. Subcommittee of Stock Assessment	Assessment form Sheet TS 5 Direct methods: trawl based spawner analysis

Code	
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Survey		Trawler/OV	
Total area (km^2)	Species		

Survey season	
Investigated depth range (m)	
Spawning season and peak (months)	

Surveys	Area in km^2	N (N of individuals) of spawners per km^2	CV or other	SSB per km^2	CV or other	Relative SSB	CV or other

Comments

Note on type of spawner:
1) total spawner
2) sequential spawner
3) presence of spawner aggregations

Regarding the total number of individuals and biomass be consistent with the raising procedure adopted in the Sheet TS1

Specify if the area is the total or the swept one

Possibility to insert graphs e trends

SAC GFCM.	Assessment form Sheet EP

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Regionalisation	YES	NO	(please use one sheet for each region)
Sampling area			
Region			

Egg production

Cruise			Date	
Total area (km^2)		Positive	Negative	

Parameters (exponential decay model)	value	CV
P_0 (# of eggs /0.05 m^2)		
Z (days^{-1})		
Temperature range	°C	°C

Adult sampling

Sampling area	
Type of gear	
Method of sampling	

Model parameters	value	CV
P_0 (# of eggs/0.05 m^2 per day)		
A (surface of region 0.05 m^2)		
W (average female weight in gr)		
F (batch fecundity: eggs / batch per mature female)		
S (spawning fraction: # spawning female per mature female)		
R (sex ratio: females/total)		

Result	value	CV
Biomass (t)		

Comments

SAC GFCM. Subcommittee of Stock Assessment		Assessment form Sheet AS1 Direct methods: acoustics	

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Cruise		O/V	
Total area (km^2)		Date	

Survey objective (in general)	
Target species	
Echo-sounder	
Sampling strategy	
ESDU (i.e. 1 nautical mile)	
TS (Target Strength)/species	
Software used in the post-processing	
Samples (gear used)	
Biological data obtained	

Surveys	Biomass in metric tons	fish numbers	Nautical Area Scattering Coefficient	Indicator …	Indicator …

Comments

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SAC GFCM. Subcommittee of Stock Assessment	Assessment form Sheet AS 2 Direct methods: acoustics length/age structure of population at sea

Code	
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Cruise		O/V	
Total area (km^2)		Date	

Target species	

Sampling season	
Sampling design	
Sampler (gear used)	
Cod –end mesh size as opening in mm	
Investigated depth range (m)	

Length/age (unity)	
Age slicing method	
Maturity scales (females and males)	

N (Total or sex combined) by Length or age class

	Year		
	….	….	…..
total			

Maturity by length or age class

	Year		
	….	….	…..

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total			

Comments

Specify if numbers are per km2 or raised to the area, assuming the same catchability .
Specify the ageing method or the age slicing procedure applied, specify the maturity scale used.
In case maturity ogive has not been estimated by year, report information for groups of years.
Possibility to insert graphs e trends

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