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GENERAL FISHERIES COMMISSION
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GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN

SCIENTIFIC ADVISORY COMMITTEE (SAC)

Twelfth Session

Budva, Montenegro, 25-29 January 2010

REPORT OF THE MEETING OF THE 11TH SAC SUB-COMMITTEE ON STOCK ASSESSMENT (SCSA) Malaga, Spain, 30 November-3 December 2009

*** Available only in English**

OPENING, ARRANGEMENT OF THE SUB-COMMITTEE MEETINGS

1. The joint Sub-Committees meeting of the Scientific Advisory Committee (SAC/GFCM) including the transversal session was held in the office of the Spanish Government in Malaga, Spain, from 30 November to 3 December 2009.

2. During the general opening, Mr Baro, Director of the "Instituto Espanol de Oceanografia" in Malaga welcomed the participants and thanked them for attending this important meeting.

3. Mr Sebatian Fraile Arévalo of the "Secretaria general del Mare" welcomed the participants to the beautiful city of Malaga and highlighted the relevance to improve the knowledge on the Mediterranean fisheries. He commended the importance of GFCM as regional Fisheries management Organization and drowns attention to the fact that the conclusions obtained in the meeting will help to the governments to adopt the best management measures to maintain in the future these valuable fisheries.

4. Mr Srour, Executive Secretary a.i of the General Fisheries Commission for the Mediterranean (GFCM), welcomed the participants and thanked the Sub-delegation of the Spanish Government in Malaga and the IEO for their kindness in hosting and arranging the meeting. Mr Srour recalled that GFCM has recently lost his Executive Secretary Dr Alain Bonzon who was always keeping in mind the interests of the Organization and its members. He invited to keep a minute of silence in his memory. Mr Srour further drawn the attention of the participants on some important issues to be addressed by the Sub-Committees and thanked the FAO regional projects for their support to this meeting.

5. Mr Henri Farrugio, Chairperson of the SAC thanked also the hosting country and the participants for attending the meeting and introduced the transversal session.

TRANSVERSAL SESSION: REVIEW OF TRANSVERSAL ISSUES

6. The outcome of transversal session is introduced in Annex III

INTRODUCTION TO THE SCSA MEETING AND ADOPTION OF THE AGENDA

7. The eleventh meeting of the SAC Sub-Committee on Stock Assessment was held in Malaga from 30 November to 3 December 2009. It was attended by 31 scientists from 14 Member countries. The list of participants is attached as Annex II.

8. The Agenda of the Sub-Committee was adopted (Annex I) and the list of documents was updated. Ms Constantina Karlou-Riga was the chairperson of the meeting and Mr Fabio Fiorentino was designated as rapporteur.

REVIEW OF NEW STOCK ASSESSMENTS OF DEMERSAL SPECIES AND RELATED SCIENTIFIC ADVICES.

RESULTS OF THE WORKING GROUP ON STOCK ASSESSMENT OF DEMERSAL SPECIES

9. 13 technical papers were presented and discussed by the Working Group held in Ancona (19-23 October 2009). From those papers, 9 were considered as assessments which covered 4 Geographical Subareas (GSAs) and concerned 9 stocks and 8 species (Annex IV, Table I). The information on assessment by species and GSA is provided in Annex V, Table I.

Document n° 1: Stock assessment of Hake (*Merluccius merluccius*) in GSA 03

Abstract: The fishing activity in Morocco plays an important, social and economical role. The landings are made in 7 ports and 86 artisanal fishery sites. The fishing boats are composed by trawlers, longliners, senners and artisanal small scale boats. The number of the trawlers is 114. 51% of the trawlers are based in Nador port, 19% in Al Hoceima, 17% in Tangier, 12% in M'diq and 1% in Rass Kebdana, however, the Tangier trawlers are mostly operating in Atlantic side. The average of the power of the trawlers is about 325 and the mean tonnage is about 50 TJB. The annual catch of the coastal fishery turn around 8500 tonnes , for an average of 117 millions dirham in value. The hake (*Merluccius merluccius*)trawlers catch in 2008 is about 210 tonnes, the CPUE is about 31 kg/nb trips for the same year. The catch, the effort and the CPUE trend show a decline from 2002 to 2008. The most species targeted with the *Merluccius merluccius* are the deep water pink shrimp , *Pagellus acarne, Mullus spp, , Boops boops, Gadus poutassou, Octopus vulgaris* and *Sepia spp*.

Source of Management advice:

Length frequencies for the year 2008 from trawlers landing within the port of M'diq were used as the basis of the assessment. Following discussion on the patterns of growth shown by hake in the Mediterranean, the 'fast' growth parameters developed for Spanish waters (GSA 1; Garcia Rodriguez et al., 2002) were used in place of those developed using more local data. This was due to a limited length range available from local sampling due to the fact that samples came from trawls that fished in near shore waters (and hence focused on smaller size groups). The length

frequency data used were derived from biological sampling of *Merluccius merluccius* landed in Mediterranean coast, and the statistics data used are the official statistics of ONP and DPM. The model of stock assessment used is the standard VPA and the yield par recruits turned by the software VIT.

Stock status: overexploited

WG Management advice and recommendations:
Decrease fishing mortality. To achieve $F_{0.1}$, a reduction of 38-62% would be required. It should be noted that this does not imply that this reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended.

SC Recommendation:
The SC did noted accept the assessment because it was based on one year only data, but recommended to continue monitoring the stock and fisheries.

Document n° 2: Stock assessment of blackspot seabream (*Pagellus bogaraveo*) in GSA 03

Abstract: The longliners fishery in Moroccan coast is the major activity in the Strait of Gibraltar. This fleet is mainly based in Tangier port which contains 200 boats of this fleet. This number represents 85 % of the total longliners in the whole Mediterranean. Units belonging to this fishery have an average GRT about 20 tons, a power average about 160 cv and an average age of 7 years. Longliners target primarily swordfish, small Tunas, red seabream, the grouper fish, *Helecolenius dactylopterus* and *Lepidopus caudatus*.

Source of Management advice:
Length frequencies for the years 2005-2007 from longliners landing within the port of Tangier averaged to approximate equilibrium conditions for the pseudocohort analysis were used as the basis for this assessment. The length data were derived from biological sampling of *Pagellus bogaraveo* landed in port of Tangier, and the statistics data used are the official statistics of ONP and DPM. Growth parameters were based upon those of Krug (1989) from Spain. The model of stock assessment used is the standard VPA and the yield par recruits turn by the software VIT.

Stock status: Moderately exploited

WG Management advice and recommendations: Maintain fishing mortality at the current level.

SC Recommendation:
The SC agreed on the fully exploitation of the stock. However, due to the depletion status of the species in front of Spanish coasts and considering the uncertainty on stock unit of the species in the Albora Sea, the SC recommended a joint stock assessment with GSAs 01 and 03 to be performed.

Document n° 3: Stock Assessment of deep water pink shrimp (*Parapenaeus longirostris*) in GSA 03.

Abstract: the fishing activity in Morocco plays an important social and economical role. The landings are made into 7 ports and 86 artisanal fishery sites. The fishing boats are composed of trawlers, longliners, senners and artisanal small scale boats. The number of the trawlers is 114. 51% of the trawlers are based in Nador port, 19% in Al Hoceima, 17% in Tangier, 12% in M'diq and 1% in Rass Kebdana, however, the Tangier trawlers are mostly operating in Atlantic side. The average of the power of the trawlers is about 325 and the mean tonnage is about 50 TJB. The annual catch of the coastal fishery turn around 8500 tonnes, for an average of 117 millions dirham in value. The *Parapenaeus longirostris* trawlers catch in 2008 is about 337 tonnes, the fishing effort is 11345 (nb of trips) which correspond to 34035 fishing days, and the CPUE is about 30 kg/nb trips for the same year. The catch, effort and CPUE trend show a decline from 2002 to 2008. The most species targeted with

the deep water pink shrimp are *Pagellus acarne*, *Mullus* spp, *Merluccius merluccius*, *Boops boops*, *Gadus poutassou*, *Octopus vulgaris* and *Sepia* spp. This species represent more than 84% of the total demersal species landed by the trawl fishery.

Source of Management advice:
Two alternative assessment approaches were used for *P. longirostris* within this GSA: a dynamic Schaeffer production model (based upon CPUE data), and VIT (based upon trawler length frequency data). Length frequencies (*cephalothoracic* length, mm) for the period Oct 2007-Sept 2008 from trawlers landing at the port of Nador, which represents ~70% of catches, were used as the basis of the VIT assessment. Biological sampling was carried out on a 4kg to 6 kg subsample of landed catch, subsequently analyzed at the laboratory for the frequency of sizes by sex, stages of sexual maturity and weight. CPUE data from the National Office for Fishing for the period 2000-2008 from the trawl fishery were used within the Schaeffer model analysis.

Stock status: Over-exploited

WG Management advice and recommendations:
WG recommended to decrease fishing mortality. To achieve $F_{0.1}$, a reduction of between 30% and ~66% would be required (based on the VIT and Schaeffer production model results, respectively). It should be noted that this does not imply that the reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended, for example; it was recommended that a decrease in fishing mortality of 10% each year be attempted.

SC Recommendation:
The SC accepted the assessment. It noted that only one year data was used for VIT but several years were used in production model. The SC advises to continue monitoring the stock and fisheries. This remark becomes stronger when the impact of the environmental factors on this species dynamics has to be taken into account.

Document n° 4: Stock assessment of bogue (*Boops boops*) in GSA 3

Abstract: Exploitation of the stocks of *Boops boops* is carried out by trawlers from Moroccan Mediterranean ports. Fishing is focussed between the coastal regions of Tangier from the port of Saidia in the east. 70% of landings occur within the ports of Nador and Al hoceima.

Source of Management advice:
Length frequencies for the years 2005-2007 from trawlers landing within the ports of Nador and Al hoceima (averaged to approximate equilibrium conditions for the pseudocohort analysis) were used as the basis of this analysis. The length cohort analysis approach within VIT was used.

Stock status: Over-exploited

WG Management advice and recommendations:
Reduce fishing mortality. To achieve $F_{0.1}$, a reduction of 64% would be required (based on the VIT results). It should be noted that this does not imply that the reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended.

SC Recommendation:
The SC agreed with the overfishing of the stock and the necessity of a substantial reduction of the fishing mortality (by 64%), which can be achieved over time (5-10years). The SC furthermore stressed the necessity to include in the assessment also artisanal fishery data, if any.

Document n° 5: Stock assessment of red mullet (*Mullus barbatus*) in GSA 03

Abstract: Exploitation of the stocks of red mullet is carried out by trawlers from Moroccan Mediterranean ports. Fishing is focussed between the coastal regions of Tangier from the port of Saidia in the east. 70% of landings occur within the ports of Nador and Al hoceima.

Source of Management advice:
Length frequencies for the years 2005-2008 from trawlers landing within the ports of Nador and Al hoceima (averaged to approximate equilibrium conditions for the pseudocohort analysis) were used as the basis of this analysis. The length cohort analysis approach within VIT was used

Stock status: Over-exploited

WG Management advice and recommendations:
Reduce fishing mortality. To achieve $F_{0.1}$, a reduction of 76% would be required (based on the VIT results). It should be noted that this does not imply that the reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended.

SC Recommendation:
The SC agreed with the overfishing of the stock and the necessity of a substantial reduction of the fishing mortality in long term. The reduction should be of 76%, which can be achieved over time (5-10 years). The SC invited the scientists to include in the assessment also artisanal fishery data, if any.

Document n° 6: Stock assessment of hake (*Merluccius merluccius*) in GSA 06 northern part

Abstract: Hake is exploited by bottom trawl, gillnet and longline, each fishing gear targeting a given length range. Highest landings, both in weight and in numbers, correspond to bottom trawling. Fishing is carried out five days a week. Recruits are the main component of the overall landings. The catch mean age is around 1 year. Annual hake landings along the Catalan Coast since late nineties were around 2000 tonnes and were produced by a total effort of between 55000-65000 fishing days (number of days with hake landings, all fishing gears combined). Landings in 2008 were highest for the period 2000-2008, and correspond to the increase in bottom trawl landings; landings by the artisanal vessels and longliners in 2008 decreased regarding the previous year. In 2007 hake annual landings were the lowest for the period 1988-2008.

Source of Management advice:
Length frequency distribution for the year 2008 from trawlers, longliners and other gears (gillnets), landing within ports in the northern part of Spain. The analysis was therefore based on data from only part of the assumed stock. The program VIT (Lleonart and Salat, 1992) is designed for the analysis of marine populations, exploited by one or several gears, based on single species catch data (structured by age or size). The main assumption underlying the model is that of steady state, because the program works with pseudo-cohorts and it is therefore not suitable for historical data series. The program uses the catch data and ancillary parameters for rebuilding the population of the species and the mortality vectors affecting it by means of Virtual Population Analysis (VPA). Once the virtual population has been rebuilt, an analysis of the fishery can be carried out with the aid of several tools: Comprehensive VPA results, Yield-per-Recruit analysis based on the fishing mortality vector, analysis of sensitivity to parameter values and transition analysis. The latter permits a non-equilibrium analysis of how a shift in exploitation regime is reflected in the fisheries. All these tools can be applied to specific studies of competition among fishing gears. A natural mortality at age vector was used within the assessment, based upon the PROBIOM Excel spreadsheet (Abella et al. 1997, 1998). The growth parameters used within the VIT analysis were

those representing the 'fast' growth assumption for hake. By combining data from different gears, a more 'complete' length frequency was developed.

Stock status: Over-exploited

WG Management advice and recommendations:
Reduce fishing mortality. To achieve F_{max}, a reduction of 70% would be required (based on the VIT results), and to achieve $F_{0.1}$ a greater decrease would be required. It should be noted that this does not imply that this reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended.

SC Recommendation:
Although the current judgement is in line with previous years results for the whole GSA, SC did not accept the assessment because it was based on one year only data and covered a part of the GSA. SC also recommended and due to the high landings observed in 2008, to check the steady state assumption comparing the results with previous years and continue to monitor the stock.

Document n° 7 : Stock assessment of red mullet (*Mullus barbatus*) in GSA 15

Abstract: The fisheries resources in GSA 15 are shared by three main member countries, namely Malta, Italy and Cyprus. 21 Maltese trawlers operate within this GSA. Only 12 of them are allowed to fish inside the Maltese 25 nautical mile Fisheries Management Zone. Five of these target red mullet on the continental shelf throughout the year, while the rest target pink and red shrimps on the continental slope. Apart from the Maltese trawling fleet a number of Sicilian trawlers fish outside the 25 nautical mile zone targeting red mullet, red shrimp and pink shrimp. 3 Cypriot vessels also fish outside the 25 nautical mile zone which target exclusively red mullet on the continental shelf.

Source of Management advice:
Three different groups of data were used in separate analyses:
The stock of *Mullus barbatus* was assessed using length frequency distributions for the years 2005-2008 from trawlers operating within the area (from Malta, Cyprus and Italy). The biological parameters used were those reported by SAMED (2002), except for the length weight relationship that was estimated using the MEDITS data. A value of 0.43 of natural mortality was used as reported by Andaloro et al. (1985). These data were used to estimate trends in total mortality over time using the approach of Beverton and Holt. Another approach using the SURvey Based Assessment (SURBA; Needle, 2003) VPA was also tested to estimate the trend in F, using data from the MEDITS Trawl survey on a time series covering 7 years from 2002-2008. The annual length frequency distribution was converted to age by the age slicing procedure in the LFDA 5 software (Hoggarth et al., 2006). A vector of natural mortality by age was calculated from Caddy´s (1991) formula, using the PROBIOM Excel spreadsheet (Abella et al., 1996; 1997). SURBA was then used to estimate mean fishing mortality by year. Two assessment approaches were used: Trends in fishing mortality by year were obtained by the Beverton and Holt method using the LFDA 5 software; Mean annual fishing mortality was estimated through SURBA (Needle, 2003) from MEDITS trawl data. Yield per recruit analysis was conducted using the YIELD package (Hoggarth et al., 2006) which also allowed the estimation of the biological reference points F_{max} and $F_{0.1}$.
Stock status: Over-exploited

WG Management advice and recommendations:
Reduce fishing mortality. Current F is between $F_{0.1}$ and F_{max}. To achieve $F_{0.1}$, a reduction of 30% would be required. It should be noted that this does not imply that the reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended.

SC Recommendation:
The SC agreed on the overfishing of the stock and the necessity to reduce the fishing mortality in long term by 30%.

Document n° 8 : Stock assessment of striped mullet (*Mullus surmuletustus*) in GSA 15

Abstract: The fisheries resources in GSA 15 are shared by three main member countries, namely Malta, Italy and Cyprus. 21 Maltese trawlers operate within this GSA. Only 12 of them are allowed to fish inside the Maltese 25 nautical mile Fisheries Management Zone. Five of these target red mullet on the continental shelf throughout the year, while the rest target pink and red shrimps on the continental slope. Apart from the Maltese trawling fleet a number of Sicilian trawlers fish outside the 25 nautical mile zone targeting red mullet, red shrimp and pink shrimp. 3 Cypriot vessels also fish outside the 25 nautical mile zone which target exclusively red mullet on the continental shelf.

Source of Management advice:
Three different groups of data were used in separate analyses:
The stock of *Mullus surmuletus* was assessed using length frequency distributions for the years 2005-2008 from trawlers operating within the area (from Malta, Cyprus and Italy). The biological parameters used were those reported by Ragonese et al. (2004), except for the length weight relationship that was estimated using the MEDITS Trawl survey on a time series covering 7 years from 2002-2008. A value of 0.43 of natural mortality was used as reported by Andaloro et al. (1985). Using these parameters the trend in fishing mortality by year was obtained by the Beverton and Holt method using the LFDA 5 software (Hoggarth et al., 2006). The second approach used the SURvey Based Assessment (SURBA; Needle, 2003) VPA was also tested to estimate the trend in F. The length frequency distribution was converted to age by the age splicing procedure in the LFDA software. A vector of natural mortality by age was calculated from Caddy´s (1991) formula, using the PROBIOM Excel spreadsheet (Abella et al., 1996; 1997). Mean F per year was then estimated using the software SURBA. Yield per recruit analysis was conducted using the YIELD package (Hoggarth et al., 2006), which also allowed the estimation of the biological reference points F_{max} and $F_{0.1}$. Two assessment approaches were used, as noted above: Beverton and Holt Z estimation (LFDA, Hoggarth et al., 2006); SURBA (Needle, 2003).

Stock status: Fully exploited

WG Management advice and recommendations:
Maintain fishing mortality at the current level (~$F_{0.1}$).

SC Recommendation:
The SC agreed on the fully exploitation of the stock and endorsed the recommendation to maintain the fishing mortality at the current level.

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Document n° 9 : Stock assessment of Norway lobster (*Nephrops norvegicus*) in GSA 17 (western part)

Abstract: *N. norvegicus* in the Adriatic Sea is caught primarily with two types of gear: the majority of the catch is by bottom trawl nets and the rest with traps (mainly in channel areas of the northern Adriatic). The catch fluctuates significantly in different times of day and night, and during the year. Generally, the catch is highest at sunrise and sunset, and different parts of

the population are accessible to fishing gear at different times of day. The catch is biggest in spring while in winter the catch is at a minimum.

Source of Management advice:
Length frequency distributions for the years 2006-2008 from Italian trawler catches (averaged to approximate equilibrium conditions for the pseudocohort analysis) formed the basis of the analysis. The assessment incorporated the sexual dimorphism of *N. norvegicus*, males being treated separately from females with different parameters used. Trial assessments were undertaken with alternative natural mortality values for males and females. These were based upon a mean value for each sex (SAMED, 2002), or a natural mortality at age vector, based upon the PROBIOM Excel spreadsheet (Abella et al. 1997, 1998). The results appeared robust to the values assumed for natural mortality. The length cohort analysis approach within VIT (Lleonart and Salat, 1992) and FLR (Kell et al., 2007) were used.

Stock status: Over-exploited

WG Management advice and recommendations:
Reduce fishing mortality. To achieve $F_{0.1}$, a reduction of 64-68% (females) and 77-79% (males) would be required. It should be noted that this does not imply that the reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended.

SC Recommendation:
The SC agreed on the overexploitation of the stock and the necessity to reduce the fishing mortality: in the long term by 68%. The SC also recommended performing joint assessment with data from the whole GSA 17.

Document n° 10 : Stock assessment of Sole (*Solea solea*) in GSA 17 western part

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). The fishing effort applied by the Italian rapido trawlers gradually increased from 1996 to 2005, and slightly decreased in the last years.

Source of Management advice:
Abundance and biomass indexes from rapido trawl surveys 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, to be drawn. Underestimation of small specimens in catches due to the gear selectivity was corrected using the selectivity parameters given by Ferretti and Froglia (1975). Several projects carried out in of GSA17 highlighted that the discard of sole both by rapido trawl and set net fisheries is negligible as the damaged specimens are also commercialized. Numbers at age were obtained from commercial catch data (2000-2008) sampled from trawlers and gillnets, and catch rate data from fishery-independent surveys (2005-2008). Abundance-at-age data was obtained from survey data. Length frequency distributions were obtained from surveys for the years 2005-2006 (catches; averaged to approximate equilibrium conditions for the pseudocohort analysis) and 2008 (survey). Length converted catch curve was also used on length frequency distributions from survey data (2008), and catch data (2005-2006). Growth parameters were obtained through the Solemon project (2004-2008). A natural mortality vector (M_a) was estimated using Caddy's method (1991) (PROBIOM Excel spreadsheet; Caddy and Abella, 1999; Abella et al. 1997, 1998). At present, data on sole are not available from the eastern side of Adriatic Sea; within

the statistics sole is inside a "mixed flatfish" category. Landings of around 200 tons of *Solea solea* have been suggested for the eastern part, mainly from set-netters.
Two alternative assessment approaches were used: statistical catch at age (SCAA; Doubleday's method, in Excel); length-converted catch curve (LFDA; Kirkwood et al., 2001).
A yield-per-recruit (Y/R) analysis (Yield version 1.0, see Hoggarth et al., 2006) was applied to estimate the reference points, based upon alternative potential values of steepness within the Beverton and Holt stock recruitment relationship (being 0.75 and 0.9).

Stock status: Over-exploited

WG Management advice and recommendations:
Reduce fishing mortality. To achieve $F_{0.1}$, a reduction of 82-86% would be required. It should be noted that this does not imply that the reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended. In turn, 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.

SC Recommendation:
The SC agreed with the overexploitation of the stock and the necessity to reduce the fishing mortality in the long term by 86%. The SC also recommended performing joint assessment with data from the whole GSA 17.

Document n° 11 : Stock assessment of Hake (*Merluccius merluccius*) in GSA 26

Abstract: The number of licensed trawl vessels ranged between 1100 and 1500 during the period from 1991 to 2007. This fleet targets many species such as red mullet *Mullus surmuletus* and *M. barbatus*; the sparids *Sparus aurata*, *Pagellus* spp., *Boops boops*, *Lithognathus mormyrus*, *Diplodus* spp.; the soles *Solea* spp.; the European hake *Merluccius merluccius*; the picarels *Spicara* spp.; the izardfishes *Synodus saurus*; the cephalopods *Sepia* spp., *Loligo* spp. And *Octopus* spp.; crabs *Portunus pelagicus* and shrimp (about 10 species). European hake contributed about 3% of the total trawl landings in the Egyptian Mediterranean waters. The vessel length varied between 18 and 22 m and its width varied from 4 to 6 m. Each vessel is powered by main engine of 150 to 600 hp but the majority of 250 hp engines. The fishing trip is about 7 to 10 days and the number of crew is about 6 to 15 persons. The mean annual landing of trawl fishery is around 16 thousand tons accounting for
approximately 33% of total catches in Egyptian Mediterranean.

Source of Management advice:
Length frequency distribution from trawl catches for the years 2006-2007 sampled from the Egyptian ports Alexandria and Rashid (averaged to approximate equilibrium conditions for the pseudocohort analysis) were used as the basis of the analysis. Data for June 2007 – April 2008 were also analysed, but results were poor (see comments). Growth parameters were obtained from Mehanna (in press). The natural mortality coefficient was estimated as the geometric mean of estimated from two methods: Taylor (1960) and Djabali et al. (1993). The length at first capture (Lc) was estimated from the catch curve analysis. The length at first sexual maturity (Lm) was estimated by fitting the maturation curve between the observed points of mid-class interval and the percentage maturity of fish corresponding to each length interval.
Two alternative assessment approaches were used:
Length cohort analysis within VIT (Lleonart and Salat, 1992);
Length-converted catch curve (FiSAT; Gayanillo et al., 1994).

Stock status: Over-exploited

WG Management advice and recommendations:
Reduce fishing mortality. To achieve $F_{0.1}$, a reduction of 51% would be required. It should be noted that this does not imply that the reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended.

SC Recommendation:
The SC agreed on the overexploitation of the stock and the necessity to reduce the fishing mortality in the long term by 51%. The SC also highlighted that it is a need to improve knowledge on the stock unit in the area.

Document n° 12: Stock assessment of red mullet (*Mullus barbatus*) in GSA 26

Abstract: Red mullets are among the most valuable and highly priced fish species in Egypt. Though widely distributed along the entire Egyptian Mediterranean coast, their major fisheries are located on the area from Alexandria to Port Said. Red mullet are mainly exploited by the trawl fishery and contributed about 10% of the total trawl landings in Mediterranean waters. The catch is composed mainly of two species; *Mullus surmuletus* and *M. barbatus*, while some species of Red Sea origin have been recorded in the eastern Mediterranean. The mean annual catch of red mullet was about 2000 tons in the period 1991-2008 (GAFRD annual reports). The trawl fleet operating in the Egyptian Mediterranean is composed by 1170 boats (mean number for period 1991-2008), varying between 18 and 22 m length and from 4 to 6 m width. Each vessel is powered by a main engine of 100 to 600 hp, but the majority are of 250 hp. Some of these vessels are equipped with echo-sounders.

Source of Management advice:
Analyses were based upon monthly length frequency distributions sampled from trawl catches for the year June 2007 - April 2008 landed in the Egyptian ports Alexandria, Demietta and Port Said (except for May and the first half of June 2007, the period when all fishing operations are prohibited). These data (raised to the landings and combined to approximate equilibrium conditions for the pseudocohort analysis) formed the basis of the assessment. Sagittal otoliths were used for age determination (see Mehanna, 2009). Back-calculated lengths-at-age were applied to the Ford – Walford plot to estimate $L\infty$ and K, while to be estimated from the equation: $-\ln [(L\infty - Lt) / L\infty] = -Kt_0 + Kt$. The total length at which 50% of the specimens were mature was estimated by a method based on a logistic non-linear least-squares regression. The size at first capture (Lc) was estimated by the catch curve analysis. The natural mortality coefficient (M) was estimated using the method of Djabali et al. (1993), as follows: $\text{Log}M = -0.0278 - 0.1172 \text{ Log } L\infty + 0.5092 \text{ Log } K$.
Two alternative assessment approaches were used:
Length cohort analysis within VIT (Lleonart and Salat, 1992);
Cumulated length-based catch curve (Jones and van Zalinge, 1981).

Stock status: Over-exploited

WG Management advice and recommendations:
Reduce fishing mortality. To achieve $F_{0.1}$, a reduction of 61% would be required. It should be noted that this does not imply that the reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended.

SC Recommendation:
The SC did not accepts the assessment because it has been based on one year only data, but it recommended continuing monitoring the stock and fisheries.

Document n° 13: Stock assessment of striped mullet (*Mullus surmuletus*) in GSA 26

Abstract: The Egyptian Mediterranean coast is about 1100 km extending from El-Salloum in the West to Taba city in the East. The mean annual fish production from this area is about 50 thousand ton (GAFRD; 1991 - 2007). The main fishing gears operated in this region are trawling, purse-seining and lining, especially long and hand lining. The fishing grounds along the Egyptian Mediterranean coast are divided into four regions, namely: Western region (Alexandria and El-Mex, Abu-Qir, Rashid, El-Maadya and Mersa Matrouh); Eastern region (Port Said and El-Arish); Demietta region; and Nile Delta region. Red mullets are among the most valuable and highly priced fish species in Egypt, though widely distributed along the entire coast of Mediterranean, their major fisheries are located on the area from Alexandria to Port Said. Red mullet are mainly exploited by the trawl fishery and contributed about 10% of the total trawl landings in the Egyptian Mediterranean (GAFRD annual reports). The catch of Red mullet is composed mainly of two species: *Mullus surmuletus* and *M. barbatus*, while some species of Red Sea origin have been recorded in the eastern Mediterranean. The striped red mullet, *Mullus surmuletus* is the most common species in the catch and constituted about 65% of red mullet landings. The number of trawl vessels which operated in the Egyptian Mediterranean ranged between 1100 and 1500 during 1991-2007. The vessel length varies between 18 and 22 m and width from 4 to 6 m.

Source of Management advice:
Analyses were based upon monthly length frequency distributions from trawl catches for the year June 2007 - April 2008 sampled from the Egyptian ports Alexandria, Demietta and Port Said (except for May and the first half of June 2007, the period when all fishing operations are prohibited). These data (raised to the landings and combined to approximate equilibrium conditions for the pseudocohort analysis) formed the basis of the assessment. Sagittal otoliths were used for age determination. Growth parameters were estimated using the von Bertalanffy equation (see Mehanna, 2009). The natural mortality coefficient (M) was estimated using the method of Djabali et al. (1993) as follows: $LogM= -0.0278 - 0.1172\ Log L\infty + 0.5092\ LogK$. The size at first capture (L_c) was estimated through the catch curve analysis. The length at first sexual maturity Lm_{50} was estimated by fitting the maturation curve between the observed points of mid-class interval and the percentage maturity of fish corresponding to each length interval. The length cohort analysis approach within VIT (Lleonart and Salat, 1992) was used.

Stock status: Over-exploited

WG Management advice and recommendations:
Reduce fishing mortality. To achieve $F_{0.1}$, a reduction of 63% would be required. It should be noted that this does not imply that the reduction be achieved in one year. A management plan to achieve this reduction over time would be recommended.

SC Recommendation:
The SC did not accept the assessment because it has been based on one year only data, but it recommended continuing monitoring the stock and fisheries.

RESULTS OF NEW STUDIES PERFORMED IN SPECIFIC GSAS INCLUDING THOSE CARRIED OUT IN THE FRAMEWORK OF REGIONAL PROJECTS AND PROGRAMS.

10. 16 technical papers were presented in the Sub-committee. From those papers, 11 were considered as assessments, 2 were not accepted as such and 3 were assessment related. The assessments covered 6 Geographical Sub-areas (GSAs) and concerned 11 stocks and 6 species (Annex IV, Table I).

Document n° 14: Stock assessment of hake (*Merluccius merluccius*) in GSA 05

Abstract: The trawl fishery off Mallorca (Balearic Islands; GFCM-GSA05) is developed by around 40 vessels, which total annual landings are approximately 1400 tons. The European hake (*Merluccius merluccius*) is a target species for this fishery, mainly exploited on the deep shelf and upper slope, with annual landings oscillating between 50 and 190 tons during the last decades.

Source of Management advice:

Source of management advice: 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 PROBIOM Excel spreadsheet. The methodology applied was: (i) a tuned virtual population analysis (VPA), applying the Extended Survivor Analysis (XSA) method on the period 1980-2008 and considering catch per unit effort (CPUE) from commercial trawl fleet (2000-2008) and bottom trawl surveys (2001-2008) as tuning fleets; and, (ii) a VPA and yield per recruit (Y/R) analysis on a mean pseudocohort from the periods 1980-1989, 1990-1999 and 2000-2008. The software used was the Lowestoft VPA program and VIT program, respectively.

Stock status: Over-exploited with moderate fishing mortality and intermediate abundance

SC Management advice and recommendations:

The SC agreed with the overexploitation of the stock and the necessity to improve the fishing pattern by adopting the 40mm square mesh size in the trawl codend. A substantial reduction of fishing mortality in the long term was also suggested.

Document n° 15: 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 trawl, French gillnet, Spanish trawl and Spanish long-line. Around 250 boats are involved in the fishery and, according to official statistics, total annual landings for the period 1998-2008 have oscillated around a mean value of 2155 tons (2470 tons in 2008). Most fleets and catches correspond to French trawl (49 and 70%, respectively). Trawl catches range between 3 and 92 cm total length (TL), with an average size of 17-23 cm TL, followed by French gillnet (~32 and 15% respectively, ranging 13-86 cm TL and average size 38-41 cm TL), Spanish trawl (~12 and 8%, respectively, ranging 5-87 cm TL, and average size 20-29 cm TL), and Spanish long-line (~7 and 7%, respectively, ranging 23-96 cm TL and average size 46-62 cm TL).

Source of Management advice:

Source of management advice: The information used for the assessment of the stock consisted in annual size composition of catches (estimated from monthly or quarterly sampling in the main landing ports), official landings and biological parameters estimated by Aldebert and Recasens (1996). The growth coefficient (k) comes from first results of tagging experiments developed by IFREMER in the area (Mellon-Duval et al, in prep.). The vector of natural mortality by age was calculated from Caddy´s formula, using the PROBIOM Excel spreadsheet (Abella et al., 1997). For the period of the study (1998-2007), 2 methodologies were applied. The first one is a tuned virtual population analysis (VPA), applying the Extended Survivor Analysis (XSA) method considering, as tuning fleets, catch per unit effort (CPUE) of commercial fisheries (French trawl, Spanish trawl and Spanish long-line) and French MEDITS campaign indices. The software used was Lowestoft VPA program (Darby and Flatman, 1994). The second method is a length cohort analysis (LCA) and

yield per recruit (Y/R) analysis on a mean pseudo-cohort, using the VIT program (Lleonart and Salat, 1992). Three different periods have been considered for the mean pseudo-cohort: one considering the entire data series (1998-2008), another for 1998-2003 and a third one for 2003-2008. Last two periods have been considered separately as a change in the mean F has been detected, from values larger than 0.5 (1998-2003) and lower than 0.5 (2004-2008).

Stock status: Overexploited

SC Management advice and recommendations:
The SC agreed with the overexploitation of the stock and the necessity to improve the fishing pattern (closing nursery areas, implementation of 40 mm square mesh size) and to reduce the fishing effort by reducing time at sea, number of fishing boats or engine power.

Document n° 16 : Stock assessment of hake (*Merluccius merluccius*) in GSA 09

Abstract: Hake is the demersal species providing the highest landings and incomes for the GSA 09. About 90% of landings of hake are due to bottom trawl vessels; the remaining fraction is provided by artisanal vessels using set nets, in particular gillnets. The trawl fleet of GSA09 at the end of 2006 accounted for 361 vessels. The main trawl fleet of GSA 09 are presented at the following continental harbours: Viareggio, Livorno, Port Santo Stefano (Tuscany), Fiumicino, Terracina, Gaeta (Latium). The majority of bottom trawlers of GSA 09 performs daily fishing trips; only some vessels can stay out for 2-3 days, especially in summer. The total fishing days carried out by all the GSA 09 trawlers varied from about 65,000 in 2004 to about 63,000 in 2006, a little decrease of the mean number of fishing days/year per vessel was observed in this period from 187 to 177. Hake fishing grounds consist in soft bottoms of continental shelves and the upper part of continental slope. Fishing pressure shows some geographical differences inside the GSA 09 according to the fleets size and bottom characteristics. The artisanal fleets, according to the official data account for 1309 vessels; widespread in many harbours along the continental and insular coasts. Of these about 50 vessels, located in some harbours of the GSA 09 (e.g Marina di Campo, Ponza, Porto Santo Stefano) are working especially from winter to summer with gillnets targeting medium and large sized hakes (greater than 25 cm TL)

Source of Management advice:
Assessments were performed with both, size structure and catches of commercial data by fishing gear for year 2006 and a time series of data on catch rates and demographic structure derived from trawl surveys conducted between 1985 and 2006. Several alternative or complementary methods were used for the assessment of the exploitation status of European hake in the GSA9. Yield per recruit analysis allowed to define the level of F that is expected to maximize yield per recruit (Fmax) as well as the precautionary reference points F0.1 and F30%SSBo. F for each year was estimated using the software SURBA, assuming different catchability and natural mortality rate by age. With an age-structured production model based on Sissenwine and Shepherd (1987) it was defined Fmsy assuming a hockey stick stock recruitment relationship. There were performed simulations on the changes in yield expected at different levels of fishing mortality considering uncertainty. Finally, trawl surveys data were used for the construction of a dynamic non-equilibrium production model and for the estimation of the reference point ZMBP. Reference points were used for defining the adequacy of the current situation (Fcurr) regarding yields and the possibility of stock self-renewal. All the approaches suggest the need of a drastic reduction of the fishing pressure on the species also considering the very early age of first capture.

Stock status: Over-exploited

SC Management advice and recommendations:
The SC agreed with the overexploitation of the stock and the reduction of fishing mortality by 40% in the long term.

Document n° 17 : Stock assessment of hake (*Merluccius merluccius*) in GSA 10

Abstract: Most part of the landings of hake is from trawlers and nets. Since 2002, landings of hake increased from 1,013 t to 1,544 t in 2006 and decreased to 1,122 t in 2008**.**

Source of Management advice:
The data used in the analyses were from trawl surveys (time series of Medits and Grund surveys from 1994 to 2008 and from 1994 to 2006 respectively). Information on effort and landings were also used. The analyses on the population were conducted using ALADYM, SURBA and YIELD models and softwares in a complementary way. Outcomes from Aladym converged with the Z estimates of Surba and yield simulated using Aladym well approximated the observed ones**.**

Stock status: Over-exploited

SC Management advice and recommendations:
The SC agreed with the overexploitation of the stock and the necessity to reduce the current fishing mortality (Fc = 0.56) in the long term until the fishing mortality be below the proposed level F0.1= 0.24.

Document n° 18 : Stock assessment of striped mullet (*Mullus surmuletus*) in GSA 05

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 small-scale fishery, respectively.

Source of Management advice:
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 nine years (2000-2008). The assessment has been carried out applying tuned VPA (Extended Survivor Analysis, XSA) on the cohorts present during 2000-2008 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 biological parameters estimated within the framework of the Data Collection Programme (2003-2004). The VPA was tuned with CPUE from commercial trawl fleet (2000-2008) and bottom trawl surveys (2001–2008). The vector of natural mortality by age was calculated from Caddy´s (1991) formula, using the PROBIOM Excel spreadsheet (Abella et al., 1997). The software used 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

Stock status: Fully exploited

SC Management advice and recommendations:
SC agreed with the fully exploitation of the stock and the advice not to increase the fishing effort

Document n° 19: Stock assessment of red mullet (*Mullus barbatus*) in GSA 07

Abstract: Red mullet (*Mullus barbatus*) is exploited in the Gulf of Lions (GFCM-GSA07) both by the French and the Spanish Trawl. Around 135 boats are involved in the fishery and, according to official statistics, total annual landings for the period 2004-2008 have oscillated around a mean value of 200 tons. Most fleet and catches correspond to the French trawl (78 and 84% respectively). Catches oscillated between 111 and 216 tons for the French trawl and 16-43 tons for the Spanish trawl. In both cases, the mean length was similar, around 13-14 cm.

Source of Management advice:
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 2004-2008, considering French and Spanish trawl. The information used for the assessment of the stock consisted in annual size composition of French and Spanish trawler landings and biological parameters recently 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).

Stock status: Fully exploited

SC Management advice and recommendations:
On the basis of examined documents, the SC recommended to change the judgement on stock status from fully exploited to overexploited and thus to reduce the fishing mortality.

Document n° 20: Stock assessment of red mullet (*Mullus barbatus*) in GSA 09

Abstract: *Mullus barbatus* is among the most important species exploited commercially in the area. It is an important component of the species assemblage that constitutes the target of the coastal fisheries using trawl nets. The species is caught mainly between 15 and 100 m and catch rates show important fluctuations depending on recruitment schedule, with a clear peak in late summer. The catch of trawlers is mainly composed by juveniles of age 0. Set nets are also utilized for the capture of red mullet, but landings of these artisanal fisheries are modest compared with those of trawlers. The species has a variable price, depending on size, availability and market request. It is consumed fresh,. Demand of small-sized individuals is high and this fact encourages the catch and landing of individuals of illegal size, even though this phenomenon is less frequent in the last years.

Source of Management advice:
Fishery assessment by VPA methods of the Spanish sardine stock GSA01 is shown. VPA Lowestoft software suite was used and XSA was the assessment method. A separable VPA was also run as exploratory analysis for both stocks. Stochastic short term projections were also produced. Data used: Landings from 2000-2008 from all Fishery ports from GSA01, ALK 2003-2008, combined ALK for 2000-2002. Length Distributions 2003-2008, combined for 2000-2002. Biological sampling 2003-2008 for Maturity at age and Weight-Length relationships. Tuning data from acoustic survey ECOMED and Commercial Fleet off Estepona, Malaga and Adra for years 2003 to 2008.

Stock status: Over-exploited

SC Management advice and recommendations:
The SC agreed with overexploitation of the stock and the advice to increase the size at first capture. Fishing mortality in the long term should be reduced by 30%.

Document n° 21: Stock assessment of red mullet (*Mullus barbatus*) in GSA 25

Abstract: *Mullus barbatus* in GSA 25 is exploited by the bottom otter trawlers and the artisanal fleet using set nets (basically trammel nets). The main species caught with *M. barbatus* are: *Spicara smaris*, *Boops boops*, *M. surmuletus, Pagellus erythrinus* and c*ephalopods* (*Octopus vulgaris, Loligo vulgaris* and *Sepia officinalis*).The artisanal fishery catches also relative large quantities of *Siganus spp*., *Sparisoma cretense* and *Diplodus spp*. The average percentage of M. *barbatus* in the overall landings of the bottom trawl and artisanal fishery, for the period 2005-2008, was 7% (equal with 19.2 tons) and 2% (equal with 20.2 tons) respectively.
Both gears exploit mostly age classes 1 and 2."

Source of Management advice:
The present assessment was performed by means of VPA analysis, using a mean pseudo-cohort from catch-at-age data for the period of 2005-2008. A Yield per Recruit (Y/R) Analysis was also performed. The VIT software (Lleonart and Salat, 1997) was used for both analyses. Due to the short time data series and the almost equal exploitation of the stock by two fishing gears, the VIT software was considered as the most appropriate software for assessing the stock.
Data used:
Catch-at-age data derived from landings for each fishing gear exploiting the stock (bottom trawl and trammel net), and discards data from bottom trawl. A combined ALK for 2006-2008 and annual length distributions from 2005-2008 were used. An M vector was used, estimated by PRODBIOM (Abella et al., 1997). The biological parameters used (growth parameters, L-W relationship and maturity ogive) were collected within the framework of the Cyprus National Data Collection Programme.

Stock status: Over-exploited

SC Management advice and recommendations:
The SC agreed with the overexploitation of the stock and recommended since the fishing pressure is coming more from artisanal fishery, to monitor this fishery in the future closely.

Document n° 22: Stock assessment of Norway lobster (*Nephrops norvegicus*) in GSA 05

Abstract: This species is one of the target species of the bottom trawl fishery developed off Mallorca by a leet 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.* Annual landings from 1986 to 2008 fluctuated between 3 and 20 tons.

Source of Management advice:
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 2002-2008. For that period average annual catches were 10 tons (3.5 for females and 6.5 for males). It has been used monthly size composition of catches by sex, estimated from on board sampling between 2002 and 2008, and official landings (daily sale bills). The biological parameters for both sexes (growth, length-weight and first maturity) were the same than previous assessment of this species in the Catalan Sea (GSA-06; Sardà et al., 1998). Natural mortality was estimated from Pauly's method (1980) and a terminal

Stock status: Fully exploited

SC Management advice and recommendations:
The SC did not agree on the fully exploitation of the stock because of the flat Y/R curve where the Fmax cannot be easily identified. The SC recommended further analyses to be done.

Document n° 23: Stock assessment of Norway lobster (*Nephrops norvegicus*) in GSA 09

Abstract: The Norway lobster is one of the most important commercial species in the GSA as total annual landing value. Almost all the landings of the species are due to bottom trawl vessels exploiting slope muddy bottoms mainly between 300 and 500 m depth. The main trawl fleets of GSA9 are present in the following continental harbours: Viareggio, Livorno, Porto Santo Stefano (Tuscany), Fiumicino, Terracina, Gaeta (Latium).
Catch of vessels targeting Norway lobster is composed of a mix of both commercial (hake, deep-sea pink shrimp, horned octopus (*Eledone cirrhosa*), squids (*Todaropsis eblanae*)), and less valuable or non-commercial species (*Etmopterus spinax*, *Galeus melastomus*, *Macrouridae*).
The trawl fleet of GSA 09 mostly targeting Norway lobster is of about 80 trawlers. Mainly in the Northern portion of the area, the number of vessels increased since the end of the 90s following the increase in availability. The catch rates in the last two years seem to be reduced and the feet promptly reacted with a reduction of the number of vessels targeting the species. The catch is mainly composed by adult individuals over the size-at-maturity and discarding of specimens under MLS (20 mm CL) is negligible
In the last five years the total landings of Norway lobster of GSA 09 fluctuated between 248 (2005) to 228 tons (2008).

Landings (t) by year and major gear types, 2002-2007 as reported through DCR.

YEAR	2005	2006	2007	2008
DTS		247.96	260.55	227.67
GNS		0.09		0.06
Traps				0.05
Total		248.05	260.55	227.79

Trend in fishing effort (days, GT*days, kW*days, TSL*days) by major gear types, 2002-2007.

Source of Management advice:
Fishery assessment by VPA methods of the Spanish sardine stock GSA01 is shown. VPA Lowestoft software suite was used and XSA was the assessment method. A separable VPA was also run as exploratory analysis for both stocks. Stochastic short term projections were also produced.

Data used:
Landings from 2000-2008 from all Fishery ports from GSA01. ALK 2003-2008, combined ALK for 2000-2002. Length Distributions 2003-2008, combined for 2000-2002. Biological sampling 2003-2008 for Maturity at age and Weight-Length relationships. Tuning data from acoustic survey ECOMED and Commercial Fleet off Estepona, Malaga and Adra for years 2003 to 2008.

Stock status: over-exploited

SC Management advice and recommendations:
The SC did not accept the assessment because it noted some contrasting signals in diagnosis of exploitation and recommended further the analysis to be done.

Document n° 24: Stock assessment of violet shrimp (*Aristeus antennatus*) in GSA 05
Abstract:
Source of Management advice:

Stock status: Over-exploited

SC Management advice and recommendations:
The SC agreed with the overexploitation diagnosis. No major comments were made

Document n° 25: Stock assessment of giant red shrimp (*Aristaeomorpha foliacea*) in GSA 15 & 16

Abstract: The giant red shrimps is an important target species for Sicilian as well as Maltese trawlers, and is caught on the continental slope throughout the year, although landing peaks are observed in summer. *A.foliacea* is fished mainly in the central – eastern side of the Strait of Sicily, whereas in the western side of the Strait it is substituted by the violet shrimp, *Aristeus antennatus*. A rough delimitation of the most important fishing grounds of red shrimps in the Strait of Sicily is available in Ragonese (1989). However, due to reduction of catch rates since 2004, some trawlers based in Mazara del Vallo, which is the main fleet in the area, recently moved to the eastern Mediterranean (Aegean and Levant Sea) to fish red shrimps (Garofalo et al., 2007).In Maltese waters, trawlers targeting the giant red shrimp A. foliacea within the 25nm fisheries management zone trawl either to the north / north-west of the Island of Gozo, or to the west / south-west of Malta, at depths of about 600m. In terms of fishing gear, the Italian and Maltese trawlers operating in the Strait of Sicily use the same typology of trawl net called "Italian trawl net", which is a type of otter trawl characterised by a low vertical opening (up to 1.5 m) with dimensions changing with engine power (Fiorentino et al., 2003). Using this gear, giant red shrimps are frequently caught together with *Nephrops norvegicus*, large *Parapenaeus longirostris*, *Merluccius merluccius* and occasionally *Aristeus antennatus.*

Source of Management advice:
The stock of A. foliacea in the Strait of Sicily has been assessed using a combination of landings data (GSA 16, 2006-2008, available through EU DCR) and scientific survey data (MEDITS trawl survey data; GSA 15: 2002-2008 / GSA 16: 1994-2008). The landings data were analysed using the VIT pseudocohort approach, keeping the individual years separate.
MEDITS survey data was analysed with the SURBA software (Needle, 2003): (1) for combined data from GSA 15 and GSA 16 and (2) keeping data from GSA 15 and GSA 16 separate. Length frequency distributions were converted to age using the age splicing procedure of the LFDA software, and a vector of natural mortality by age was calculated from Caddy's (1991) formula, using the PRODBIOM spreadsheet (Abella et al., 1996; 1997). In addition, yield per recruit / spawning stock biomass per recruit and biological reference points were estimated within the VIT (Lleonart and Salat, 2000) and Yield (Hoggarth et al., 2006) packages.
The assessment was performed in the second meeting of the STECF sub-group on the Mediterranean (SGMED-09-02). "

Stock status: Over-exploited

SC Management advice and recommendations:
The SC agreed with the overexploitation of the stock and the necessity to reduce the fishing mortality in the long term by 30%.

Document n° 26: Stock assessment of deep water pink shrimp (*Parapenaeus longirostris*) in GSA 09

Abstract: The deep sea pink shrimp is one of the most important species exploited commercially by the trawl fleet (361 vessels) in the GSA9. The fishing grounds are distributed from 150 to 400 m depth, where the main target species are hake, *Merluccius merluccius*, *horned octopus, Eledone cirrhosa* and Norway lobster*, Nephrops norvegicus*, at greater depths. The stock is more abundant in the southern part (central northern Tyrrhenian Sea) than in the northern part (Ligurian Sea). Landings in 2006 and 2008 were concentrated on adults of age classes 2-4. High landings were observed in 2006. Fishing mortality peaked for specimens of age classes 2 and 3. Recruitment and relative SSB showed an increasing trend in the last ten years. Current fishing mortality estimated from catch data (2006-08) using LCA is currently slight below the estimated F reference point (F01). Trawl surveys returned higher F values well above F01.

Source of Management advice:
Data used: catch data collected from 2006-08. Trawl survey data (Grund: 1994-2007; Medits: 1994-2008). Assessment has been done comparing Fcurr respect to Fref (F01). Estimates of Fcurr have been obtained using Length Cohort Analysis (LCA) and Survey Based Assessment (SURBA). Yield software has been used to estimate F01 given a set of biological parameters and fisheries data and assuming a given uncertainty level for some parameters (CV=0.2).

Stock status: Fully exploited

SC Management advice and recommendations:
Considering that the two used approaches gave current F very close to F0.1, the SC agreed with the fully exploitation of the stock.

Assessment related documents

Document n° 27 : Assessment of Norway lobster, *Nephrops norvegicus*, in the central Adriatic Sea by E. Betulla Morello, Michela Martinelli, Igor Isajlovic, Andrea Belardinelli, Daria Ezgeta, Alessandro Lucchetti, Carlo Froglia, Jim Atkinson, Nedo Vrgoc, Enrico Arneri

Abstract: *Nephrops norvegicus* is of major commercial importance throughout the NE Atlantic and Mediterranean distribution, including in the Adriatic Sea. In the Adriatic, Nephrops ranks first of all crustacean species exploited in terms of value, and second in terms of weight, with a decreasing trend in catches since 1993. It is found on muddy grounds between 50 m and .400 m depth, with important fishing grounds at around 70 m off Ancona and around 200 – 270 m in the Pomo pits. Stock assessment of Nephrops is complicated by the fact that the species is caught in commercial trawling gear only when it emerges from its burrow. Emergence varies with time of day, season, animal size, sex, and reproductive status, so the fishery exploits the population selectively and in a different manner according to sex . Moreover, Nephrops lack hard structures bearing marks indicative of age, so the standard age-based methodologies applied in fishery-dependent stock assessment cannot be applied. Methods relying on length compositions have been applied, but they depend on reliable growth data, which are not always available. For these reasons, fishery-independent methods of stock assessment are of particular relevance to the species. and the most practical of these uses burrow counts as an index of stock abundance. The methodology for this involves the use of towed, underwater television (UWTV) or still photography. Towed, the UWTV methodology is now used as standard in the UK (Marrs et al., 1998; Tuck et al., 1999), where more than 50% of the European catch of Nephrops is taken. Usually, UWTV surveys provide an index of stock abundance that can be used to assess trends in stock status, but in other, instances, and subject to certain assumptions, they can be used to provide stock biomass estimates. The Istituto di Scienze Marine (CNR – ISMAR) of Ancona and the Institute of Oceanography and Fisheries of Split joined forces, under the auspices of FAO – ADRIAMED, towards the evaluation and assessment of the Nephrops stocks in the Pomo pits using the towed UWTV methodology. The

sampling was carried out in the period 5 – 27 May 2009 on board CNR's RV G. Dallaporta. The aim of this contribution is that of presenting the results of such UWTV survey.
SC COMMENTS: The SC considered very interesting the presentation and supported this kind of study. The use of independent method to estimate stock biomass of demersal species was welcomed.

Document n° 28 : Preliminary results of the MedSudMed and CopeMed II Working Group *on Parapenaeus longirostris* in the Projects' area (GSAs 12, 13, 14, 15 & 16) by S. Ben Meriem, L. Knittweis, M. Dimech, F. Fiorentino, V. Gancitano, G. Garofalo, O. Jarboui, R. Pace, L. Ceriola

Abstract: The total capture production of *P. longirostris* in waters from Sicily and Tunisia exceeded 7000 tonnes with peaks > 10000 tonnes. An appraisal of the spatial distribution and of state of the stock in this sub-region became of increasing relevance in order to harmonise and optimize the management strategies for a sustainability use of this resource. The MedSudMed and CopeMedII supported a joint preliminary exercise on *P. longirostris* in the projects' area. The exploitation pattern differs substantially from artisanal and industrial trawlers that fish more the oldest fraction of the stock than artisanal trawlers that targeted the youngest fraction of the population. A decrease of 20% of the current fishing mortality does not produce significant decrease in the yield. The immediate losses after an increase of the length at first capture of 20% would be relatively low for the two fleets; the losses from an increase in length at first capture by 20% would be 12% for the artisanal trawlers fleet while industrial trawlers suffer immediate losses around 4%.

SC Comments: the SC congratulated the study and outlined the importance of works involving all countries fishing on shared stocks in order to keep effective advices. The SC recommended the presented as preliminary study to become a true and complete assessment in few time.

Document n° 29 : An analysis of a disappearance case - Hake in GSA 24 – by Ali Cemal Gücü

Abstract: The hake had not been a significant commercial fish in GSA-24 until 1990's when a sudden increase in the landing was experienced. Following a series of good years, the landings were sharply declined. Undoubtedly the intensity of trawl fishery in the area had a role in the decline, however as the decline occurred shortly after a sudden increase, the event can hardly be explained within the fisheries context only. In this study, I tried to analyze the behaviour of hake on the continental shelf in association with environmental parameters. The results indicated that formation and movements of different water masses in the area has primary importance on the occurrence of hake on the continental shelf. The growth pattern incurred from the modal shift in monthly length-frequency distributions showed that the species undergoes fast growth phase on the continental shelf which is most likely associated with intense feeding. As results the most likely conclusion to the appearance/disappearance event in the GSA-24 was that the change in the hydrology of the region which was probably linked to the cold period prevailed at the same time, has temporarily altered the clupeid composition and distribution on the continental shelf. The change in the small pelagic species along with the changes in the hydrology favoured the hake which ascends to the coastal waters in the region to feed mainly on clupeids

SC Comments: the SC congratulate for this presentation and outline the importance of studies in border of species distribution can clarify relationship between stock dynamics and environmental factors

REVIEW OF NEW STOCK ASSESSMENTS OF SMALL PELAGICS AND RELATED SCIENTIFIC ADVICES.

Results of Working Group on stock assessment of small pelagics

11. 9 technical papers were presented and discussed by the Working Group held in Ancona (26-30 October 2009). From those papers, 6 were considered as assessments, 1 was not accepted and another one was assessment related. The assessments covered 3 GSAs and concerned 6 stocks and 2 species (Annex IV, Table II). The information on assessment by species and GSA is provided in Annex V, Table II

Document n° 30 : Stock assessment of sardine (*Sardina pilchardus*) in GSA 07

Abstract: In the gulf of Lion, pelagic fisheries are targeted on sardine and anchovy. Fishing effort depends on market fluctuations. A mean of 50 trawler boats in the last years are targeting these pelagic species. There are also 14 purse seiners in the south of gulf of Lion that catch also these species. Some purse seine boats from Spain come in the area to fish mainly sardine.

Source of Management advice:
The stocks of the main species of small pelagics in the gulf of the Lion are evaluated annually. The objective is to provide some advices to administrations and the profession on the state of resources in view of a durable exploitation. The pelagic species studied are anchovy and sardine in priority but also mackerels, horse mackerels, *sardinella* and sprat when present. The different species don't have the same biology and behaviour (life span, reproduction period, and habitat). Also, the catches data and specific fishing effort collected by producer organisations are not sufficiently precise to permit an indirect approach of the stock assessments.
The solution chosen in the gulf of Lion is to use direct assessment method of stocks by echo - integration while completing them with indicators of the fishing activity. At this end, PELMED surveys are performed at daytime in July. Transects are prospected, perpendicular to the coast at a speed of 8 knots, from 15-20m depth until the offshore break. Pelagic and bottom trawling operations are performed to identify species met along transects. Population structures are identified by size and age. The acoustic assessment results are completed by an analysis of catches and fishing effort to improve the fisheries diagnoses.

Stock status: Moderate fishing and intermediate abundance.

WG Management advice and recommendations:
As biomass estimation for 2006-2008 remains lower than the 2005 estimate, it is recommended not to increase the fishing effort, despite the fact that the amount of juveniles in 2008 was bigger than in recent years (50000 t). This recommendation is coherent with the advice given for anchovy for the same fishery in this area, as this a mixed fishery. Scientific recommendation for the advice With the aim of assessing shared stocks, re-enforce of the cooperation between France and Spain to actualise biological data as well as catch and effort data collection for the boats of the two countries catching sardine in the Gulf of Lion is desirable.

SC Recommendation:
The SC agreed with the WG advices (not to increase the fishing effort) but recommended the use of adequate BRP to identify the current exploitation state of this stock.

Document n° 31 : Stock assessment of anchovy (*Engraulis encrasicolous*) in GSA 07

Abstract: In the gulf of Lion, pelagic fisheries are targeted on sardine and anchovy. Fishing effort depends on market fluctuations. A mean of 50 trawler boats in the last years are targeting these pelagic species. There are also 14 purse seiners in the south of gulf of Lion that catch also these species. Some purse seine boats from Spain come in the area to fish mainly sardine.

Source of Management advice:

The stocks of the main species of small pelagics in the gulf of the Lion are evaluated annually. The objective is to provide some advices to administrations and the profession on the state of resources in view of a durable exploitation. The pelagic species studied are anchovy and sardine in priority but also mackerels, horse mackerels, *sardinella* and sprat when present. The different species don't have the same biology and behaviour (life span, reproduction period, habitat,…). Also, the catches data and specific fishing effort collected by producer organisations are not sufficiently precise to permit an indirect approach of the stock assessments.
The solution chosen in the gulf of Lion is to use direct assessment method of stocks by echo - integration while completing them with indicators of the fishing activity. At this end, PELMED surveys are performed at daytime in July. Transects are prospected, perpendicular to the coast at a speed of 8 knots, from 15-20m depth until the offshore break. Pelagic and bottom trawling operations are performed to identify species met along transects. Population structures are identified by size and age. The acoustic assessment results are completed by an analysis of catches and fishing effort to improve the fisheries diagnoses.

Stock status: Moderate fishing with low abundance

WG Management advice and recommendations:
Given the low levels of biomass for the last 4 years in comparison with the series of acoustic biomass available, the WG recommends not to allow any increase in fishing effort.

SC Recommendation:
The SC agreed with the WG advices (not to increase the fishing effort) but recommended the use of adequate BRP to identify the current exploitation state of this stock.

Document n° 32 : Stock assessment of sardine (*Sardina pilchardus*) in GSA 16

Abstract: In Sciacca port, the most important base port for the landings of small pelagic fish species along the southern Sicilian coast (GSA16), accounting for about 2/3 of total landings in GSA 16, two operational units are presently active, purse seiners and pelagic pair trawlers. In both OUs anchovy represents the main target species due to the higher market price, so generally sardine catches are to be considered of secondary importance for local fishery. Average sardine landings over the period 1997-2008 were about 1,500 metric tons, with a general decreasing trend. Sardine biomass, estimated by acoustic methods, ranged from a minimum of 6,000 tons in 2002 to a maximum of 39,000 tons in 2005.

Source of Management advice:
Census data for catch and effort information (on deck interviews) in Sciacca port. Biological samples for fish biology information. Acoustic data for fish biomass evaluations. Total official landing for the last 3 years were also taken into account.

Stock status: Moderate fishing and intermediate abundance

WG Management advice and recommendations:
Biomass evaluations from echo-surveys carried out from June 1998 to August 2008 in GSA 16 show that sardine population experienced quite large inter-annual fluctuations, from about 39,000 t in 2005 to 6,000 t in 2002. Taking into account that fishing effort was relatively stable in last decade, results would suggest the importance of environmental factors variability on yearly recruitment success. Since 2006 biomass estimates have been at moderate level. Management advice and Recommendations: Current exploitation level seems to be moderate. Given the multispecies nature of this fishery, and in agreement with the recommendations concerning anchovy, the WG recommends that the fishing effort should not be allowed to increase. As the exact

impact of fry fishery on this population is not known, the WG recommends a close monitoring of this fishery (catches and biological features) is assured.

SC Recommendation:
The SC agreed with the WG advices (not to increase the fishing effort) but recommended the use of adequate BRP to identify the current exploitation state of this stock.

Document n° 33 : Stock assessment of anchovy (*Engraulis encrasicolous*) in GSA 16

Abstract: In Sciacca port, the most important base port for the landings of small pelagic fish species along the southern Sicilian coast (GSA16), explaining for about 2/3 of total landings in GSA 16, two operational units are presently active, purse seiners and pelagic pair trawlers. Average anchovy landings over the period (1997-2008) were about 1,500 metric tons, with large interannual fluctuations. Anchovy biomass, estimated by acoustic methods, ranged from a minimum o 3,1000 tons in 2008 to a maximum of 32,000 tons in 2005

Source of Management advice:
Census data for catch and effort information (on deck interviews) in Sciacca port. Estimated landings (sampling data) for the whole GSA16 from official DCR programme. Biological samples for fish biology information. Acoustic data for fish biomass evaluations.

Stock status: High fishing mortality and low abundance

WG Management advice and recommendations:
Biomass evaluations from echo-surveys carried out from June 1998 to August 2008 in the Strait of Sicily show that anchovy population experienced quite large inter-annual fluctuations, from a maximum of about 32,000 t in 2005 to a minimum of 3,100 t in 2008. Latest biomass estimates (2006-2008 surveys) are the lowest of the series. Taking into account that fishing effort was relatively stable in last decade, whereas CPUE trend was even increasing, results would suggest the importance of environmental factors variability on yearly recruitment success and/or a possible increase in the vulnerability of the resource. However, 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 level of exploitation rates but with high variability experienced over the last years, give a warning about the sustainability of current levels of fishing effort. In addition, possible negative effects on these populations could result from pressure of other fishing gears on larval stages. Given that biomass was very low for three consecutive years (2006, 2007 and 2008) and the increasing trend in exploitation rate, fishing effort should not be allowed to increase. The fry fishery for sardine should not be extended after March so as to avoid additional mortality of juvenile anchovy.

SC Recommendation:
The SC agreed with the WG advices (not to increase the fishing effort) but recommended the use of adequate BRP to identify the current exploitation state of this stock. The SC noted that stock suffers of high exploitation rates combined with low biomass level.

Document n° 34 : Stock assessment of sardine (*Sardina pilchardus*) in GSA 22

Abstract: In GSA 22 (Greek part) sardine is almost exclusively exploited by the purse seine fleet. Pelagic trawls are banned and benthic trawls are allowed to fish small pelagics in percentages less than 5% of their total catch. Regarding the regulations enforced they concern a closed period from the mid December till the end of February and technical measures such as minimum distance from shore, gear and mesh size, engine, GR. There is a minimum landing

size at 11 cm. Discards values are less than 1%, reaching approximately 0.3% data for GSA 22. Data of the landings per vessel class indicate that small vessels (12-24 m) are mainly responsible for sardine catches (>88% of sardine catches).

Source of Management advice:
This assessment is based on fishery independent surveys information as well as on Integrated Catch at Age (ICA) analysis model. Acoustic surveys estimations were used for Total Biomass estimates. ICA assessment method uses separable virtual population analysis (VPA) with weighted tuning indices. The application of ICA was based on commercial catch data (2000-2008) and as tuning indices were used the biomass estimates from acoustic surveys estimates over the period 2003-2008 with a gap in 2007, as no acoustic survey data were available for this year.

Stock status: High fishing mortality and intermediate abundance

WG Management advice and recommendations:
These assessment suggestions should be taken as cautionary, as this ICA assessment for this area it is based on a short time series of data. The major component of the stock was the 1-year-old and 2-year-old-sardine (i.e. the recruitment to the fishery). An increasing trend in the estimates of SSB was observed since 2004. Fishing mortality although high seems to level out in a lower stage since 2004. The current improved assessment of ICA for sardine indicated higher levels of exploitation rate, above the empirical level for stock decline (E>0.4, Patterson 1992) for small pelagic. The average exploitation rate for the recent five years of the time series available was suggested in order to advice on the exploitation status of the stock. Therefore, taking into account the increasing trend in total stock biomass since 2004 and given the short time series available, the stock is characterized as fully exploited. A time series extension and monitoring in an annual basis is required in order to suggest reliable and effective Reference Points for this fishery. Monitoring of the status of the stock with fisheries independent techniques is essential for this fishery. Therefore, by these results we consider fishing effort should not increase beyond the current levels. The likely consequences of changing the closed period for the purse seine fishery should be analyzed. Since the fishery is considered a multispecies fishery targeting both anchovy and sardine, a shift in the closed fishing period (present middle December till the end of February) towards the recruitment period of anchovy (October to December) or the recruitment period of sardine (February to April) should be examined.

SC Recommendation:
The SC agreed with the WG advices (not to increase the fishing effort)

Document n° 35 : Stock assessment of anchovy (*Engraulis encrasicolous*) in GSA 22

Abstract: In GSA 22 (Greek part) anchovy is almost exclusively exploited by the purse seine fleet. Pelagic trawls are banned and benthic trawls are allowed to fish small pelagics in percentages less than 5% of their total catch. Regarding the regulations enforced they concern a closed period from the mid December till the end of February and technical measures such as minimum distance from shore, gear and mesh size, engine, GR. There is a minimum landing size at 9 cm. Discards values are less than 1%, reaching approximately 0.06% data for GSA 22. Data of the landings per vessel class indicate that small vessels (12-24 m) are mainly responsible for anchovy catches (>70% of sardine catches).

Source of Management advice:
This assessment is based on fishery independent surveys information as well as on Integrated Catch at Age (ICA) analysis model. Acoustic surveys estimations were used for Total Biomass estimates.

ICA assessment method uses separable virtual population analysis (VPA) with weighted tuning indices. The application of ICA was based on commercial catch data (2000-2008) and as tuning indices were used the biomass estimates from acoustic surveys estimates and DEPM surveys estimates over the period 2003-2008 with a gap in 2007, as no surveys data were available for this year.

Stock status: Fully exploited, moderate fishing and intermediate abundance

WG Management advice and recommendations:
Based on ICA results the mean F (for ages 1 to 3) showed a decrease since 2003 showing a rather plane pattern at a lower level. Conclusions based on this assessment should be considered cautionary, as they are based on a short time series of data, not suitable to suggest reference points of Blim. Taking into account that anchovy is a short lived species characterized by high fluctuations in abundance and recruitment strongly depending on environmental conditions, it is advisable that current results only precautionary should be used for management advice. Precautionary the use of F(E0.4) that assures exploitation rate below the empirical level for stock decline (E<0.4, Patterson 1992) for small pelagics is suggested as preferable reference point and the average exploitation rate for the recent five years of the time series (E=0.349) available was suggested in order to advice on the exploitation status of the stock. Based on this assessment results and the aforementioned parameters this stock is considered to be harvested sustainable, operating below but close to an optimal yield level, with no expected room for further expansion. However this has to be confirmed in following years and the anchovy stock should be monitored in an annual basis with direct assessment surveys.

SC Recommendation:
The SC agreed with the WG advices (not to increase the fishing effort)

Document n° 36 : Stock assessment of round sardine (*Sardinella aurita*) in GSA 26

Abstract: The Egyptian Mediterranean coast is about 1100 km extending from El-Sallum in the West to Taba city in the East. The mean annual fish production from this area is about 50 thousand ton. There are three fishing methods conducted in the Egyptian Mediterranean; trawling, purse-seining and hook (especially long and hand lining).
The fishing grounds along the Egyptian Mediterranean coast divided into four regions; Western region (Alexandria and El-Mex, Abu-Qir, Rasheed, El-Maadiya and Mersa Matruh), Eastern region (Port Said and El-Arish), Demietta region and Nile Delta region.
The number of purse- seiners in the Egyptian Mediterranean varied between 215 and 286 vessels. The vessel's length ranged between 15 and 20 meter and its width of about 5 to 7 meter. They are powered by engines of 100 to 500 hp. The purse-seiners are operated at night using lighted dinghies. All fishing ceases during an approximately ten days during each month, when the moon is full. The crew number ranged between 15 and 25 persons. The fishing trip takes one to two days duration.
The purse-seine fishery contributes about 57% of the total fish production.
The dominant fish families in the purse-seine catch are family: *Clupeidae* which commonly known as sardines and herring; family*: Carangidae* (horse mackerel, scads and jacks); family: *Scombridae* (mackerels, bonitos and tunas) and family: *Pomatomidae* (blue fish).

Source of Management advice:
Length-frequency data of S. aurita were collected monthly from the commercial catches of purse-seiners at the landing sites during 4 years (2005-2008). Otoliths' readings technique was used for age determination. The back-calculated lengths were used to estimate the growth parameters (L∞ & K) of the von Bertalanffy growth model by fitting the Ford (1933) and Walford (1946) plot. The total mortality (Z) was estimated using the length converted catch curve method of Pauly (1983). The natural mortality coefficient (M) by length and age was calculated PRODBIOM The fishing

mortality coefficient F = Z – M and the exploitation rate E was estimated as E = F/Z. The length at first capture Lc was estimated by the analysis of catch curve using the method of Pauly (1984) while the length at first sexual maturity L50 was estimated by fitting the maturation curve. LCA was performed using VIT software (LIeonart and Salat, 1997) using two different values of F terminal (0.2 and 0.4). Relative yield per recruit (Y'/R) and relative biomass per recruit (B'/R) were estimated using the model of Beverton and Holt (1966) incorporated in FiSAT software.
The yield per recruit analysis was done using vit software.

Stock status: Overexploited with high fishing mortality.

WG Management advice and recommendations:
Fishing mortality should be reduced by about 50% to achieve F0.1, while the exploitation rate should be decreased by about 52% to conserve the spawning stock biomass. Nursery grounds should be identified and protected from illegal fishing and pollution.

SC Recommendation:
The SC did not endorse this assessment because it has been carried out under steady state approach and data did not cover the whole fishing ground of the stock. However SC welcomed and congratulated the work done and encouraged to continue to assess the stock. Moreover the SC agreed on the WG comments.

Document n° 37 : Stock assessment of sardine (*Sardina pilchardus*) in GSA 04 (no assessment forms were delivered)

Abstract: This study was performed on 2859 specimens of sardine, *Sardina pilchardus* collected biweekly from November 2006 to October 2007. Samplings were carried out at the fishing port of Annaba where purse-seine methods are used for small-scale fishing at depths from 15 to 30m. Data concerning the exploitation of catches were analysed by means of 2 software packages:) FiSAT (2004), which we used to determine the essential parameters for the study of dynamics; and ii) VIT (2000), the most suitable tool for the stock assessment based on the application of Length Cohort Analysis (LCA) together with a Yield per Recruit Analyses (Y/R) based on short series of data. This software VIT (2000) assumes steady state and functions with pseudo-cohorts, requiring knowledge of the catches over 1 year only instead of a historical series of several years. The results of this application revealed that the exploitable average biomass of the sardine stock, composed of 28 length sizes from 6.5 to 20 cm with a step of 0.5 cm, was around 4778.93 tons of which 2513 tons (53%) were spawning stock . The size and the average age of the sardine stock were 12.5 cm and 2.7 years. Total Biomass balance (D) is estimated at 5508.64 tons. This corresponded to growth in weight of 4453.77 tons, (80.85%), as compared to recruitment of only 1054.86 tons (19.15%). Losses were caused mainly by natural mortality (M), estimated at 3823.14 tons, and accounting for 69.40 %, This was higher than fishing mortality (F) which was 1685.5 tons, that is, 30.60 %. We estimated the yield per recruit (Y/R) of sardine at 2.682 g. This value was lower than the threshold of maximum yield per recruit at 3.413 g. Though preliminary, these results indicate that the sardine population can be considered to be in a situation of under-exploitation in this area. Considering the shape of the Y/R, the 0.1 reference point must be added as a priority strategy. In general, sardine stock analysed is: (1) moderately exploited with reference to Y/R0.1. (2) under-exploited with reference to Y/R max. Under the precautionary principle, fishing efforts should not increase and we recommend limiting fishing to current levels. However, we suggest monitoring both the fishing strategy. Moreover we recommend annual monitoring of the evolution of catches.

WG Management advice and recommendations:
The WG acknowledge the importance of the study on the sardine fishery in the Eastern part of Algeria. And the WG encourages its continuity expanding if possible to the rest of the Algerian coasts. Nevertheless due to the limited period of sampling and geographical area covered in the study, as well as the need for improvements in biological parameters, results were considered too preliminary. Improvements were suggested in the scheme of sampling for length and in the study of the biological parameters of the stock. Concerning the assessment of the stock expansion of the data series for several years would be very valuable and in particular complementing the monitoring of the fishery with direct acoustic surveys.

SC Recommendation:
The SC did not endorse this assessment because data were very preliminary. However SC encouraged continuing to assess the stock.

Assessment related documents

Document n° 38 : Small pelagics in GSA24 (Turkey) by Serdar Sakinan.

Abstract: Despite its oligotrophic character, the carrying capacity of the ecosystem for small pelagic is assumed to be improving because of the man-induced eutrophication in coastal waters of southern Turkey (GSA 24). Small pelagics had not been commercially important in the area before 1980's or at least their importance was not known because fishery was concentrated on highly commercial peneaid crustaceans. After 1980, the small pelagics which had been only treated as "bait-fish" has begun gaining sudden importance. This importance is reflected in the landings and also in the number of purse-seiners which did not exist before 1980's. Until very recently the scientific studies on the small pelagics in GSA 24 were restricted to checklists, new records and to some biological aspects of the major species such as rounded sardine. Therefore it is not known whether the increase of landings was simply due to the increase in the purse seine fleet or the carrying capacity of the small pelagic stocks have also increased due to changes in the coastal ecosystem. In contrary to small pelagics, the demersal stocks have been studied quite intensely since 1950's. The time series data of the trawl surveys suggest an increase in the small pelagic after 1990's when quite a significant quantities of small pelagic fishes, which very seldom caught by a bottom trawl comprised significant part of the samples. The land around GSA 24 holds one of the most productive agricultural regions of Turkey. There are 4 important rivers passing by and washing away agricultural wastes to the sea. At the same time Mersin is the fastest growing city near Mediterranean in Turkey with minor concern in waste water treatment. Consequently, the oligotrophic character in the coastal waters has turned to severe eutrophication in 1990's. Besides the effect of eutrophication, removal of the predators could be another factor for the increasing small pelagics population. Demersal fish assemblage is largely dependent on small pelagics. The earlier studies state that the main food source of the major piscivours such as hake and lizardfish were mullids. Later mullids were significantly declined due to overfishing and small pelagic became the main food sources. The model results indicate that the 65% of the food requirement of the piscivourous fishes are met by small pelagics. The overfishing is removing the predators of small pelagics from the systems. System could be switched to top down control and resulted increase in population. The spatial partitioning of small pelagic fish which was formerly constituted by *Sardinella aurita* and *Sardina pilchardus* alone has been changed with the recent establishment of *Etrumeus teres* and *Dussumeria elipsoides* stocks, and with the sudden increase of *Engraulis encrasicholus*. This increase in number of species could be a result on fluctuations of temperature regime. An extensive study using fisheries acoustics has been started in 2009 on the small pelagic fish stocks by Middle East technical University – Institute of Marine Sciences. The data is being collected within a project supported by Turkish Scientific and Technological Research Council, TUBITAK. Current study is not designed to

assess pelagic stocks but to understand the ecology of the small pelagic fish in the GSA 24. The scope of the research covers characterization of the species composition and spawning and over wintering habitat partitioning of small pelagics in the area. The aim is to obtain an analysis of fish movements, in response to environmental parameters; mainly temperature and primary production. In the scope of the project, acoustic surveys, CTD castings, satellite data, and trawl samplings are being conducted. The biological parameters like, length –weight relationship, gonadosomatic index, condition and maturity index are also being evaluated. As of October 2009, the preliminary results show that there seems a direct and evident relation with the primary production. The NASC values are high in the areas where fluorescence is the highest. There are also some very strong clues that the hydrological conditions and different water masses covering the region are the fundamental factor determining the distribution of the fishes. The research project is going to be finished at the end of 2011. The next steps of the project are going to include the adoption of the surveys to the MEDIAS protocol which brings standards to the acoustic surveys conducted in the Mediterranean Sea. The final aim is to determine the essential habitats of the small pelagic including spawning, feeding and nursery grounds, and give recommendations to the related ministries for management and conservation.

WG COMMENTS: The WG welcomed the information provided to the meeting on the ecology of the small pelagics in this region. The work was considered very valuable and the WG endorsed the continuity of those studies. However as the nature of the data do not allow making any assessment of the pelagic resources and the fisheries in the area, the WG would encourage the provision of data about the monitoring of the pelagic fisheries and about direct estimation of pelagic resource in future meetings.

SC Comments: Endorsed

RESULTS OF NEW STUDIES PERFORMED IN SPECIFIC GSAS INCLUDING THOSE CARRIED OUT IN THE FRAMEWORK OF REGIONAL PROJECTS AND PROGRAMS

12. 9 technical papers were presented. From those papers, 6 were considered as assessments and 3 assessment related. The assessments covered 3 GSAs and concerned 6 stocks and 2 species (Annex IV, Table II).

Document n° 39 : Stock assessment of anchovy (*Engraulis encrasicolus*) in GSA 01

Abstract: Sardine (*Sardina pilchardus*) and anchovy (*Engraulis encrasicolus*) are the main target species of the purse seine fleet in Northern Alboran GSA1, but other species with lower economical importance are also captured, sometimes representing a high percentage of the capture: horse mackerel (*Trachurus spp*.), mackerel (*Scomber spp*.), frigate mackerel (*Auxis rochei*), Atlantic saury (*Scomberesox saurus*) and gilt sardine (*Sardinella aurita*). This report is exclusively focused on fishery of anchovy.

Source of Management advice:
Fishery assessment by VPA methods of the spanish anchovy stock GSA01 is shown. VPA Lowestoft software suite was used and XSA was the assessment method. A separable VPA was also run as exploratory analysis for both stocks. Stochastic short term projections were also produced.
Data used: Landings from 2002-2008 from all Fishery ports from GSA01.
Combined ALKs 2003-2008 for all the years. Length distribution 2003-2008. Length distribution 2003 was applied to 2002 landing Tuning data from acoustic survey ECOMED for years 2003 to 2008.

Stock status: Over-exploited with moderate fishing mortality and low abundance.

SC Management advice and recommendations:
The SC agreed with the advice "not increase the fishing effort". However the SC recommended using adequate BRP, based on Biomass, to identify the current exploitation state of this stock. The SC also recommended changing the author's judgement of "moderate fishing mortality" to "high fishing mortality".

Document n° 40 : Stock assessment of sardine (*Sardina pilchardus*) in GSA 01

Abstract: Sardine (*Sardina pilchardus*) and anchovy (*Engraulis encrasicolus*) are the main target species of the purse seine fleet in Northern Alboran GSA1, but other species with lower economical importance are also captured, sometimes representing a high percentage of the capture: horse mackerel (*Trachurus spp*.), mackerel (*Scomber spp.),* frigate mackerel (*Auxis rochei*), Atlantic saury (*Scomberesox saurus*) and gilt sardine (*Sardinella aurita*). This report is exclusively focused on fishery of sardine.

Source of Management advice:
Fishery assessment by VPA methods of the Spanish sardine stock GSA01 is shown. VPA Lowestoft software suite was used and XSA was the assessment method. A separable VPA was also run as exploratory analysis for both stocks. Stochastic short term projections were also produced.
Data used: Landings from 2000-2008 from all Fishery ports from GSA01. ALK 2003-2008, combined ALK for 2000-2002. Length Distributions 2003-2008, combined for 2000-2002.
Biological sampling 2003-2008 for Maturity at age and Weight-Length relationships. Tuning data from acoustic survey ECOMED and Commercial Fleet off Estepona, Malaga and Adra for years 2003 to 2008.

Stock status: Over-exploited with moderate fishing mortality and low abundance.

SC Management advice and recommendations:
The SC agreed with the advice "not to increase the fishing effort". However the SC recommended the use of adequate BRP to identify the current exploitation state of this stock. Finally based on the examined data, sardine was considered as fully exploited with risk to overexploitation

Document n° 41 : Stock assessment of anchovy (*Engraulis encrasicolus*) in GSA 06
Abstract:
Source of Management advice:

Stock status:

SC Management advice and recommendations:
The SC agreed with the advice "not increase the fishing effort". However the SC recommended the use of adequate BRP, based on Biomass, to identify the current exploitation state of this stock.

Document n° 42 : Stock assessment of sardine (*Sardina pilchardus*) in GSA 06
Abstract:
Source of Management advice:

Stock status:

SC Management advice and recommendations:

The SC agreed with the advice "not increase the fishing effort". However the SC recommended the use of adequate BRP, based on Biomass, to identify the current exploitation state of this stock.

Document n° 43 : Stock assessment of anchovy (*Engraulis encrasicolus*) in GSA 17

Abstract: Fishery: mid-water trawlers and purse seiners.
Average total catch in the time interval 1976-2008 is 28,000 tons.
Average total catch in the time interval 2006-2008 is 44,000 tons.

Source of Management advice:
VPA based on Laurec-Shepherd tuning was carried out, by means of the software developed by Darby and Flatman (1994). The total catch at age from 1976 to 2008 (split year) used were relative to both western and eastern sides of Adriatic. Tuning was performed using abundance at age data from echo-surveys carried out in both western and eastern sides of Adriatic (data since 2004 up to 2008). Natural mortality at age was estimated by means of Gislason's method:
The M at age was: 0 1.02, 1 0.82, 2 0.67, 3 0.57, 4 0.54
The threshold exploitation rate F/Z = 0.4, suggested by Patterson (1992) for small pelagics, was used as biological reference point.

Stock status: Moderately exploited.

SC Management advice and recommendations:
The SC agreed with the proposed advice. The use BRP based on biomass was also recommended. The SC also noticed substantial differences between the new assessments and those performed on previous years. The authors explained that this was due to the improvement of the assessment because of the incorporation of new data on age structure, new tuning data and natural mortality vector at age. The SC congratulated the authors for presenting a first joint assessment by all countries involved in the fishery and agreed on the management advice of not increasing the fishing effort.

Document n° 44 : Stock assessment of sardine (*Sardina pilchardus*) in GSA 17

Abstract: Fishery: mid-water trawlers and purse seiners.
Average total catch in the time interval 1975-2008 is 44,000 tones.
Average total catch in the time interval 2006-2008 is 22,000 tones.

Source of Management advice:
VPA based on Laurec-Shepherd tuning was carried out, by means of the software developed by Darby and Flatman (1994). The total catch at age from 1975 to 2008 used was relative to both western and eastern sides of Adriatic. Tuning was performed using abundance at age data from echo-surveys carried out in both western and eastern sides of Adriatic (data since 2004 up to 2008).
Natural mortality at age was estimated by means of Gislason's method:
The M at age was 0 0.75, 1 0.68, 2 0.58, 3 0.53, 4 0.49, 5 0.47, 6 0.43, 7 0.42, 8 0.42, 9 0.41
The threshold exploitation rate F/Z = 0.4, suggested by Patterson (1992) for small pelagics, was used as biological reference point.

Stock status: Fully exploited.

SC Management advice and recommendations:
The use BRP based on biomass was also recommended. The SC also noticed substantial differences between the new assessments and those performed on previous years. The authors explained that this was due to the improvement of the assessment because of the incorporation of new data on age

structure, new tuning data and natural mortality vector at age. The SC congratulated the authors for presenting a first joint assessment by all countries involved in the fishery and agreed on the management advice of not increasing the fishing effort.

ASSESSMENT RELATED DOCUMENTS

Document n° 45 : Spawning stock biomass of the North Western Mediterranean anchovy in 2007 and 2008 GSA 6 and GSA 7 by I. Palomera, L. Recasens, I. Alvarez, B. Molí, P. Libori, A. Sánchez

Abstract: The biomass of North Western Mediterranean anchovy stock was estimated in 2007 and 2008 spawning seasons by means of the Daily Egg Production Method (DEPM), covering the GFCM Geographical SubAreas 6 and 7. Values of anchovy stock spawning biomass (SSB) were 20850 and t in the Gulf of Lions (GSA7) and 3047 t in the Northern Spain area (GSA6). Results show an important decline of anchovy biomass since the last evaluation made with the same method in 1994, being a 70% decrease in the Northern Spain area and around 50% in the Gulf of Lions. These results together with the poor fisheries results for the past years allow us to consider that the anchovy stock in the North Western Mediterranean might be in a critical situation, especially in the southern area (GSA 6-Northern Spain).

SC Comments:

The SC appreciated the work done . Based on the fact that DEPM is an additional tool for small pelagics assessments, recommended the extension of DEPM to other areas of the Mediterranean.

Document n° 46 : SARDONE - Improving assessment and management of small pelagic species in the Mediterranean presented by E. Betulla Morello

Abstract: SARDONE Project is aimed at developing a series of tools to better understand stock assessment and fishery management of small pelagic fish resources (anchovy and sardine) of the Mediterranean. The three major stocks and fisheries were chosen: the NW Mediterranean, the Adriatic Sea and the Aegean Sea. Investigations have focussed on detecting nursery areas; developing acoustic surveys for the estimation of recruitment strength; filling the gap in knowledge on the ecology of late larvae and juveniles; improving the selectivity of current fishing gear; assessing the impact of fry fisheries on the stocks; and exploring the application of novel stock assessment methodologies to Mediterranean small pelagic stocks.

SC Comments:

The SC congratulated for the very interesting project where the small pelagics are assessed within an Ecosystem Approach to Fishery in three areas of the Mediterranean. The SC looks forward to the possibility of new adaptive management for small pelagics made possible by this work.

Document n° 47 : Anchovy (*Engraulis encrasicolus* L.) abundance and distribution in the Northern and Central Adriatic (GSA17) by C. Manfredi, C. Piccinetti, , N. Vrgoč, B. Marčeta

Abstract: Anchovy abundance and spatial distribution in the northern and central Adriatic (GSA17) were analysed by means of Medits surveys data. Medits surveys were carried out in summer covering the whole area of the GSA 17 from 1996 to 2009 and using the same standardized methodologies. The sampling net is a bottom trawl that catches a large number of small pelagic individuals because its wide vertical spread (2.5 m). The temporal pattern of spatial distribution of anchovies was obtained mapping by GIS. Great abundances of anchovies were found along western coastal area near the delta of the Po river and to the north of Ancona. Along the western coastal side, great densities were found in the northern channel area and near the Neretva river. Some differences in the abundance and in the extension of distribution area were pointed out among different years. The temporal persistence of high abundance areas was then evaluated by means of an index of spatial persistence. Persistence analysis pinpointed some areas steadily occupied by high biomass and density that were especially placed along western coastal area. Distribution area of anchovies seems according to size: juveniles are distributed along coastal areas while older individuals live offshore.

SC Comments:
The SC appreciated the use of Medits data in order to obtain biological information on the spatial distribution of those species in the whole Adriatic Sea

Document n° 48 : Sardine (*Sardina pilchardus*) abundance and distribution in the Northern and Central Adriatic (GSA17) by C. Manfredi, C. Piccinetti, , N. Vrgoč, B. Marčeta

Abstract: Medits surveys data were used in order to analyse abundance and spatial distribution of sardine in the northern and central Adriatic (GSA17). From 1996 to 2009 Medits surveys were carried out in summer in the whole area of the GSA 17 using the same standardized methodologies. Geostatistic tools were used in order to analysis temporal pattern of spatial distribution of sardine in the area. Sardines were especially found in the middle part of the northern Adriatic and along coastal areas, although in the last five years a reduction in the extension of distribution area was recorded. This reduction is probably linked to an abundance decrease; in fact biomass and density indices show a clear decline in the last five surveys. Indices of spatial persistence of biomass and density were also calculated in order to identify areas steadily occupied by large abundance of sardines. Some persistence areas of abundance where identified in the northern area along the Istrian coast.

FOLLOW-UP OF SAC/SCSA RECOMMENDATIONS

New available information on mapping the distribution of juveniles
Three working documents were presented.

Title: Nursery areas for hake (*Merluccius merluccius*) of the Gulf of Lions (GFCM-GSA07) by
Francesc Ordines[1], Angélique Jadaud[2], Beatriz Guijarro[1], María Valls[1], Henri Farrugio[2] and Enric Massutí[1]
[1]IEO- Centre Oceanogràfic de les Balears, Moll de Ponent s/n, 07015 Palma de Mallorca (Spain)
[2]IFREMER, 1 rue Jean Monnet, BP 171, 34203 Sète (France)

Abstract: Hake (*Merluccius merluccius*) is an important demersal target species of the commercial fisheries in the Gulf of Lions (GFCM-GSA07). In this area, hake is exploited by French trawl, French gillnet, Spanish trawl and Spanish long-line. Available data on juvenile hakes (0 group) coming from the MEDITS surveys in the Gulf of Lions for the period 1998 to 2008 have been preliminary analysed. For each of the 11 years, standardized indices of abundance of age 0 individuals have been calculated and combined data for the whole series of MEDITS surveys was used to create a contour map showing their distribution. It was created using SURFER software, by applying the inverse distance to a power method. The map obtained in this way shows that in June, the hake recruits are mainly concentrated in the eastern part of the Gulf of Lions, along the external border of the continental shelf, in the vicinity of the top of the slope canyons where a Fishery Restricted Area has been proposed by the GFCM in order to protect the large spawners living there.

Title: Assessment of nursery & spawning areas of commercially important species in GSA 15 by Knittweis, L. and Dimech, M.

Abstract: Understanding the distribution of vulnerable life cycle stages of commercially important demersal species aids in the identification of stock fractions and their dynamics, and is vital information for the implementation of spatially explicit fisheries effort management measures. Trawl survey data gathered around the Maltese Islands during the MEDITS project in 2003-2008 were analysed for *Merluccius merluccius*, *Mullus barbatus*, *Mullus surmuletus*, *Parapenaeus longirostris*, *Aristaeomorpha foliacea* and *Nephrops norvegicus*. Abundance as well as biomass indices were calculated, and maps of the distribution of immature individuals plotted in order to reveal the potential location of nursery sites. Results revealed that juveniles of the species *M. barbatus*, *M. surmuletus* and in particular *M. merluccius*, *P. longirostris* were concentrated to the east / north-east of the Maltese Islands, in the vicinity of the Malta Bank. The distribution of *N. norvegicus* and *A. foliacea* juveniles

was found to be patchier, with sites distributed throughout the deeper waters lying to the west / northwest of the Maltese Islands.

Title: Nursery areas of some demersal species in the Adriatic Sea (GSA 17)
by C. Manfredi, C. Piccinetti, N. Vrgoč, B. Marčeta

Abstract: Prediction of nursery areas localization of some demersal species was studied in Northern and Central Adriatic Sea using geostatistical tools and data from trawl surveys time series. The investigated species are: *Eledone cirrhosa* (*Cephalopoda, Octopodidae*), *Lophius budegassa* (*Teleostei, Lophiidae*), *Merluccius merluccius* (*Teleostei, Merluccidae*) and *Nephrops norvegicus*(*Crustacea, Nephropidae*).

ESTABLISHING GFCM PROTOCOLS FOR SURVEYS AT SEA

13. Upon request of the Scientific Advisory Committee (SAC), the GFCM Secretariat contacted national research institutions and regional projects to provide any available protocols for surveys-at-sea. So far, the Secretariat received two documents related with protocols for trawl surveys (MEDITS and SOLEMON) and another one for acoustic surveys (MEDIAS). However it is a need for further action to be undertaken. Thus the Secretariat was requested to further investigate for additional protocols in national institutions. This request will be ended by June 2010

PRIORITY AND SHARED STOCKS LISTS INCLUDING THE IDENTIFICATION OF CRITERIA TO UPDATE

14. A presentation done during the WG on demersals, provided on the abundance of *Pecten jacobeus* in the Adriatic Sea, based upon results from the Solemon survey, showed that observed catches were very low in recent years, potentially as a consequence of a lack of management advice, and also environmental deterioration.

    The WG recommended as *Pecten jacobeus* to be included in the priority and shard stocks lists.
    The SC endorsed.

CONTRIBUTION TO IMPROVING AND UPDATING THE SAC GLOSSARY

The moderator for the SAC Glossary Mr. J. Lleonart presented the provisional version of the SAC glossary which is available in the GFCM web site. The SC took note on the glossary prepared by the Moderator and agreed on the establishment of a team consisting of S. Ben Meriem, H. Farrugio, M. Dimeck and F. Fiorentino who will send any revisions to the moderator by the 29th of December. It was agreed to send to the part that have to be improved.

GENERAL COMMENTS-CONCLUSIONS AND SCIENTIFIC ADVICE

From the Working Group on demersals

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

Comments

- **WG Comments:** There is a need to be consistent and clear when presenting stock assessment results, particularly from VIT, whether values given represent the absolute estimated value of reference points, or the 'F factor' values – i.e. their position relative to the estimated current effort (e.g. where the F-factor F0.1=0.5, the position of F0.1 is half the

value of Fcurrent). Discussions suggested there was merit in using the relative values (e.g. F0.1/Fcurrent).

SC Comments: Concerning the use of absolute or relative use of fishing mortalities, the SC recommends using both values, indicating clearly what is in use, because the absolute F is important for managers to have to compare different areas while relative value is easier to understand for laypeople, variations of current fishing mortalities versus the optimal ones.

- **WG Comments:** The range of ages or lengths over which the average fishing mortality is estimated needs to be clearly stated. Furthermore, when estimated through length-based methodologies, this range should encompass only those lengths that are fully selected by the gear, to avoid under-estimation of fishing mortality.

  SC Comments: endorsed

- **WG Comments:** A presentation provided on the abundance of *Pecten jacobeus* in the Adriatic Sea, based upon results from the Solemon survey, showed that observed catches were very low in recent years, potentially as a consequence of a lack of management advice, and also environmental deterioration. Consideration of the inclusion of *Pecten* on the priority species table and GFCM shared stocks list was suggested to the SAC.

  SC Comments: endorsed.

SUGGESTIONS FOR THE FUTURE

- **WG Comments**: During the meeting, it was noted that a range of growth and other biological parameters were being used in different geographical regions. Some of these were potentially biased due to sampling limitations, or the methods used to prepare samples. As a result, the first recommendation was for the Secretariat to collate information on biological parameters, building on those activities performed in the past, for the Working Group to validate in the future.

  SC Comments: To agree on a set of parameters to be used each for eastern, central and western Mediterranean. This regional review can be done during the age-reading workshop or at the next assessment working group. The input data should be summarized into a single table which has to be included in the assessment forms.

- **WG Comments**: For the previously proposed workshop on otolith preparation and age reading, the work should be combined with future otolith exchange programmes to improve the standardisation of methodologies and ageing protocols and to increase consistency between institutes and regions.

  SC Comments: Validate the growth pattern of main commercial species, integrate growth rates from otolith reading with the analyses of length frequency distribution, tag and recapture experiments and simulations approaches.

- **WG Comments**: Regional co-operation on the biology and assessment of demersal species should be improved. This, and the support of research needs, may best be facilitated through regional projects.

  SC Committee: endorsed

- **WG Comments**: The increasing use of survey-based assessment approaches such as SURBA (Needle, 2003) may require modification of the GFCM stock assessment forms in Excel to develop a specific sheet for the methodology. This process should be linked to the practical manual being developed for this software.

  SC Committee: endorsed

- **WG Comments**: Working Group attendees found the meeting useful for the exchange of ideas, development of skills, and peer review of assessments and advice to managers.

  SC Committee: endorsed

- **WG Comments**: There were a relatively limited number of attendees at the Working Group. In part, this may have resulted from the decision for assessments completed prior to the meeting to bypass the Working Group and be presented directly to the SCSA (Annex II). While the reduced Group size made the collation of activities easier, and allowed the Terms of Reference to be delivered within the available time, it prevented the original plan of developing four thematic sub-groups on crustaceans, hake, mullets and 'other' demersal species. In turn, where scientists from key countries were absent, the process of performing joint stock assessments on shared stocks was also hindered.

  SC COMMITTEE: endorsed and also commented that all the GFCM members are key countries of which the absence prevents the work to be done as appropriate

- **WG Comments**: The development of regional assessment groups (as for bodies within ICES, e.g. the 'North Sea demersal working group') is a potential way forward. This would support the exchange of information and skills within regions, while being consistent with the ecology of the different regions of the Mediterranean, with the ultimate aim of developing scientific advice on a multispecies, rather than single species, basis.

  SC Committee: endorsed

FROM THE WORKING GROUP ON SMALL PELAGICS:

- **WG Recommendation**: The standard assessment forms in Excel require improvements in order to adapt to the type of inputs usually needed for the assessment of pelagic stocks, in particular to expand them to allow properly inputting the results concerning the direct acoustic or DEPM surveys. In general a complete revision of the assessment forms can be designed by consultation with interested of the pelagic domain.

  SC comment: endorsed

- **WG Recommendation**: Several of the stocks assessed in this Working Group may be dynamically related with the populations found in adjacent areas and further research is required in order to verify the existence of those connections which might affect the stock unit definitions and the assessments performed on the current GSA area basis. In this context, the following non complete list of areas and stocks may benefit of those type of researches:
  - Sardine and anchovy between GSA 04 and 05
  - Sardine and anchovy between GSA 06 and 07

- Both species between GSA 12, 13, 14, 15 and 16
- Both species in GSA 17 and 18
- GSA 22 Greek and Turkish waters

SC comment: endorsed with the exception of sardine and anchovy between GSA 04 and 05.

- **WG Recommendation**: The assessment of sardine and anchovy stocks entirely depends on the application of direct assessment methods by acoustic and DEPM surveys (as little benefit from the convergence properties of a VPA like assessment can be expected). The WG strongly recommends the continuation of these survey implementations is all areas already applying them and encourages the incorporation of these direct monitoring systems in the remaining Mediterranean areas.

  SC comment: endorsed

- **WG Recommendation:** The revision of the axiom for constant Natural mortality to a pattern of natural mortality at age according to growth parameters makes compulsory to assure the quality of the growth parameters, as the age structured assessments depends heavily on the natural mortality values. Therefore the WG recommends verifying the basis of those growth parameters as a way to assure quality in the age structured assessments.

  SC comment: endorsed

- **WG Recommendation**: With the aim of assessing shared stocks, re-enforce of the cooperation between France and Spain to actualise biological data as well as catch and effort data collection for the boats of the two countries catching sardine in the Gulf of Lion is desirable.

  SC comment: endorsed

- **WG Recommendation**: For the South of Sicily the WG recommends a close monitoring of the fry fishery (catches and biological features) as the impact on the sardine fishery is unknown.

  SC comment: endorsed

- **WG Recommendation**: The WG on small pelagics recommends finalising the construction of the common data base for the sardine and anchovy fisheries and direct monitoring in the Adriatic at sub-regional level and to complete assessments for the forthcoming Stock Assessment Sub Committee Meeting in December 2009.

  SC comment: endorsed

- **WG Recommendation**: For the Aegean sea, the likely consequences of changing the closed period for the purse seine fishery should be analysed. A shift in the closed fishing period (present middle December till the end of February) towards the recruitment period of anchovy (October to December) or the recruitment period of sardine (February to April) could be examined.

  SC comment: endorsed

- **WG Recommendation**: Very little is known about the sardine in GSA 24 . Adoption of MEDIA's protocols in the individual acoustic studies conducted by Turkish scientist on that area would be complimentary.

  SC comment: endorsed

- **WG Recommendation**: Concerning Egyptian fisheries: the WG supports the obtention of an accurate data base about their fisheries involving good records for fishery statistics and good monitoring system. An acoustic survey of pelagic resources in the Egyptian Mediterranean is recommended to improve the current assessment, with possible support of regional projects.

  SC comment: endorsed

- **WG Recommendation**: For Algerian pelagic fisheries, the WG recommends expansion of the data series for several years and in particular complementing the monitoring of the fishery with direct acoustic surveys.

  SC comment: endorsed

2010 SCSA WORKPLAN

15. The Sub-Committee agreed on the following activities:

- Performing stock assessment of selected elasmobranches in the framework of the medium term working program as proposed by SCMEE.

- Convening regional training on age reading for some species of interest (jointly with regional projects and other initiatives). The terms of reference will be send to SAC.

- Postponing to 2011 the joint GFCM/ICCAT meeting on small tuna fisheries in the Mediterranean and the Black Sea:
  It should be underlined that SCRS/ICCAT has previously taken the same decision.

- Convining the Working Group of demersals in Istanbul (Turkey) and the Working Group on small pelagics in Mazzara del Vallo (Italy).

ANY OTHER MATTERS

16. Issues related to the functioning of the Working Groups on stock assessment
    It was proposed that assessments could only be performed/presented during the yearly WGs on demersal and small pelagics. Under this proposal, assessments could not be presented to the SC and the technical review of the assessments would take place at the WGs. The SC would revise the diagnosis of the status of the stock as well as the proposed management measures and submit them to the SAC. Due to the expected increase of the number of assessments the 5 days for the WGs would have to be extended by 2-3 days.

17. Agreement could not be reached on this proposal. It was noted that under this proposal, the WG would review assessments done by other bodies or regional projects and do some

assessments itself. Some participants noted that this meant the WG would be reviewing its own work.

18. The SC agreed that bodies involved in assessment of Mediterranean fish stocks should try to avoid scheduling meetings conflicting with the WG dates.

19. Improvement of assessment forms
During the time period between the working groups and the SC, the assessment forms had included additional sheets regarding the use of direct methods. It was also agreed that any suggestions for improving the forms to be directed GFCM Secretariat.

NOMINATION OF THE SCSA COORDINATOR

20. The SCSA unanimously nominated Mr Fabio Fiorentino (Italy) as new coordinator of the Sub-Committee.

21. The participants commended the excellent work achieved by Ms Constantina Karlou-Riga during the last four years and congratulated her for the new position as EastMed project coordinator.

DATE AND VENUE OF THE NEXT MEETING

22. The date and the venue of the next SCSA meeting will be set up by the SAC

ADOPTION OF THE REPORT AND CLOSURE OF THE MEETING

23. The report was adopted by the meeting on 3 December 2009

Annex I

Agenda

1. **Opening and arrangement of the Sub-Committee meetings**
2. **Transversal session: review of transversal issues**
   - 2.1 SCSI/SCSA transversal Working Group on GFCM logbook (Rome, 29 June-1st July 2009) (by SCSI coordinator)
   - 2.2 SCMEE/SCSA/SCESS Transversal Working Group on Selectivity improvement and bycatch reduction (Tunis, 23-25 September 2009) (by SCMEE coordinator) including discussion on the medium term Working programme on elasmobranches
   - 2.3 Progress on improvement and updating of SAC glossary (by J. Lleonart)
   - 2.4 Progress in the implementation of the FAO-ArtFiMed Project in Morocco and Tunisia (by Caminas and Bernardon)
   - 2.5 Presentation of a pilot study on the implementation of the 40 mm square mesh in the bottom trawls (by Jacques Sacchi and Jorge Baro)
   - 2.6 Follow up on the issue of the Climate change and its impact on fisheries and ecosystems (By the GFCM Secretariat, M. Camilleri)
   - 2.7 Introduction of the activity aimed to update the reference frame and set up a medium strategic plan for the SAC (By J.J. Maguire)
   - 2.8 Introduction and discussion on the issue of Alien species in the Mediterranean and Black Sea (by Bayram)
3. **Introduction to the SCSA meeting and adoption of the agenda**
4. **Review of new stock assessments of demersal species and related scientific advice**
   - 4.1. Results of the Working Group on stock assessment of demersal species;
   - 4.2. Results of new studies preformed in specific GSAs including those carried out in the framework of regional projects and programs
5. **Review of new stock assessments of small pelagic species and related scientific advices**
   - 5.1. Results of the Working Group on stock assessment of small pelagic species;
   - 5.2. Results of new studies preformed in specific GSAs including those carried out in the framework of regional projects and programs
6. **Follow-up of SAC/SCSA recommendations on :**
   - 6.1. New available information on mapping the distribution of juveniles
   - 6.2. Establishing GFCM protocols for surveys at sea
   - 6.3. Priority and shared stocks lists including the identification of criteria to update
   - 6.4. Contribution to improving and updating the SAC glossary
   - 6.5. Progress on the use of biological indicators and development of reference points.
7. **General conclusions and scientific advice**
8. **2010 SCSA workplan**
9. **Any other matters**
10. **Nomination of the SCSA coordinator**
11. **Date and venue of the next meeting**
12. **Adoption of the report and closure of the meeting**

Annex II

List of Participants

SCSA coordinator
Constantina KARLOU_RIGA
EastMed Project
Androu 1,112 57 Athens, Greece
Tel +30 2108847960
email: fishres@otenet.gr

Jorge BARO
Instituto Español de Oceanografia, Centro Oceanográfico de Málaga
Puerto Pesquero s/n Apdo 285
29640 Fuengirola, Spain
Tel: +34 952 197100
Fax: +34952 463808
e_mail: jorge.baro@ma.ieo.es

Adnan TOKAÇ
Ege University Faculty of Fisheries
35100 Bornova-Izmir, Turkey
Tel: +90 532 6216580
Fax: +90 232 3747450
e_mail: adnan.tokac@ege.edu.tr

Othman JARBOUI
Marine Living Resources Laboratory (INSTM, Tunisia)
BP1035, 3018 Sfax, Tunisia
Tel: +216 74 497117
Fax: +216 74 497989
e_mail: Othman.jarboui@instm.rnrt.tn

Jordi LLEONART
Institut de Ciències del MAR/CSIC
Passeig Marítim de la Barceloneta,
37-49 E -08003 Barcelona
Tel: +34 93 230 96 49
e_mail: lleonart@icm.csic.es

Alberto GARCIA GARCIA
Instituto Español de Fuengirola s/n
Málaga, Spain
Tel: +34 952476955
Fax: +34952463808
e_mail: agarcia@ma.ieo.es

Said BENCHOUCHA
INRH
BP 5268 Dradeb Tanger, Morocco
Tel: +212 539 946575
Fax: +212 539 325 139
e_mail: bench2468@yahoo.fr

Franco BIAGI
European Commission
B1049 Bruxelles
Rue Joseph II, J99 Belgium
Tel: +32 22994104
Fax: +32 22950524
e_mail: franco.biagi@ec.europa.eu

Beatriz GUIJARRO
Instituto Español de Oceanografia Centre Oceanografic de les Balears
Moll de Ponent s/n
07015 Palma, Spain
Tel: +34971133739
Fax: +34971404945
e_mail: beatriz@ba.ieo.es

Leyla KNITTWEIS
Ministry for ressources and Rural Affairs,
Capture Fisheries Section
Fort San Lucjan,
Marsaxlokk BBG 1283, Malta
Tel: +356 22293312
Fax +356 21659380
e_mail: leyla.knittweis@gov.mt

Fabio FIORENTINO
Istituto per l'Ambiente Marino Costiero
Consiglio Nazionale delle Ricerche
V. Luigi Vaccara 61
91026 Mazara del Vallo (TP) Italy
Tel: +39 09 23948966
Fax: +39 09 23906634
e_mail: Fabio.fiorentino@iamc.cnr,it

Nikolas MICHAILIDIS
Department of Fisheries and Marine Research
101 Vithleem, Strovolos, Cyprus
Tel: +357 22807806
Fax: +357 22775955
e_mail: nmichailidis@dfmr.moa.gov.cy

Pedro BARROS (FIMF/FAO)
Viale delle Terme di Caracalla 1
00153 Rome
Tel: +39 06 57056469
e_mail: pedro.barros@fao.org

Alberto SANTOJANNI
CNR-ISMAR Ancona
Largo Fiera della PEsca2
21025 Ancona, Italy
Tel: +39 071 2078858
Fax:+39 071 55313
e_mail: a.santojanni@ismar.cnr.it

Enrico ARNERI
AdriaMed MedSudMed
Project Coordinator
Viale delle Terme di Caracalla,1
00153 Rome
Tel: + 39 06 57056092
Fax : +39 06 57053020
e_mail: enrico.arneri@fao.org

Aleksandar JOKSIMOVIC
Institute of Marine Biology
Dobrota BB, p. Box 69, Montenegro
Tel: +382 32334569
Fax: +382 32334570
e_mail: acojo@ac.me

Juan Antonio CAMIÑAS
FAO CopeMed II
Sebdelegacion del Gobierno en Malaga
P de Sancha 64, Malaga Spain
Tel: +34 952989299
Fax: +34 952989245
e_mail: juanantonio.caminas@fao.org

Sadok BEN MERIEM
Institur National des Sciences et Technologies de la Mer
Port de pêche 2060 La Goulette, Tunisia
Tel : +216 71 735 848
e_mail : sadokbm@yahoo.fr

Luca CERIOLA
Viale delle Terme di Caracalla,1
00153 Rome Italy
Tel: 0039 06570 53481
e_mail: luca.ceriola@fao.org

Henri FARRUGGIO
Laboratoire Ressources Halieutiques
IFREMER
Avenue Jean Monnet BP171
34203 Sète, France
Tel: +33 499579200
Fax: +33 499573295
e_mail: henri.farrugio@ifremer.fr

Alvaro ABELLA
ARPAT
Via Marrani 114
57126 Livorno, Italy
Tel: +39 0586 263456
Fax: +39 0586 263477
e_mail: a.abella@arpat.toscana.it

Maria Teresa SPEDICATO
CISPA Tecnologia e Ricerca
Via dei Trulli 18-20
70126 Bari, Italy
Tel: +39 080 5433596
Fax: +39 080 5433586
e_mail: spedicato@coispa.it

Josip MARKOVIC
Ministry of agricolture, fisheries and rural development
Directorate of Fisheries
Miramarska 24
10000 Zagreb, Croatia
Tel: +385 1 610 6626
Fax: +385 1 610 92 06
e_mail: josip.markovic@mps.hr

Corrado PICCINETTI
Laboratorio di Biologia Marina e Pesca dell'Università di Bologna in Fano
Viale Adriatico,1/n
61032 FANO (PU), Italy
Tel: +39 0721 802689
Fax: +39 0721 801654
e_mail: corrado.piccinetti@unibo.it

Luis GIL DE SOLA SIMARRO
Istituto Español de Oceanografía
Quelle Pesqueros/n
29640 Fuengirola, Spain
Tel: +34 952 197124
Fax: +34 952 463808
e_mail: gildesola@ma.ieo.es

Rezart KAPEDANI
Ministry of Environment, Forestry and Water Administration
Rruga e Durrësit, No. 27
Tirana
Tel: +355 4 246270
e_mail: rkapedani@moe.gov.al

Bojan MARCETA
Fishery Biologist
National Institute of Biology
Vecna Pot 111
SI 1001 Ljubljana, Slovenia
e_mail: bojan.marceta@guest.arnes.si

Vjekoslav TIČINA
Institute of Oceanography And Fisheries
Split, Croatia
Tel.: +385 21 408037
Fax: +385 21 358650
e_mail: ticina@izor.hr

Nedo VROGC
Institute of Oceanographic and Fisheries
PO box 500
21000 Split, Croatia

Federico DE ROSSI (FIEL/GFCM)
Viale delle Terme di Caracalla, 1
00153 Rome Italy
Tel: 0039 06570 53481
e_mail: federico.derossi@fao.org

Abdellah SROUR
Executive Secretary *ad interim*
International Institution and Liaison Service
Fisheries and Aquaculture Economics and Policy Division
Fisheries and Aquaculture Department
Viale delle Terme di Caracalla,1
00153 Rome Italy
Tel: + 39 06 57055730
Fax: + 39 06 57056500
E-mail: abdellah.srour@fao.org

Annex III

OUTCOME OF THE TRANSVERSAL SESSION OF THE SAC-SUB-COMMITTEES
Malaga, Spain, 30 November 2009

This session was attended by 73 experts from 15 Member countries and 4 partner organisations. It was agreed that general discussion on the topics will take place during this session and that further reflections could be undertaken during the sub-committees meetings. The following subjects were reviewed:

Transversal workshop on Regional Logbook (J. Vigneau)

Abstract. In response to a demand by SAC (GFCM Scientific Advisory Committee), endorsed by the 2009 session of the GFCM, a workshop was held in July, in the premises of FAO (Roma), on the setting up of a Regional logbook for the Mediterranean and Black Sea. The terms of references of this workshop included a review of the current situation regarding the collection of effort and landings data in the different Member Countries, the identification of the objectives and scope of a GFCM logbook, the agreement of the parameters and format, and the proposition of a roadmap for the implementation of the GFCM logbook. Alternative means of collection of effort and landings per fishing activity and area for the vessels not covered by the GFCM logbook, were also to be considered. The objective and scope of a regional GFCM logbook were clearly defined as being a tool to serve the needs for MCS (Monitoring, Control and Surveillance) of the fisheries in the Mediterranean and Black Sea, and a primary source of data for the GFCM data collection framework, and in particular the Task 1. Building on existing formats among GFCM Member Countries and adapting the parameters to the needs for Task 1 obligations, a proposal was made during the meeting (see document in annex XX). Concerning the roadmap for implementation, it was recommended that

- The GFCM logbook should be implemented as a minimum for vessels more than 15 metres in length overall.
- The implementation of the GFCM logbook should be effective for Member Countries as from 1st January 2012.
- A transitional period should be considered for some countries having little or no logistic resources to handle a LB system.
- The EU should check whether there is a need to change the ERS (Electronic Recording System) Regulation to reflect the proposed GFCM Logbook
- GFCM, FAO regional projects and the EU should offer assistance to Member Countries having little experience in setting up a logbook system.

Finally, it was also stated that the use of the GFCM Logbook will not cover all the requirements to complete the GFCM Task 1, and the information collected should be cross-checked with other sources for quality issues. Alternative means for collecting effort and landings information presented to the workshop were harbour surveys, fishing calendar surveys, monthly, daily or simplified forms.

Comments. The transversal session endorsed the outputs of the workshop on the regional logbook. Experts discussed the size of the vessels to be covered by the logbook and some highlighted the need to include vessels below 15m since the fishing efficiency of such vessels has increased with technology innovations. Nevertheless, it was agreed that it was up to the Commission to decide on this matter. Many experts did not agree on the proposal to limit reporting to only the GFCM priority species and suggested that all the species caught, including species of conservation concern, should be reported. Experts acknowledged the fact that there may be some difficulties in bringing fishermen to complete logbooks for a variety of reasons, including problems of illiteracy. However, there was general agreement that a logbook scheme is a vital instrument for fisheries control and management, as well as for scientific monitoring and assessment. A proposal to introduce a simplified logbook for the artisanal fleet was also put forward by some experts.

Transversal Working Group on Selectivity improvement and bycatch reduction
(M.N. Bradai)

Abstract
The meeting addressed various issues and made the main following conclusions:

- The large variability in bycatch between different areas and gears in the Mediterranean;
- The need to develop and adapt mitigation measures have been developed outside the Mediterranean
- The lack of aggregated knowledge on the biology and fishery of elasmobranches in many parts of the Mediterranean;
- The need of a common strategy to reduce the effect of fisheries on sea turtles, marine mammals and seabird bycatch;

The SCMEE further made the following main recommendations to SAC:

- More studies should be conducted on the characterisation of bycatch of species of conservation concern in areas of the Mediterranean;
- The importance of testing of mitigation measures and technologies that have been developed outside the Mediterranean and by some Regional Fisheries Management Organisations;
- More information, education campaigns and training workshops should be conducted to inform the fishing industry on regulations on species of conservation concern and current practices to reduce the mortality of such species;
- Develop and initiate a regional strategy to reduce sea turtles, marine mammals and seabird bycatch;
- Setup a medium term year work plan to improve knowledge and assess the status of elasmobranches in the Mediterranean and the black sea was elaborated.

Comments. The participants acknowledged the extensive work carried out by the workshop on reduction of bycatch and discards. The session highlighted the need to further implement a strategy to improve the selectivity of fishing gears operated in the GFCM area. The participants agreed on the proposal to step-up assessments on elasmobranches and stressed on the importance to continue collaborating with other relevant organizations involved in elasmobranches monitoring activities. The MedSudMed coordinator informed the participants that extensive work and training

activities have been carried out by MedSudMed on the biology and age reading of these species and suggested to consider all of these as a foundation for the work of SAC. Finally the session proposed that the definition of by-catch should be drawn up and that a data collection framework for species of conservation concern caught during fishing operations should be established.

Progress on improvement and updating of SAC glossary (J. Lleonart)

Abstract. The GFCM Glossary has remained untouched since 2003. It contains 693 words and 841 definitions. This unbalance is due to the presence of 115 words with more than one (actually 2 to 7) definition. A number of words correspond to the ordinary language, the jargon of some other specialized discipline not directly related to Mediterranean fisheries (i.e. statistics, general ecology or economy, etc.), not relevant to GFCM, or simply obsolete. It is advisable to remove those words that do not belong to the specific tasks of GFCM. On the other hand multiple definitions for a single word usually mislead the reader. Usually they are redundant. They say the same thing (or similar) with different words and level of precision. These problems were identified by the SAC and led it to promote the refinement of the glossary. That means to reduce the GFCM Glossary to the words really significant for the normal scientific work and provide a single clear definition in order to allow the people working on GFCM issues to exactly understand the meaning of the key words in the GFCM context.
A first phase of analysis of the glossary gave the following proposals: to remove: 253 definitions, to modify 359 definitions and to accept as they are 215.
A second phase including consultations with GFCM Secretariat and SCESS coordinator and another analysis (not yet finished at the date of this report) the proposals are the following: 224 definitions to be accepted, 76 new words (with definition) to be added, 36 definitions already modified, 175 definitions to be analyzed and 398 definitions (involving 307 words) proposed for deletion.

Comments. The work carried out so far to revise the GFCM glossary was commended by the experts. It was agreed that further consultation with the SAC sub-committees together with national scientific and academic institutions would be very valuable. 29th December 2009 was set as a deadline for consultations after which the consultant will proceed to finalise the draft revised glossary to be presented at the SAC session in January 2010. The Sub-Committees were invited to identify appropriate means to contribute to the glossary revision process.

Progress on the implementation of the FAO-ArtFiMed Project in Morocco and Tunisia (Caminas and Bernardon)

Abstract. Le projet ArtFiMed s'intègre à la fois (i) aux priorités des pays en matière de lutte contre la pauvreté, d'amélioration des conditions socio-économiques des populations côtières et de réhabilitation des pêches artisanales, (ii) aux préoccupations régionales en matière d'échange d'expériences, d'amélioration de la gestion des stocks partagés et des espèces d'intérêt commun, (iii) aux recommandations et objectifs internationaux énoncés dans le cadre des objectifs pour

Millénaire et du Comité des Pêches de la FAO. Dans une première étape, des rapports diagnostics des trois sites sélectionnés pour la mise en œuvre du projet, Dikky au Maroc, et El Akarit et Ghannouch en Tunisie ont été élaborés et seront présentes. Ces rapports ont fait l'objet d'un processus de concertation avec les communautés bénéficiaires pour évaluer précisément le contexte dans les zones d'intervention et permettre ainsi l'identification participative des besoins et des activités qui seront mises en œuvre dans le cadre du projet.

Comments. The achievements of the project during its first phase were acclaimed by the participants. The proposal to also focus on the impact of artisanal fisheries on the state of the stocks and vice-versa was raised by some experts. The transversal session also acknowledged the effort being made by the project to promote the involvement of artisanal fishers in the fisheries management process.

CopeMed pilot study on the implementation of the 40 mm square mesh in the bottom trawls (J. Sacchi and J. Baro)

Abstract. With reference to Resolution GFCM/31/2007/3 on the introduction of the 40mm square mesh in the codend of trawl nets exploiting demersal resources and Recommendation GFCM/33/2009/2 on a minimum mesh size in the codend of demersal trawl nets by 31 January 2012, CopeMed II project supported by the Coordination Committee agreed with the GFCM in supporting a subregional action according the availability of financial resources. The commitment included: a) Preparing a Technical document on the 40 mm mesh selectivity; b) Organising a subregional Workshop to analyse the implementation of such measure; c) to prepare methodologies that could be utilised for the CopeMed countries and d)helping the INRH in carrying out a pilot study as example for the other subregional countries. A technical document was prepared by two international experts to CopeMed II. The document include a protocol on trawling gear selectivity; standard methodologies to evaluate the biological and economic effects of the 40 mm mesh implementation and standard methodologies for the analysis of the biological and socio economic effects of the implementation of the 40 mm Resolution. The document is in its last phase and will be distributed by CopeMed II. A Workshop (Malaga, 10-11 September 2009) was organised by CopeMed II to: promote the cooperation between the CopeMed countries on this issue; discuss the implementation of the GFCM Recommendation and to prepare a pilot study on the gear selectivity, biological and socio-economic impacts of the adoption of this measure to be applied on a first step in Morocco and later to be extended to the other south Project' countries according to the budget availability. Experts from the EU, Tunisia, Algeria, Morocco and the authors of the document from France and Spain participated in the meeting. A draft plan for the pilot survey to be carried out in Nador (Morocco) in collaboration with the INRH was also discussed during the Malaga meeting aimed to prepare the scientific and operational aspects to carry out the pilot survey to: evaluate the yields of the target species using a 40 mm traditional (rhombic) and a codend of 40 mm with a square mesh (experimental); obtain the selectivity parameters for target species and types of mesh; determine the discarded fraction; conduct an economic assessment of the effects of changing the mesh size; compare the experimental results with the obtained by the Moroccan trawl gear, in terms of by-catch of unwanted species, juveniles and discards. As main conclusions of the workshop the operational protocols were adopted, the gear and vessel type selected, the survey equipment and material needs agreed, the on board and data analysis methodologies adopted. The document prepared by CopeMed II was revised, the different responsibilities distributed and a first budget table prepared and the schedule adopted. At the moment of the SCs meeting CopeMed II should contact INRH and GFCM Secretariat to agree on the budget contributions to carry out this activity in Morocco.

The cost of the pilot project was calculated as 120.926 $, including the four phases: 1.Elaboration of documents, preparatory meeting and campaign preparation (14.091 $); 2.Experimental campaign of selectivity in Nador (81.104 $); 3. Data analysis (15.898 $) and 4.Final report and Conclusions (9.834 $).

Comments. The session welcomed the pilot study being conducted through COPEMED II assistance in Morocco on the impact of the implementation of the minimum mesh size. Some experts highlighted the importance of taking into consideration the varying behaviours of fishers from one area to another when establishing a sampling design.

Climate change and its impact on fisheries and Ecosystems (M. Camilleri, GFCM Secretariat)

Abstract. The concerns about direct and indirect impacts of climate change on the physical marine environment, marine ecosystems, living marine resources and the livelihoods of people who exploit them are shared globally. Over the last few years, the FAO Fisheries and Aquaculture Department (FI) have been addressing this issue through a specially established internal working group on Climate Change in which the GFCM Secretariat is represented. In April 2008, the FI held an Expert Workshop on Climate Change Implications for Fisheries and Aquaculture (FAO Fisheries Report 870) to respond to the request made by the FAO Committee on Fisheries (COFI) to address the subject and to provide inputs to the FAO High-Level Conference on World Food Security. The Workshop identified and reviewed key issues, from the physical changes, the impacts on aquatic resources and ecosystems and how these ecological impacts translate into human dimensions of coping and adapting within fisheries aquaculture. It also evaluated policy options, mitigation, impact reduction means and the building of adaptive capacity to climate change. Three technical papers formed the basis of the technical discussions and have been recently published by the FAO (FAO Fisheries and Aquaculture Technical Paper 530). In addition, the FAO along with several other international organisations have published a joint policy brief entitled "Fisheries and aquaculture in our changing climate". With a forecasted significant increase in sea surface temperature and sea level rise over the next century, the Mediterranean and Black Sea fisheries and aquaculture industries are also particularly vulnerable to climate change. In this respect and in the light of the outputs of the FAO workshop referred to above, there is a growing need for the GFCM Scientific Advisory Committee to focus on the issue of climate change and to include it in various components of its programme of work.

Comments. The participants welcomed the presentation delivered by the Secretariat and agreed that SAC activities should incorporate climate change issues. The Sub-Committees and the Coordination Meeting of the Sub-Committees were invited to identify concrete activities in this regard.

SAC framework and medium term strategic plan (J.J. Maguire)

Abstract. J.-J. Maguire briefly introduced the terms of reference for his assignment to review the SAC frame of reference. He invited participants to talk to him on their views on the SAC

achievements, modes of operations and other aspects they considered important in improving the performance of the SAC.

Introduction and discussion on the issue of Alien species in the Mediterranean and Black Sea (B. Ozturk)

Abstract. Alien species of the Black and Mediterranean Seas were reported. Main vectors were shipping, hull fouling, clinging and sediment tank of the ships. Besides, intentionally and unintentionally introduction was also important both seas for the dispersion of the alien species. Impact of fisheries, human health and biodiversity changes has been examined. Climate change and dispersion of the alien species also considered. Some recommendation and suggestion were listed and submitted to the GFCM Secretariat.

Comments. The presentation was commended by the participants who agreed that the subject of alien species and their impact of fisheries ecosystems and resources deserves due attention. Nevertheless, experts stressed that not all alien species should be considered invasive and / or established, and that the short, medium and long term impacts on fisheries should be addressed, some of which may be positive and could be exploited. The SCMEE was invited to formulate draft a strategy to focus on the monitoring of alien species and their impact, with immediate effect.

Annex IV

Table of Assessment

Table I. Assessments for demersals (including those considered as preliminary)

GSA	Species	Data type	Yrs data	Methodology used	Stock status	Management opinion	WG comments	SC comments
GSA 3 (southern Alboran sea)	*Merlucccius merluccius*	Lfreq	2008	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited	Reduce the fishing mortality by 60%.	Variable pattern in fishing mortality	Due to one year only data the assessment was considered as **preliminary**
	Pagellus bogaraveo	Lfreq CPUE	2005-2007 2001-2007	LCA – Pseudocohort analysis (VIT) Y/R	Moderately exploited	Maintain the fishing mortality at the current level	Due to the flat-topped Y/R curve, the Fmax is not well defined	Due to the depletion status of the species in the Spanish coast and the uncertainty of the unit stock, in the Alboran Sea, a joint assessment with GSAs 1 and 3 is recommended
	Parapenaeus longirostris	CPUE Lfreq	2000-2008 Oct 2007-Sept 2008	Schaeffer Surplus production LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited	Reduce the fishing mortality by 30-66% (depending on the model). A long term management plan is required	Many Fter values were tried. Schaefer model fitted well the data	The outcomes from one year data used in the analytical model were supplemented by the several years data used in Schaefer model
	Boops boops	Lfreq Catch	2000-2008	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited	Reduce the fishing mortality by 64%. A longterm management plan is required	No particular comments	It is a need to include in the assessment also the artisanal fishery data, if any

	Mullus barbatus	Lfreq Catch	2005-08	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited	Reduce the fishing mortality by 76%. A long term management plan is required	No particular comments	It is a need to include in the assessment also the artisanal fishery data, if any

GSA 05 (Balearic islands)	*Merlucccius merluccius*	Lfreq CPUE	1980-2008	VPA – Extended Surv ivor Analysis (XSA) LCA – Pseudocohort analysis Y/R analysis	Over-exploited	Improve the trawl exploitation pattern and reduce the trawl effort. A long term management plan is required		Endorsed
	Mullus surmuletus	Lfreq CPUE	2000-2008	Cohot (XSA) Pseudocohort analysis (VIT) Y /R	Fully exploited			Endorsed
	Nephrops norvegicus	Lfreq CPUE	2002-2008	LCA – Pseudocohort (VIT)	Fully exploited			The assessment **was not accepted.** Further analysis is needed
	Aristeus antennatus	Lfreq Catch/age	1992-2008	LCA – Pseudocohort and Y/R (VIT) Separab ;e Virtual analysis and XSA – Extended Survivor analysis	Over-exploited			Endorsed
GSA 06 (northern part of northern Spain)	*Merluccius merluccius*	Lfreq	2008	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited	Reduce the fishing mortality by 70% (when Fmax is reference point)	High landings in 2008 invalidate the equilibrium assumption	Although the assessment is in line with previous years assessments covering the whole GSA, it **was not accepted** as such due to the one year data and also to the part of the GSA covered

GSA 07 (Gulf of Lions)	*Merluccius merluccius*	Lfreq CPUE	1998-2008	Cohort (XSA) Pseudocohort (LCA, VIT), Y/R	Over-exploited	Improve trawl exploitation pattern, close nursery areas to fishing, implement 40mm square mesh size in trawl codened		It is a necessity to reduce the fishing effort
	Mullus barbatus	Lfreq	2004-2008	Pseudocohort (LCA, VIT), Y/R	Fully exploited	Reduce the fishing effort		The stock status based on the examined docs was changed by the SC from fully exploited to **overexploited**
GSA 09 (Ligurian and north Tirrenian)	*Merluccius merluccius*	Lfreq Catch Surveys data	1994-2006	LCA, Y/R (SURBA, ICES for HCR, Yield software, VIT)	Over-exploited	Reduce the fishing mortality by 40%. A long-term management plan is required		Endorsed
	Mullus barbatus	Lfreq Landings	1994-2008	Non-equilibrium production model Y/R	Over-exploited	Reduce the fishing mortality by 30% (when FMSY reference point)		Endorsed
	Nephrops norvegicus	Lfreq Landings	1994-2008	LCA (VIT, SURBA)	Over-exploited	Reduce the fishing effort		The assessment **was not accepted** due to contrasting signals in diagnosis. Further analysis is needed
	Parapenaeus longirostris	Lfreq Catch Surveys	1994-2008	LCA and Y/R (VIT, SURBA, YIELD)	Fully exploited			The stock status diagnosis is also based on the fact that fishing mortality is close to F0.1
GSA 10 (South and Central Tirrenian)	*Merluccius merluccius*	Lfreq Abundance indices	1994-2008	Pool dynamic model (ALADYM, LFDA, SURBA, CPUE) Y/R (Yield)	Over-exploited	Reduce the fishing effort until fishing mortality is below F0.1.A long term management plan is required		Endorsed

GSA 15 (Malta)	*Mullus barbatus*	Lfreq MEDITS	2002-2008	B&H Z and SURBA	Over-exploited	Reduce the fishing mortality by 30%. A long term management plan is required	SURBA outputs were uncertain, which is probably due to the shot time series data	Endorsed
	Mullus surmuletus	Lfreq MEDITS	(2002) 2006-2008 Lfreq	B&H Z and SURBA	Fully exploited	Maintain fishing mortality at the current level	SURBA outputs were uncertain, whuch is probably due to the shot time series data	Endorsed
GSAs 15+16 (Malta + South of Sicily)	*Aristaeomorpa foliacea*	GSA 15: Survey data from 2002-2008 GSA 16: Survey data from 1994-2008 and landings from 2006-2008	GSA 15: 2002-2008 GSA 16: 1994-2008	LCA, survey based and Y/R analyses (VIT, LFDA, YIELD, SURBA)	Over-exploited	Reduce the fishing mortality by 30% (when F0.1 reference point)		Endorsed
GSA 17 (western part of northern Adriatic)	*Nephrops norvegicus*	Lfreq (Catch at length) survey	2006-2008	LCA – Pseudocohort analysis (VIT) Y/R FLR	Over-exploited	Reduce the fishing mortality on females by 64-68% and on males by 77-79% (depending on M values). A long term management plan is required	Data were available only on the western side of the Adriatic	A joint assessment with data covering the whole GSA was recommended

	Solea solea	Catch/ age on landings Lfreq from surveys	2000-2008 2005-2006	LCCC, SCAA Y/R	Over-exploited	Reduce the fishing mortality by 82-86%. A long term management plan is required	Spatial distribution indicated sole move east across Adriatic with increasing age. Thus fishing mortality based on Italian coast data may be biased	A joint assessment with data covering the whole GSA was recommended
GSA 25 (Cyprus)	*Mullus barbatus*	Catch/ age on landings	2005-2008	VPA – Pseudocohort analysis (VIT) Y/R	Over-exploited	Reduce fishing pressure		Since fishing pressure is due more to artisanal fishery, SC recommended to monitor this fishery more closely
GSA 26 (South Levant)	*Merluccius merluccius*	Lfreq	2006-2007	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited	Reduce the fishing mortality by 51%. A long term management plan is required	Model did not fit well the 2008 data. The status reflects the study period only	It is a need to improve knowledge of the stock unit in the area
	Mullus barbatus	Lfreq	July 07 – Apr 08	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited	Reduce the fishing mortality by 61%		Due to the one year only data the assessment was considered as **preliminary**
	Mullus surmuletus	Lfreq	July 07 – Apr 08	LCA – Pseudocohort analysis (VIT) Y/R	Over-exploited	Reduce the fishing mortality by 63%		Due to the one year only data the assessment was considered as **preliminary**

Table II. Assessments for small pelagics (including those considered as preliminary)

GSA	Species	Data type	Yrs data	Methodology used	Stock status	Management opinion	WG comments	SC comments
GSA 01 (Northern Alboran Sea)	*Engraulis encrasicolus*	Lfreq Landings Tuning from purse seiners	2002-2008	XSA acoustics	Over-exploited With moderate fishing mortality and low abundance	No reference points were given	Presented inside the SC	The use of BRP is also recommended to be used. However based to the examined data, the **moderate fishing mortality** should change to **high fishing mortality**
GSA 01 (Northern Alboran Sea)	*Sardina pilchardus*	Lfreq Landings Tuning from purse seiners	2002-2008	XSA acoustics	Over-exploited with moderate fishing mortality and low abundance	No reference points were given	Presented inside the SC	The use of BRP is also recommended to be used. However based to the examined data, sardine was considered as fully exploited with risk to overexploitation
GSA 04 (Algeria)	*Sardina pilchardus*	Lfreq	Nov 2006-Oct 2007	LCA pseudocohort			The work done was **very preliminary** and was not considered as assessment	In agreement with WG comments
GSA 06 (Northern Spain)	*Engraulis encrasicolus*	Lfreq Landings Tuning from purse seiners	2002-2008	XSA acoustics	Over-exploited with high fishing mortality and low abundance	No reference points were given	Presented inside the SC	The use of BRP is also recommended to be used
GSA 06 (Northern Spain)	*Sardina pilchardus*	Lfreq Landings Tuning from purse seiners	1994-2008	XSA acoustics	Over-exploited with moderate fishing mortality and low abundance	No reference points were given	Presented inside the SC	The use of BRP is also recommended to be used
GSA 07 (Gulf of Lions)	*Sardina pilchardus*	Catches Biomass	1997-2008 1993-2008	Trends acoustics	Moderately exploited but intermediate biomass	As biomass estimation for 2006-2008 remain lower than 2005	Mixed fishery. Advice coherent with that for anchovy.	Endorsed. The use of BRP is also recommended to be used

					abundance	estimate, it is recommended not to increse the fishing effort	Assessment rely on the assumption of unbiased estimate of biomass by acoustics	
	Engraulis encrasicolus	Catches Biomass	1997-2008 1993-2008	Trends acoustics DEPM	Moderately exploited but biomass at low stock abundance	Given the low levels of biomass for the last 4 yrs in comparison with the series of acoustic biomass available, it is recommended not to increase the fishing effort	Mixed pelagic fishery. Assessment relies on the assumption of unbiased estimate of biomass by acoustics (which is consistent with a DEPM estimate). Decreasing tendency in GSAs 06, 07	Endorsed. The use of BRP is also recommended to be used
GSA 16 South of Sicily)	*Sardina pilchardus*	Catches Biomass	1998-2008 1998-2008	Trends acoustics	Moderately exploited but biomass at intermediate abundance	Medium biomass levels in 2006-2008 at moderate fishing levels. In coherence with anchovy, is recommended not to increase the fishing effort with anchovy	Mixed fishery. Advice coherent with that for anchovy. Assessment rely on the assumption of unbiased estimate of biomass by acoustics	Endorsed. The use of BRP is also recommended to be used
	Engraulis encrasicolus	Catches Biomass	1998-2008 1998-2008	Trends Acoustics DEPM	High fishing mortality at low stock abundance	Given that biomass was very low for 3 consecutive yrs (2006, 2007 2008) and the increasing trend in exploitation rate, fishing effort should not allowed to increase	Mixed fishery with sardine. Assessment relies on the assumption of unbiased estimate of biomass by acoustics (which is consistent with a DEPM estimate). Harvest rates average the last 3 yrs	Endorsed. The use of BRP is also recommended to be used
GSA 17	*Engraulis encrasicolus*	Catch at age Abundance	1975-2008	VPA with Laurec-	Moderately exploited	Not to increase the fishing effort	Presented inside the SC	Endorsed The use of BRP is

		indices from echo surveys		Shepherd tuning				also recommended to be used The substantial differences between the new assessments and those of previous years were explained by the improvement of the assessments due to the incorporation of data covering the whole GSA
GSA 17	*Sardina pilchardus*	Catch at age Abundance indices from echo surveys	1975-2008	VPA with Laurec-Shepherd tuning	Fully exploited	Not to increase the fishing effort	Presented inside the SC	Endorsed The use of BRP is also recommended to be used The substantial differences between the new assessments and those of previous years were explained by the improvement of the assessments due to the incorporation of data covering the whole GSA
GSA 22 (Aegean Sea)	*Sardina pilchardus*	Catches Biomass Catch at age	2000-2008 2003-2006 2008	Trends acoustics ICA	Fully overexploited	Harvested sustainable, operating above but close to an optimal yield level, with no expected room for further expansion	Mixed fishery. ICA assessment should be taken with caution given the short time series available. Increasing trend in the estimates of SSB since 2004. Fishing mortality high but at a lower stage since 2004	Endorsed

	Engraulis encrasicolus	Catches Biomass Catch at age	2000-2008 2003-2006 2008	Trends acoustics DEPM ICA	Fully exploited	Harvested sustainable, operating above but close to an optimal yield level, with no expected room for further expansion	Mixed fishery. ICA assessment should be taken with caution given the short time series available. Increasing trend in the estimates of SSB since 2004. Average exploitation rate (last 5 yrs) =0.35, just < the empirical level for stock decline (E<0.4, Patterson , 1992)	Endorsed
GSA 26 (South Levant)	*Sardinella aurita*	Catches Lengths	1997-2007 2005-2008	VIT/YPR	Overexploited	Decrease the fishing mortality by 30%-50%	Length based analysis. Concrete fishing effort reduction to achieve F0.1 depends upon the method used either Pauly's catch curve or VIT approach. The same conclusion was obtained from the relative Y/R analysis. Direct acoustic assessment would greatly improve the assessment	Because the assessment was carried out under steady approach and also it did not cover the whole area, **was not accepted as such.** SC encouraged to continue monitor the stock

Annex V

Stocks assessed in 2009

Table I. Stocks assessed for demersal species

Species/GSA	03	05	07	09	10	15	15-16	17	25	26	Total
Merluccius merluccius		1	1	1	1					1	**5**
Mullus barbatus	1		1	1		1			1		**5**
Mullus surmuletus		1				1					**2**
Pagellus bogaraveo	1										**1**
Boops boops	1										**1**
Parapenaeus longirostris	1			1							**2**
Nephrops norvegicus								1			**1**
Solea solea								1			**1**
Aristeus antennatus		1									**1**
Aristaeorpha foliacea							1				**1**
Total	**4**	**3**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**1**	**20**

Assessments performed in the WG

Shared stocks

Table II. Stocks assessed for small pelagic

Species/GSA	01	06	07	16	17	22	Total
Sardina pilchardus	1	1	1	1	1	1	**6**
Engraulis encrasicolous	1	1	1	1	1	1	**6**
Total	**2**	**2**	**2**	**2**	**2**	**2**	**12**

Assessments performed in the WG

Shared stocks