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GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN

SCIENTIFIC ADVISORY COMMITTEE

Eighth Session

Tirana, Albania, 25-28 October 2005

REPORT OF THE SEVENTH SESSION OF THE SUB-COMMITTEE FOR STOCK ASSESSMENT (SCSA) ROME, ITALY, 26-30 SEPTEMBER 2005

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GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN

(GFCM)

SCIENTIFIC ADVISORY COMMITTEE

Report of the meeting of the 7th Session of the Sub-Committee on Stock Assessment (SCSA)[1]

Rome, Italy, 26-30 September, 2005

1. OPENING OF THE MEETING

The seventh meeting of the SAC Sub-Committee on Stock Assessment was held at FAO in Rome from 26 to 30 September 2005.

The meeting was attended by 48 scientists from 8 countries, 2 scientists from FAO regional programmes, 1 representative from FAO and 2 from EU. The list of participants is attached as Appendix A.

2. ADOPTION OF THE AGENDA

The Agenda of the Sub-Committee was adopted (Appendix B) and the list of documents was updated (Appendix C).

Ms Constantina Karlou-Riga was nominated chairperson of the meeting and Mr Enrico Arneri and Mr Stelios Somarakis were designated as rapporteurs.

3. PRESENTATIONS TO AND DISCUSSIONS BY THE DEMERSAL WORKING GROUP

9 technical papers were presented and discussed by the Working Group.

Assessments for 9 stocks were presented covering 4 Geographical Subareas (GSAs), 5 species, and 1 shared stock. See Appendix D.

3.1 DEMERSAL ASSESSMENT DOCUMENTS

Document n° 1: Assessment of red shrimp (*Aristeus antennatus*) exploited by the Spanish trawl fishery (1992-2004): in the geographical sub-area GSA 05 (Balearic Islands).

Document n°2: Assessment of red shrimp (*Aristeus antennatus*) exploited by the Spanish trawl fishery (1996-2004): in the geographical sub-area GSA 06 (Northern Spain).

SUMMARY: GSA 05 Extended Survivor Analysis (XSA) methods (Lowestoft program; Darby and Flatman, 1994) and yield-per-recruit (Y/R) analysis (Lowestoft program; Darby and Flatman, 1994) have been performed to assess the red shrimp Spanish fishery in the Geographical Sub-area 05 and 06 (years 1992-2004). Analysis was performed using sex-combined age data. The Analysis for GSA 05 shows a stable state around of 750 t of the total biomass , fishing mortality of 0.6, and 36 millions of recruits in average. For GSA 06 an average total biomass of 3000 t, fishing mortality of 0.2, and 196 million recruits. Yield per recruit analysis shows optimum effort around 75% of the present in GSA 05

[1] As submitted by the Coordinator

and in GSA 06 the present effort is below the optimum. Notwithstanding these figures, decline of the stock biomass and recruitment in the last years for the resource, recommend against increasing the fishing effort. Temporal closure during mating or/and maturation ovary period could be considered as a measure to protect the spawning. Changes in the mesh size could contribute to increase the current Y/R.

SOURCE OF MANAGEMENT ADVICE: Separable VPA and Extended Survivor Analysis (XSA) methods (Lowestoft program; Darby and Flatman, 1994) and yield-per-recruit (Y/R) analysis (Lowestoft program; Darby and Flatman, 1994) have been performed to assess the red shrimp Spanish fishery for the whole Geographical Sub-area 05 and 06 (years 1996-2004). Following the recommendations made by the Sub-Committee in 2004, the assessment has been performed using combined sex. The advantage of the *Aristeus* assessment by combined sex is that the results are more easily understand for the management. The trends obtained by VPA non equilibrium methods give an improved perception of the state of the resource.

STOCK STATUS: Fully exploited.

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: The assessment of age based by summed sex and combined sex are quite similar. The Separable VPA and XSA shows similar figures. Recruitment and stock biomass are quite stable although there are fluctuations and some decline for the last years. The current F is above Fmax in the Yield per Recruit analysis from the output of the XSA. The SC suggested performing, in the future a sensitivity analysis on M values as well as tuning of VPA with trawl survey data series. The resource was considered full exploited from the previous assessments, at present using non-equilibrium methods, this figure is reinforced. The resource will benefit from the adoption of square mesh and from the adoption of other management measures such as temporal or spatial closed fishing seasons.

The SC recommends: not to increase the fishing effort.

Document n° 3: Stock assessment of red mullet (*Mullus barbatus*) from the trawl fishery off the whole geographical sub-area 06 (Northern Spain)

SUMMARY: Red mullet (*Mullus barbatus*) is one of the target species of the trawl fishery in the GFCM geographical sub-area Northern Spain (GSA-06). The trawl fleet operating in this area is composed by 647 boats averaging 47 TRB, 58 GT and 297 HP. Some of these units (smaller vessels) operate almost exclusively on the continental shelf, targeting red mullet, octopus, hake and different species of sea breams. According to official data, landings increased considerably between 1973 and 1982 and from this year until now a decreasing trend has been observed. In the period 1998-2004 landings of this species averaged 1315 t per year.

SOURCE OF MANAGEMENT ADVICE: The state of exploitation was assessed by VPA, tunned with standardised CPUE from the commercial fleet and abundance indices from trawl surveys and applying the Extended Survivor Analysis (XSA) method (Lowestoft programme; Darby and Flatman, 1994). Yield-per-recruit (Y/R) analysis (VIT programme; Lleonart and Salat, 1992) on a mean pseudo-cohort 1998-2004 was also applied. Both methods were performed using size composition of trawl catches from 1998 to 2004. Transition analysis was carried out considering two different management strategies aimed at improving the state of this resource: (1) a 20% reduction in current effort and (2) a change of mesh type in cod-end, from the current 40 mm diamond shape to 40 mm square.

STOCK STATUS: *Mullus barbatus* in GSA 06 is overexploited. Growth overfishing was detected and there is a risk of recruitment overfishing.

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: results depend partially on the assumption on natural mortality value, therefore it is advisable to perform a sensitivity analysis on this parameter and also to study the interaction between trawl and trammel net fisheries.

The SC recommends the improvement of the exploitation pattern by implementing the 40 mm square mesh as well as a strict observance of the 50 m depth ban which would protect the stock from growth overfishing. Moreover a reduction of fishing effort would be advisable.

Document n° 4: Stock Assessment of striped red mullet (*Mullus surmuletus*) from the trawl fishery off the geographical sub-area 05 (Balearic Islands)

SUMMARY: Striped red mullet (*Mullus surmuletus*) is one of the most important target species for the trawl fishery developed by around 40 vessels off Mallorca (Balearic Islands, GFCM-GSA05). The annual landings of this species, which represents 80–90% of red mullets (*Mullus* spp.) landings, have oscillated between 65 and 100 tons in the last decade.

SOURCE OF MANAGEMENT ADVICE: The assessment of this stock has been carried out applying tuned VPA (Extended Survivor Analysis, XSA) on a data series covering 8 years (1997–2004) and both VPA and Y/R analysis on mean pseudo-cohorts from that period. These approaches were performed using monthly size composition of catches, official landings and the biological parameters estimated in the framework of the Data Collection Programme (2003–2004). The VPA was tuned with CPUE from commercial trawl fleet (2000–2004) and bottom trawl surveys (2001–2004). The software used were the Lowestoft VPA program (Darby & Flatman, 1994) for the XSA analysis and the VIT program (Lleonart & Salat, 1992) for the cohort and Y/R analysis.

STOCK STATUS: the resource is fully exploited in the Balearic Islands (GSA 05)

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: The results of the XSA showed that population parameters such as biomass, F, recruitment and SSB remained quite stable over the assessed period, ranging between 180–250 tons, 0.7–1.1, 2.1–2.9 millions and 80–110 tons, respectively. The mean pseudo-cohort analysis for the period 1997–2004 estimated a mean F of 0.886 and gave very close values (1 year) for the mean and critical age of the current stock. The mean biomass of the stock was approximately 24% of its virgin biomass and the current Y/R remained near the maximum.

The SC recommends: not to increase fishing effort

Document n° 5: Stock assessment of hake (*Merluccius merluccius*) from the trawl fishery off the geographical sub-area 05 (Balearic Islands)

SUMMARY: Hake (*Merluccius merluccius*) is a target species for the trawl fishery developed by around 40 vessels off Mallorca (Balearic Islands, GFCM-GSA05), annual landings have oscillated between 50 and 190 tons in the last decades.

SOURCE OF MANAGEMENT ADVICE: The assessment of this stock has been carried out using tuned VPA (applying the Extended Survivor Analysis (XSA) method) on the period 1980-2004, and VPA and Y/R analysis on mean pseudo-cohorts from that period. These approaches were performed, using monthly size composition of catches, official landings and the biological parameters estimated from the Data Collection Programme (2003-2004). The VPA was tuned with CPUE from commercial trawl fleet (2000-2004) and bottom trawl surveys (2001-2004). Transitional analysis was also applied to simulate different management strategies, based on effort reduction and the improvement of gear selectivity.

STOCK STATUS: Growth overexploitation, Current biomass 7% of virgin biomass, if F current is reduced by 60%, Y/Rmax would be 1.5 times higher than the current value.

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: XSA results showed high variability (without significant tendency) in population parameters, such as biomass, F, recruitment and SSB, which oscillated between 80-300 tons, 0.5-1.9, 0.7-3.3 millions and 10-60 tons, respectively. The mean pseudo-cohort analysis for the last period (2000-2004) estimated a mean F of 0.8, a current

stock mean and critical age of 0.8 and 2.0 years, respectively, and a mean biomass of the stock around 7% of its virgin biomass. The current Y/R (60 g/recruit) is lower than the Y/Rmax (89 g/recruit). It could be concluded that: (i) the resource is over-exploited (growth over-fishing: a reduction of about 60% in the current effort is necessary to reach the Y/Rmax); (ii) the use of 40 mm square mesh in the cod-end could improve both yields and the state of the stock in a more effective way than the reduction of 20% in the fishing effort.

The SC recommends to improve the selectivity. In comparison with the 40 mm diamond mesh size the use of 40 mm square mesh size is more effective.

Document n° 6: Stock assessment of hake (*Merluccius merluccius*) from the trawl fishery off the geographical sub-area GSA 06 (Northern Spain)

SUMMARY: Hake (*Merluccius merluccius*) is one of the most important target species for the trawl fisheries carried out by around 647 vessels along the GFCM geographical sub-area Northern SPAIN (GSA-06). In the last years, the annual landings of this species, which are mainly composed by juveniles living on the continental shelf, were of about 3900 tons in the whole area.

SOURCE OF MANAGEMENT ADVICE: The state of exploitation was assessed by means of a VPA, tuned with standardised CPUE from the commercial fleet and abundance indices from trawl surveys, applying the Extended Survivor Analysis (XSA) method (Lowestoft program; Darby and Flatman, 1994) on a period 1992-2004, and from yield-per-recruit (Y/R) analysis (VIT programme; Lleonart and Salat, 1992) on a mean pseudo-cohort 1992-2004 for the GFCM geographical sub-area Northern Spain (GSA-06). Both methods were performed from size composition of trawl catches (obtained from on board and on port monthly sampling) and official landings. This assessment has been performed using the biological growth parameters obtained within the Spanish DCR National Programme (2002-2004 period). Transitional analysis was also made to simulate different management strategies for the improvement of the state of this resource.

STOCK STATUS: Growth overexploitation. Current biomass lower than 10 % of virgin biomass. If Fcurrentis reduced by 80% Y/Rmax, would be 4.64 times higher than the current value. A decreasing trend in landings, total biomass and SSB is observed. Risk of recruitment overexploitation.

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: growth overfishing is confirmed and there is a concrete risk of recruitment overfishing as the decrease of SSB points out. The need to take immediate action to reduce growth overexploitation and to avoid recruitment overfishing was stressed.

The SC recommends to improve the selectivity. In comparison with the 40 mm diamond mesh size the use of 40 mm square mesh size is more effective.

Document n° 7: Stock assessment of hake (*Merluccius merluccius*) from the Gulf of Lions geographical sub-area GSA 07 (France)

SUMMARY: Hake (*Merluccius merluccius*) is one of the most important demersal target species of commercial fisheries in the Gulf of Lions (GFCM geographical sub-area 7). In this area, hake is exploited by important trawlers and small-scale fleets, which develop four different hake fisheries: French trawl, French gillnet, Spanish trawl and Spanish long-line. Around 250 boats are involved in these fisheries (113 for French trawl, 95 for French gillnet, 26 for Spanish trawl and 20 for Spanish long-line), with total annual catches estimated around 2850 tons (2000 for French trawl, 400-500 for French gillnet, 200 for Spanish trawl and 165 for Spanish long-line).

SOURCE OF MANAGEMENT ADVICE: Assessment of the stock has been carried out using methods of virtual population analysis (VPA) and yield per recruit analysis (Y/R), based on cohorts and/or mean pseudo-cohorts by age. Transition analysis has also been performed in order to simulate different management strategies.

STOCK STATUS: growth overfishing, risk of recruitment overfishing

WG MANAGEMENT ADVICE AND RECOMMENDATIONS:. Management objectives: To reduce growth overfishing by improving the trawling exploitation pattern and reducing trawling effort. The risk of recruitment overfishing is highlighted by a decrease in recruitment in recent years The need to take immediate action to reduce growth overexploitation and to avoid recruitment overfishing was stressed.

The SC recommends:

to use 40 mm square mesh size in the codend.

to enforce existing regulation on minimum landing size.

Document n° 8 : Hake (*Merluccius merluccius*) in Saronikos Gulf (part of GSA 22)

SUMMARY: Hake (*Merluccius merluccius*) is fished by trawlers and long-lines or nets, but it is the main target species of trawlers. In the Saronikos Gulf the trawler catch of hake represents 45% of the total hake catch, while that of both long-lines and nets 50% about. In 2004, the trawler catch was recorded as 404 ton. The state of stock was examined by the yield per recruit analysis on the 2004 pseudocohort applying the VIT software (Lleonart et al, 1999-2000). It was found that the fishing effort should decrease by 68%. Previous assessment has been carried out in the Saronikos Gulf in 1988-92 and 1998. In 1988-1992 the stock had been assessed as overexploited and the fishing effort had to decrease by 72%, while in 1998 was found as well overexploited at the same level as that of 1988-92. Although since 1998 the increase in trawler cod end mesh size from 14mm to 20 mm between stretched knots has been implemented and the yield has increased by 11%, the stock is far from the maximum sustainable yield. However the reaction of the stock to the management measure was highlighted indicating the necessity to further enforce the existing regulations on mesh size and minimum landing size. Assuming as current state that of 1992, transition analysis was made in order to predict the catch values after the implementation of the increase in mesh size in 1998 and to compare the predicted values with the actual ones.

SOURCE OF MANAGEMENT ADVICE: LCA and Y/R (VIT) with 2004 data, transition analysis performed increasing mesh size from 14 to 20 mm (knot to knot).

STOCK STATUS: overexploited, far from sustainability

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: this is an assessment of a portion of the stock. The analysis recommends, with the present mesh size, a decrease of 68% of the effort to reach MSY, as long term objective; but this figure could be less pessimistic if the exploitation pattern would be improved. It is advisable in the future to include in the analysis data coming from all the gear (nets and long-lines) exploiting this resource.

The SC recommends:

not increase the fishing effort

to enforce the existing regulations on mesh size and minimum landing size.

Document n° 9 : Stock Assessment of picarel (*Spicara smaris*) exploited by trawlers and beach seines in the Saronikos Gulf (GFCM – GSA 22Picarel (*Spicara smaris*) in Saronikos gulf GSA 22

SUMMARY: Picarel (*Spicara smaris*) constitutes the main target species of beach seiners, but it is also caught by trawlers. In the Saronikos Gulf the picarel catch by trawlers and beach seiners in the year 1998 was 70 and 59 tons respectively. The fishing season for trawlers and beach seiners (in 1998) was 8 months (Jan-May). The state of picarel stock was assessed by Y/R analysis (VIT program) on the 1998 pseudo-cohort and it was found that picarel is moderately exploited when taking as reference point F0.1. The assessment was performed using growth parameters obtained by Karlou (in press).

Since 1999, Fisheries Laboratory keeps picarel catch data only for trawlers. In 2002 the fishing season for beach seiners decreased by 2 months (EC Regulation 1550/2000). Thus, transition analysis was also made to predict the state of stock by decreasing the beach seiner fishing effort in year 4 (2002) and to compare the predicted trawler catch values with the actual ones. Trawlers (70 tonnes in 1998) and beach seines (60 tonnes in 1998)

SOURCE OF MANAGEMENT ADVICE: LCA and Y/R (VIT)

STOCK STATUS: MSY cannot be estimated because Y/R very flat, according to F01 the stock is moderately exploited (in 1998).

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: Simulation was performed decreasing beach seines fishing season by 25% (in 2002) giving an increase in trawlers catches of 10%, decrease in beach seines of 18% and a decrease of total catches of 2.2%. Use of direct methods to complement information on the status of the stock is suggested. Habitat of the species (coastal and protected areas) should be taken into account.

SC Recommendations:

Data and assessment should be updated with recent years data before any management recommendations can be proposed.

4. PRESENTATIONS TO AND DISCUSSIONS BY THE SMALL PELAGICS WORKING GROUP

14 technical papers were presented and discussed by the Working Group.

Assessments for 11 stocks were presented covering 6 Geographical Subareas (GSAs), 3 species, and 5 shared stock. See Appendix D.

Two types of documents were presented: (i) assessment documents and (ii) assessment-related documents. The conclusions and recommendations related to the assessment presented in each document and endorsed by the Sub-Committee are listed below.

4.1 PELAGIC ASSESSMENT DOCUMENTS

Document n° 10 : Anchovy (*Engraulis encrasicolus*) stock assessment in the GFCM Geographical Sub-Area GSA 01, Northern Alboran Sea

SUMMARY: The annual landings of anchovy (*Engraulis encrasicolus*) in the Northern Alboran Sea for the last fifteen years ranged between 0.2 and 3000 tons. Anchovy was the species with the highest economical value. Only the Malaga Bay area, representing 85% of total landings, has been considered. During the period from 1990-2004, the anchovy stock of the Alboran showed great fluctuations in the catch. A successful recruitment as estimated by echo-acoustic tracking was observed during 2001 in the Alboran Sea (13210 t) producing a strong increment of landings in 2002, besides to an increase of CPUE. Nevertheless, the catch dropped in 2003 and 2004 to 250 and 750 tons. This decline is consistent with the echo-acoustic evaluation (550 tons in 2003 and 2013 tons in 2004).

SOURCE OF MANAGEMENT ADVICE: Acoustic surveys and commercial landings and CPUEs.

STOCK STATUS: Low biomass in recent years

WG MANAGEMENT ADVICE AND RECOMMENDATIONS:

Direct surveys of spawning stock biomass and recruitment strength coupled with catch-at-age estimates would improve assessment of the stock. The autumn acoustic surveys can help in mapping of nursery areas.

SC recommends:

annual assessment of the stock is needed;

the fishing effort should not be increased

Document No 11. Anchovy (*Engraulis encrasicolus*) stock assessment in the GFCM Geographical Sub-Area GSA 06, Northern Spain

SUMMARY: The annual landings of anchovy (*Engraulis encrasicolus*) in the Northern Spain for the last fifteen years ranged between 8000 and 22000 tons. Anchovy was the species with the highest economical value. The studied area was divided in two regions (Tramontana Region, C. Creus-C. La Nao and Levantine Region, C. La Nao-C. Palos) in order to use the historical series of acoustic evaluation data (survey ECOMED). It is recorded in the Tramontana Region since 1990.

The period in which the surveys were carried out corresponds to the recruitment season of the species (November – December). The acoustic evaluation provides an estimation of the recruitment of the species. The most important recruitment area is located between Barcelona and the south of the Ebro River Delta.

1.- Tramontana region. The estimated biomass for the whole area in 2004 (27000 t) was the same as in 2003. For this area, the surveys suggested that the recruitment was very low from 1996 to 2000, the population appeared to recover in 2001 and 2003 but in the 2004 was low again.

The landings, although with a Slight increase in 2002 (unfortunately, no acoustic data during 2002 was able to be provided), present negative trend. CPUE in 2004 is similar to 2003.

2.- Levantine Region. The estimated biomass for 2004 was very low and the landings show the strongest negative trend for all the Mediterranean regions.

SOURCE OF MANAGEMENT ADVICE: Time series of acoustic surveys. Landings. CPUE.

STOCK STATUS: declining trend in biomass

WG MANAGEMENT ADVICE AND RECOMMENDATIONS:

Direct surveys of spawning stock biomass and recruitment strength coupled with catch-at-age estimates would improve assessment of the stock. The autumn acoustic surveys can help in mapping of nursery areas

SC recommends:

the fishing effort should not be increased;

annual assessment of the stock is needed.

Document No 12. Sardine (*Sardina pilchardus*) stock assessment in the GFCM Geographical Sub-Area GSA 01, Northern Alboran Sea

SUMMARY: The annual landings of sardine (*Sardina pilchardus*) in the Northern Alboran Sea for the last fifteen years ranged between 4000 and 11000 t. This species is the most heavily fished although its economical value is low.

The period in which the surveys were carried out corresponds to the beginning of the species reproduction season (November – December).

The estimated biomass from Gata Cape to Fuengirola in 2004 is four time higher than in 2003, although juvenile abundance was only 11 % on the whole.

The landings present a strong annual fluctuation with a decreasing CPUE from 2000.

SOURCE OF MANAGEMENT ADVICE: Time series of acoustic surveys. Landings. CPUE.

STOCK STATUS: Decreasing trend of CPUEs

WG MANAGEMENT ADVICE AND RECOMMENDATIONS:

SC recommends:

the fishing effort should not be increased.

Document No 13. Sardine (*Sardina pilchardus*) stock assessment in the GFCM Geographical Sub-Area GSA 06, Northern Spain

SUMMARY: The annual landings of sardine (*Sardina pilchardus*) in the Northern Spain for the last fifteen years ranged between 19000 and 53000 tons. This species is the most heavily fished although its economical value is low.

The studied area was divided in two regions (Tramontana Region, C. Creus-C. La Nao and Levantine Region, C. La Nao-C. Palos) in order to use the historical series of acoustic evaluation data (survey ECOMED), recorded in the Tramontana Region since 1990.

The period in which the surveys were carried out corresponds to the beginning of the species reproduction season (November – December).

1.- Tramontana Region. From 1990 to 2004, the estimated biomass fluctuated from 200000 t in 1992 to 50000 t in 2004. The estimation for 2004 keeps stable with respect to year 2003, but there is a negative trend in biomass from 1992. The same trend was observed in abundance of juveniles.

As regards the landings, they show the same negative biomass trend, but there is an increase in the CPUE, which is recorded for the main ports in the region.

2.- Levantine Region. The estimated biomass for 2004 was 8000 t, similar to 2003 year (7000 t).

Landings show the strongest negative trend for all the Mediterranean regions.

SOURCE OF MANAGEMENT ADVICE: Time series of acoustic surveys. Landings. CPUE.

STOCK STATUS: negative trend in biomass and catches

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: none

SC recommends:

not to increase the current level of fishing effort;

to adjust the minimum legal size to the size at first maturity (13 cm)

Document No 14. *Engraulis encrasicolus,* 1993-2004. Gulf of Lions – Acoustic surveys. – GSA 07

SUMMARY: The annual landings of anchovy in the last years are between 4000 and 7000 tons in the Gulf of Lions. The landings are regulated by the market prices. When market price is low, the trawl fleet directs its activities towards demersal resources, which are overexploited. Fifty trawlers target their activity on anchovy. The size structure from landing of 2002-2004 shows a lack in big fish in the last year. The evaluation of the resource is carried out through yearly echo-acoustic surveys since 1993. The anchovy resources of the Gulf of Lions seem to decline for the last three years, averaging 48000 t in the period from 2002 to 2004. There is no trend in mean weight calculated from acoustic evaluation for the last 6 years. Mackerel biomass (*Scomber scombrus*) is increasing in 2004 and could have an effect on anchovy stock as predator of this species. A preliminary examination of the results of the 2005 survey suggests that anchovy biomass might be low but this could also be the result of a temporary un-accessibility of this species to the pelagic trawl.

SOURCE OF MANAGEMENT ADVICE: Time series of acoustic surveys. Landings. CPUE.

STOCK STATUS: declining trend in biomass in recent years.

WG MANAGEMENT ADVICE AND RECOMMENDATIONS:

The fishing effort on the Gulf of Lions anchovy stock is conditioned by market demand and is likely to increase (especially so, after the collapse of the Bay of Biscay stock). Continuation of monitoring of this stock is recommended.

Direct surveys of spawning stock biomass and recruitment strength coupled with catch-at-age estimates would improve assessment of the stock.

It could be considered that common French-Spanish surveys be conducted in the future to cover the whole NW Mediterranean anchovy stock.

There is still a debate whether the stocks of the gulf of Lions are the same of those of the Catalan coasts. Transport of larvae has been documented for anchovy larvae but the degree of transport from the gulf of Lions is still unknown. Nevertheless using an operational definition of stocks there are two separate GSAs and stocks.

SC recommendations:

to carry out joint surveys between Spain and France twice a year (spring and autumn) covering also the Ebro river zone where spawners are;

update the biological data and CPUEs data of Spanish purse seine fleet in gulf of Lions.

Document No 15. *Sardina pilchardus*, 1993-2004. Gulf of Lions – Acoustic surveys. – GSA 07

SUMMARY: The sardine landing in the Gulf of Lions averages 7400 t., for the period from 2002-2004. The landings and fishing effort have been monitored since 1985 but the most reliable values have been collected since 1999. The production is less regulated by fishing market compared to anchovy, but trawlers can easily shift to demersal resources, which are overexploited.

The acoustic evaluation has been carried out since 1993 in the Gulf of Lions during the summertime. The sardine biomass is very variable but remains in 2004 quite at the same level as in 2002, up to 110000 t. There is a downward trend in mean weight calculated from acoustic evaluation. The survey series provides also data on resources variability for other small pelagic species (mackerel, horse mackerel, sardinella and sprat).

SOURCE OF MANAGEMENT ADVICE: Time series of acoustic surveys. Landings. CPUE.

STOCK STATUS: stable

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: none

SC recommendations : none

Document No 16. Sardina pilchardus, 2004. State of exploitation of the sardine stock off the Mediterranean coasts of Morroco. – GSA 03

SUMMARY: The sardine is the most important pelagic fish in the Mediterranean Moroccan waters with a mean yearly landing of 14000 t during the last five years. There is a special sardine fleet composed of 150 boats, distributed in seven Mediterranean ports. The examination of catch and CPUE time series show an increasing trend. An assessment of the state of the stock was made with LCA for the year 2004. The results show that the fishery is mainly targeting adult specimens (17-19 cm). However, the fishing mortality of younger specimens was also increased (more than 40% of the fish caught were immature). The yield per recruit analysis indicates that the stock is fully exploited.

SOURCE OF MANAGEMENT ADVICE: The exploitation status of the Mediterranean sardine is based on the analysis of catch, efforts and CPUE. The evaluation based on the analysis of pseudo-cohorts (LCA) has been updated for 2004.

STOCK STATUS: fully exploited

WG MANAGEMENT ADVICE AND RECOMMENDATIONS:

SC recommends:

to keep the current level of fishing effort;

to protect juveniles establishing a seasonal closure of coastal areas during the recruitment period in spring.

Document No 17. Anchovy (*Engraulis encrasicolus,* L.) stock assessment in the Adriatic Sea: 1975-2004. – GSA 17

SUMMARY: Anchovy (*Engraulis encrasicolus*, L.) is one of the most important commercial species of the Adriatic Sea. Stock of anchovy living in northern and central Adriatic Sea is shared between Italy, Slovenia and Croatia. The present assessment concerns the anchovy stock of northern and central Adriatic Sea (GFCM GSA 17), pooling together data coming from Italy, Slovenia and Croatia. It has been carried out in the ambit of an extension of the AdriaMed-SP research programme. The annual catch of anchovy for the three mentioned countries was obtained for the period 1975-2004. For the same time interval, fishing effort data and length frequency and age-length data were available. These data were combined into fish age classes, so that catch-at-age data were used as basic input of Virtual Population Analysis (VPA), employed for the present stock assessment.

Annual values of mid-year stock biomass at sea, annual values of the fishing mortality rate over the age class range 0-3, were obtained. In addition, on the basis of the mentioned fishing mortality rates and natural mortality rate, annual exploitation rates were calculated and compared with a threshold derived from literature and suggested for small pelagics.

Stock biomass of anchovy dropped at very low level in 1987. After this collapse a slow, but continuous recovery of biomass took place. The present assessment shows a stronger recovery during last two years. Due to high biomass fluctuations of small pelagics it is recommended to maintain the current level of fishing effort.

SOURCE OF MANAGEMENT ADVICE: VPA with Laurec-Shepherd tuning on commercial CPUEs

STOCK STATUS: moderately exploited

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: see general advice and recommendation on Adriatic small pelagic stocks.

Document No 18. Sardina (*Sardina pilchardus,* Walb.) stock assessment in the Adriatic Sea: 1975-2004. – GSA 17

SUMMARY: Sardine (*Sardina pilchardus*, Walb.) is an important commercial species of the Adriatic Sea. Stock of sardine living in northern and central Adriatic is shared between Italy, Slovenia and Croatia. The present assessment concerns the sardine stock of northern and central Adriatic Sea (GFCM GSA 17), pooling together data coming from Italy, Croatia and Slovenia. It has been carried out in the ambit of an extension of the AdriaMed-SP research programme.

The annual catch of sardine for the three mentioned countries was obtained for the period 1975-2004. Also length frequency and age-length data and catch and effort data were available. Data were combined into fish age classes, so that catch-at-age data were obtained. That represented the basic input data of Virtual Population Analysis (VPA), employed for the present stock assessment.

Annual values of mid-year stock biomass at sea, annual values of fishing mortality rate over the age class range 0-5, were obtained. Moreover, annual exploitation rates were calculated and compared with a threshold derived from literature and suggested for small pelagics.

A continuous decline of stock biomass has been observed after the peak in the first half of 1980s. The present assessment shows a slight increase of the biomass and the exploitation rate is around the threshold. Therefore, it is recommended not to allow the fishing effort to rise. Furthermore, difficulties in obtaining economically satisfactory catches by fishermen were perceived in Italy.

SOURCE OF MANAGEMENT ADVICE: VPA with Laurec-Shepherd tuning on commercial CPUEs

STOCK STATUS: Biomass trend decreasing for the last 15 years, total catches as well, exploitation rate above threshold, stock at least fully exploited, probably overexploited.

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: see general advice and recommendation on Adriatic small pelagic stock.

Document No 19. Multispecies stock assessment of small pelagic fish (anchovy, sardine and sprat) in the eastern part of Adriatic Sea (GFCM Geographical Sub-Area 17) September,2004. GSA 17. Acoustic survey.

SUMMARY: The Directorate of Fisheries of the Croatian Ministry of Agriculture, Forestry and Water Management in cooperation with the Institute of Oceanography and Fisheries in Split, has organized an acoustic survey of small pelagic fish combined with environmental monitoring along the eastern part of Adriatic Sea, called PELMON. Study area of PELMON programme corresponds to Croatian territorial waters together with protected ecological-fishery zone. Given the multispecies character of small pelagic fisheries in Adriatic Sea, target species were anchovy (*Engraulis encrasicolus*), sardine (*Sardina pilchardus*) and sprat (*Sprattus sprattus*). All other pelagic species were considered within common group called OPS. It was found that these species had very heterogeneous spatial distributions within study area that probably changes according to fish migrations during the year. Estimates of stock biomass of anchovy, sardine and sprat within the study areas in September 2004, regarding to 95% confidence intervals, were 57,373-106,359 tonnes, 131,004-295,950 tonnes and 528-1,518 tonnes respectively. It can be noticed that these estimates of small pelagic fish biomass are significantly higher than those obtained by the most recent VPA stock assessments in the entire Adriatic Sea, suggesting a need of further discussion and exchange of views on validity of methods being applied in pelagic stocks assessment.

SOURCE OF MANAGEMENT ADVICE: echo survey in Croatian territorial waters

STOCK STATUS: point estimates referring to September 2004 show substantial biomass of sardine, and to a lesser extent of anchovy. Biomass of sprat rather low.

WG MANAGEMENT ADVICE AND RECOMMENDATIONS: see general advice and recommendation on Adriatic small pelagic stock.

GENERAL ADVICE AND RECOMMENDATION ON ADRIATIC SMALL PELAGIC STOCKS

For the first time assessments covering the whole GSA 17 by means of echo survey and virtual population analysis were presented to the SC. The results are not completely homogeneous but this must be taken for granted as this important joint international activity has just started. This activity involved also an intercalibration exercise between the Italian and Croatian research vessels. In the future, it will be possible to cover the whole Adriatic every year with echo survey, and to obtain synoptic maps of small pelagic resources, estimates of instantaneous biomasses by species and by area. Moreover these data will also be utilised as fishery independent tuning series for the VPA, thus improving the quality also of these estimates. Overall a great improvement in the scientific advice on small pelagics fish stocks is to be expected shortly. At present the discrepancies in the various assessments relates mainly to the different perception of the stock status on the two side of the Adriatic. These differences prevented the SC to obtain a consensus on the management advice. The following two paragraphs summarize the different positions:

1) The VPA carried out on a series of 30 years (up to 2004) show a sharp declining of biomass of sardine to a tenth of its maximum value in 1985 (around 70 000 tonnes in 2004). This trend is in accordance to that of the echo surveys conducted on the western side of the Adriatic from 1985, which is registering very low biomass of sardine in recent years. This biomass declining corresponds to an

increasing trend of F, which has surpassed the limit reference point in recent years. The stock-recruitment relationship shows clear evidence of recruitment overfishing. The stock of anchovy appears to be in healthy state in recent years but the collapse registered in 1987 calls for a cautious approach and suggests **not to increase the fishing effort**, given the fact that the fishery is multispecies and effort on sardine cannot be separated from effort on anchovy.

2) The echo surveys carried out in Croatian waters in 2003 and 2004 show a sardine biomass greater than 200 000 tonnes. It is also considered that the variability of small pelagic biomass is high and driven mainly by environmental factors rather than fishing. Taking into account the multispecies aspect of the fishery, the fact that substantial biomass of sardine has been detected on the eastern part of the Adriatic and the fact that anchovy appear to be in healthy conditions in GSA 17, it seems that there is room for a **moderate increase of fishing effort** on these resources.

Document No 20. Ichthyoplanktonic and acoustic biomass estimates of the anchovy in the Aegean Sea (June 2003 and June 2004). – GSA 22

SUMMARY: The biomass of Aegean Sea anchovy stock was estimated in June 2003 and June 2004 with the concurrent application of the Daily Egg Production (DEPM) and the Acoustic methods. Spawning stock biomass (SSB) based on the DEPM was 40042 t in 2003 and 22799 t in 2004. Stock biomass based on acoustics was 47838 t in 2003 and 46508 t in 2004. Results showed a remarkable decline of anchovy biomass between 2003 and 2004 in the eastern part of the surveyed area.

SOURCE OF MANAGEMENT ADVICE: Acoustic and DEPM biomass estimates

STOCK STATUS:

WG MANAGEMENT ADVICE AND RECOMMENDATIONS:

The biomass estimates obtained by the acoustics and DEPM should be used with concurrent estimates of catch-at-age to improve the assessment of the stock

The eastern part of the Aegean belonging to Turkish territorial waters cannot be sampled for the biomass estimates. This problem should be considered in the context of a future EASTMED framework.

SC management recommendations:

annual assessment of the stock is needed

shift of the current closed period (December-February) either to autumn (recruitment of anchovy) or to spring (recruitment of sardine)

4.2 ASSESSMENT RELATED DOCUMENTS

Document No 21. Length at first maturity of the Adriatic anchovy (*Engraulis encrasicolus*, L.). – GSA 17

SUMMARY: An histological analysis of gonads was performed during the spawning season of the most commercially important clupeoid of Adriatic sea, *Engraulis encrasicolus*. Samples were collected during the spring - summer 2003 (May – September) and the summer 2005 (June and July) in northern and middle Adriatic Sea. Gonadic maturity for males and females was described by an histological five maturity stages scale according to Billard (1986) and West (1990).

When two-year data were used the length at first maturity (L50) of females was found at about 8.1 cm; moreover the histological aspect of ovaries containing several oocyte batches in different maturity

stage, indicated an intermittent release of ripe eggs in the course of a prolonged spawning season (April – August).

Although it wasn't possible to fit a logistic curve for males, data suggest that length at first maturity is about 7.5 cm. Over this length testes were always mature.

Our results confirm that the length at first maturity of anchovy may be different among different areas of Mediterranean basin. This could be due to the diverse climatic and trophic parameters that characterize the various areas of Mediterranean sea.

Document No 22. Lengths-at-maturity of anchovy and sardine in the central Aegean and Ionian Seas. - GSA 20-22

SUMMARY: The length at maturity of female anchovy and sardine were estimated from pelagic trawl samples collected during DEPM surveys in the central Aegean and Ionian Seas. The timing of surveys coincided with the peak of the spawning period of anchovy or sardine in the two areas (anchovy: June 1999; sardine: December 2000 in the Aegean Sea and February 2001 in the Ionian Sea). The estimated lengths-at-maturity (L50) and 95% confidence intervals were based on a large number of histologically analyzed females. L50 for anchovy was 104.41 mm in the Aegean and 104.62 mm in the Ionian Sea. L50 for sardine was 118.39 mm in the Aegean Sea (December 2000) and 113.83 mm in the Ionian Sea (February 2001).

GENERAL COMMENTS ON L_{50} OF ANCHOVY

A revised table with available estimated lengths at first maturity of anchovy has been prepared based on annex D of last year report of the Small Pelagic WG. Table is given in Appendix E. This table shows a remarkable variability in this parameter in the Mediterranean. It is now proved for the Adriatic stock that anchovy matures at a very small size (8 cm).

Document No 23. Regional mapping of anchovy and sardine biomass in the MedSudMed area: Update on the activities conducted so far. - GSA 13, 14, 15, 16

SUMMARY: Preliminary results on joint mapping of sardine (*Sardina pilchardus*) and anchovy (*Engraulis encrasicolus*) are presented. Four institutes of the Central Mediterranean discussed and agreed upon a common methodology for acoustic data collection and processing under the framework of the MedSudMed Project. In 2004, GSA 13, 14, 15 and 16 were prospected by acoustic surveys. Even though sampling periods differ (summer in GSA 13 and 14 and autumn in GSA 15 and 16), it was agreed to conduct this joint exercise in order to tune the common methodology. GSA 15 was covered for the first time during 2004. It was not possible to collect representative biological samples; however, the results provide an overview of small pelagic fish densities in this area. In particular, control hauls were mainly composed by juveniles of *Engraulis encrasicolus*, *Sardinella aurita* and *Trachurus trachurus*. The spatial distribution of anchovy and sardine biomass, together with a total biomass estimate is presented for GSA 16. If compared with the 2003 results, biomass estimates single out an increase of sardine (17,960 t) while the anchovy population remained at the same level (9,820 t). Future prospects foresee the finalisation of similar processing for GSAs 13 and 14 (which is in progress), as well as better experimental catches in GSA 15 in order to provide more accurate results.

COMMENTS: none

5. REVIEW OF THE OUTPUTS OF THE TRANSVERSAL ACTIVITIES (E,G: SCIS MEASUREMENT OF EFFORT; OPERATIONAL UNITS, SCMEE EAF) AND FOLLOW-UP BY SCSA – JOINT SESSION OF SCSA WITH SCMEE

5.1 OPERATIONAL UNITS AND THE MEASUREMENT OF FISHING EFFORT

The Coordinator of the SCSI, Dr Matthew Camilleri, presented the results of the workshop held in Tangiers (4-6 July 2005) on Operational Units and the Measurement of Fishing Effort. He explained that the discussions held during the workshop and the emerging conclusions were based on two pilot studies conducted with the support of Adriamed and Copemed in the Adriatic and Central-Western Mediterranean basins. The Coordinator described how the former study concentrated on drawing up an inventory of Operational Units for the entire sub-region, whilst the latter focussed on obtaining multidisciplinary data on the Operational Units related to the Mediterranean *Coryphaena hippurus* fishery.

Dr Camilleri stated that, with a few adjustments, the data tables used in the Adriamed pilot study to identify Operational Units were adopted by the workshop and were under further discussion during the on-going SCSI session so that they could be finalised and proposed to the SAC. Furthermore, he demonstrated how the *Coryphaena* fishery pilot study obtained monthly catch, effort, economic and biological data at the level of Operational Units. He stressed that if specific fishing effort control regimes are to be implemented by the GFCM then data at such a level of detail would need to be available. He added that information on the fishing activities performed prior and after the *Coryphaena* fishery was collected, thus obtaining an insight on the movement of vessels from one Operational Unit to another and the related implications of applying effort restrictions.

With respect to fishing effort measurement, the SCSI Coordinator explained that little progress had been achieved on this subject due to the absence of focussed studies. Nevertheless, he stated that four levels of fishing effort parameters were identified during the workshop, with the first level describing the minimum parameters required for effort measurement. In addition, it was reported that the important issue of standardising the measure of fishing effort between gears was still pending.

COMMENTS: An objection put forward in the discussion was that these tables do not contemplate the demographic structure of the target species.

5.2 THE CORYPHAENA WG

On the basis of the work carried out by the *Coryphaena* WG within the framework of the COPEMED project (participating countries were Tunisia, Malta Spain in 2004-2005), including the results obtained from the Operational Units pilot study on the *Coryphaena* fishery, a set of management measures were proposed (Appendix F). The SCSA endorsed this management proposal and agreed to forward it to SAC as a recommendation. The SCSA further suggested that, whilst recognising that the size at first maturity was difficult to establish for this species, a minimum landing size could strengthen the management regime and thus future efforts should be made to establish this size, if possible.

Comments: A mention was made by the SCSA on the size of vessels involved in the fishery. It was reported that the majority of vessels are under 15m and it was suggested that the GFCM should contemplate the possibility of also obtaining a list of vessels under 15m operating in international waters.

5.3 PRESENTATION OF RESULTS OF THE EAF WORKSHOP

An overview of the SCMEE transversal EAF Workshop Report held on Ecosystem Approach to Fisheries, Salammbô, Tunisia, 7-9 September, 2005, Tunisia was presented by J. Lleonart at the request of both the SCSA and SCMEE coordinators.

In the view of EAF, the old methods of fisheries assessment were considered compatible, meaning that even new reference points would have to be adapted.

The scope of the EAF workshop explored tools for the analysis of exploited ecosystems, specifically those referring to:

- essential and sensitive habitats

- modelling

- ecosystem indicators

- Marine Protected Areas

-selectivity and gears

- by catch of vulnerable and protected species

An output of the EAF Workshop relies on the formulation of a Strategy/Workplan, that poses a roadmap to the implementation of EAF principles by:

- recommendations to all Subcommittees
- continuation of research on indicators, considering their robustmenss
- reinforcing the transversal collaboration
- invite to test and discuss the use of the two ecological indicators presented the %PPR-TLc and synthetic trend indicator

COMMENTS:

- All the recommendations that emanated from EAF workshop were endorsed by the joint SCSA-SCMEE session.
- An objection was made to the recommendation of the SCMEE EAF workshop referring to the reference indicators recommendation in the phrasing of "acceptable and easily understood by stakeholders". The word "acceptable" to stakeholders was not endorsed by the SCMEE and SCSA.

5.4 DOCUMENTS PRESENTED TO THE JOINT SCSA-SCMEE SESSION:

Document 24 Quantifying ecosystem overfishing in the Mediterranean Sea with a new index of fisheries' impact on marine trophic webs

SUMMARY: Theoretical analysis of effects of catches on energy transfer along trophic webs allows quantifying the relative theoretical decrease in secondary production with respect to the unfished state. The decrease in production is proposed as a proxy for quantifying ecosystem effects of fishing, and it is formally defined in a new index of ecosystem overfishing, L (Loss in production) index. From theoretical network analysis, L index formulation is based on properties of catches (Trophic Level and Primary Production Required) and of exploited ecosystems (Primary Production and Transfer Efficiency) and allows estimating the index for mass-balance models and landing data. Application of the index to 51 ecological models of exploited ecosystems, previously classified as overexploited or sustainable exploited, allows associating a probability of being sustainable fished to each index value. Successively, L index, estimated from landing data and outputs of ecosystem models for the Mediterranean Sea, allows quantify current level of exploitation, expressed as probability of being sustainable fished, for many marine ecosystems. Moreover, by fixing desired probability levels as reference points, the corresponding index values provide basis for back-estimating the associated maximum allowable catches. The index is also applied to outputs of dynamic models of exploited ecosystems allowing an evaluation of sustainability of fisheries along time for the past fishing history and for future scenarios of alternative management options. Results evidence the usefulness of L index in providing general basis for quantifying the level of disruption for Mediterranean ecosystems subjected to different fishing pressures and allow defining an ecosystem-based reference framework for fisheries management.

SC COMMENTS: This work provided an example on the use of ecological indicators to the EAF principles by using concepts and tools such as, trophic level, trophic efficiency, primary production

required (as an indicator of ecosystem functioning) and diversity. New ways are explored to evaluate new indices of ecosystem overfishing.

Document n° 25 Historical series of small pelagics in the Mediterranean Sea: do they present any recognisable pattern?

SUMMARY: We formulate three questions regarding the data series of small pelagics landings in the Mediterranean sea, i.e.: i) Do sardine and anchovy have inverse trends that would suggest species replacement or substitution, as reported for other areas of the world?, ii) Does *sardinella*, a species of tropical affinities, substitute the temperate-water sprat?, and iii) What is the relationship between trends of small and large pelagics?

To answer these questions we analysed two historical data sets: (i) FAO FISHSTAT+ GFCM data base for the Mediterranean and Black sea, by statistical division from 1970 to 2003 and (ii) A series of effort and landings in Barcelona harbour from 1992 to 2003, where data is disaggregated by species, day, and boat.

For the Mediterranean no significant correlation between sardine and anchovy catches were found. Only the statistical divisions Aegean and Sardinia showed a significant positive correlation. Sardine and anchovy CPUE also did not correlate in Barcelona harbour data at different temporal scales (daily, annual). Sardinella shows a clear increasing trend, but sprat reported catches are only significant in the Black Sea, no significant correlations were found.

Correlation between small and large pelagics is positive and significant in the Mediterranean.

The main conclusions reached are: i) Replacement or alternation of sardine and anchovy in the Mediterranean cannot be sustained, ii) Sardinella shows a clear increasing trend. However the low sprat reported catches do not allow us to pronounce about the possibility of substitution, and iii) The significant positive correlation between small and large pelagics seems to indicate the existence of a bottom-up control mechanism. This would suggest management measures addressed to maintain high biomass levels of small pelagics in order to made available large amounts of the more valuable large pelagics.

SC COMMENTS: The joint SCSA-SCMEE considered that the catch values do not reflect the real biomass and no conclusions can be obtained from the analysis of the FAO FISHSTAT PLUS database.

Document n° 26 An overview of the researches carried out in the Northern Adriatic Sea and Venice Lagoon (2000-2005) in the framework of the Ecosystem based approach to fishery management.

SUMMARY: The northern Adriatic Sea and the Venice Lagoon are subjected to intensive fishing exploitation. In the framework of assessing the direct and indirect effects of this source of ecological disturbance different researches were carried out, including experimental and modeling analyses. In the Venice Lagoon, the direct effects of mechanical clam harvesting (an exploitation activity which targets the allocthonous species *Tapes philippinarum*) were experimentally investigated. Major effects on the bottom morphology, benthic communities, nutrient and sediment resuspension were described. Data were integrated into a mass-balance model, allowing to inferre that this exploitation activity induces severe effects on the whole ecosystem, reducing its maturity. According to the model a positive feedback between mechanical clam harvesting and *T. philippinarum* population was identified. In fact this species, due to its capability to feed on SOM, could partially benefit from the food supply represented by the organic matter resuspended during fishing. This result could explain the resistance of this species to its intensive exploitation. Furthermore negative effects of mechanical clam harvesting on artisanal fishery were described in the lagoon. The analyses of long-term time series of the landings (1946-2000) allowed further descriptions of the ecological stages of this ecosystem in relation to fishing exploitation and nutrient enrichment. The same approach was applied

regarding the Northern Adriatic Sea. Main research topics were the evaluation of stress induced on non-target species due to trawling operations (physiological stress, sub-lethal damages, survival). Furthermore, an assessment of discard composition in demersal fisheries was carried out, whereas the study of recolonisation dynamics of benthic communities highlighted that chronic fishing strongly reduced the benthic biomass and production in disturbed areas. Collected data were assembled in a mass-balance model which will allow exploring the effects of fishing on the whole ecosystem.

SC COMMENTS: no comments

6. PURSUING ACTIVITIES ON THE IDENTIFICATION OF BIOLOGICAL INDICATORS, ESTABLISHING REFERENCE POINTS AND TESTING THEM ON SELECTED FISHERIES OR GSAs – CONT. JOINT SESSION

Document n° 27 Use of fisheries independent data for the definition of the stock status of *Mullus barbatus* utilizing mortality rates based reference points.

SUMMARY: The goal of this paper is to describe the main stock assessment attempts made up to now in Italy with the exclusive use of fisheries independent data and reference points based on mortality rates and to discuss their usefulness as well as the reliability of the obtained results regarding the red mullet *Mullus barbatus*. Preliminary stock assessments for *M. barbatus* has been performed in the last years using data proceeding from trawl surveys (De Ranieri et al., 1994; Demestre et al., 1997; Voliani et al., 1998; Ardizzone, 1998; Abella et al., 1999; Zamboni et al.,1999, 2000, Abella et al. in press). Yield-per-Recruit, Spawning-per-recruit and Stock/Recruitment analyses were performed as well as Surplus Production

SC COMMENTS: SC encourage on the use of data coming from direct methods (MEDITS) in order to model fishery systems focusing on management measures.

Document n° 28 Temporal variability and spatial diversity of small pelagic fish biomass in the Northern Adriatic sea

SUMMARY: Small pelagic fish aggregate, forming distributions of abundance on a wide variety of space and time scale. This phenomenon is of great ecological and biological importance and has relevant effects on fishery. The major difficulty for understanding fish variability is the lack of sufficient data on biomass variability over both temporal and spatial scales expecially over long periods. In the Adriatic Sea distributions of abundance of small pelagic fish were acoustically estimated for more than two decades on a time scale of one year and on spatial scale from aggregations (tenths of metres) to the whole North Adriatic Sea (hundreds of kilometres).

The aim of this paper is to provide a conceptual framework and mathematical tools for study this variety, using acoustic data.

SC COMMENTS: none

Document 29 A preliminary contribution on the applicability and the performance of some biological and economic indicators for the Adriatic Sea demersal fisheries. The case of the Operational Units in the western GSA 18

SUMMARY: Indicators represent a valid tool to support the decision making process in fishery management. The principal aims of indicators in fishery management are widely discussed and treated into many scientific and technical documents, as well as discussed in many *fora*. The necessity to identify, select and test some biological and economic indicators (and their associated reference values) is considered relevant for the fishery management and it is becoming a priority for many fisheries. The identification of bio-economic indicators and reference points were also considered in

the mandate of the GFCM-SAC. Such indicators should be made available to the policy makers and fishery managers together with management options concerning each individual stock or resources category. In sub-regional contexts where shared stocks occur, as is the case for the Adriatic Sea, the use of internationally concurred indicators assumes critical importance to support cooperative management by the countries concerned.

SC COMMENTS: SC observed that economic sustainability may lead to biologic unsustainability. Some systems may have subsidized species or high priced species that may lead to these contradictions.

7. EFFECTS OF FISHING GEAR ON THE MARINE ECOSYSTEMS - CONT. JOINT SESSION

No document presented

8. BIOLOGICAL IMPACT OF DIFFERENT FISHERIES MANAGEMENT OPTIONS - CONT. JOINT SESSION

Document n° 30 Assessing the ecosystem impact of fishing activities on the South Catalan Sea by developing dynamic simulations on fishing effort and target species.

SUMMARY: The development of an ecosystem approach to fisheries in the Mediterranean Sea implies to broader the context on where fishing activities are analyzed and managed. In this framework, an ecological model has been developed in the South Catalan Sea (Northwestern Mediterranean) to describe the structure and functioning of this ecosystem and to assess the impacts of fishing within an ecosystem context. The model includes 40 functional groups representing target and non target species from primary producers to top predators, whilst trawling, purse seining, long lining and troll bait fishing are also explicitly included in the model parameterization. Recently, the model has been calibrated with available time series of data belonging to 1978-2003 time period. This has enabled us to assess the ability of the model to predict the past dynamics of exploited marine resources and to analyze the contribution of internal factors (e.g. trophic interactions) and external factors (e.g. fishing and environment) to resources' dynamics. Moreover, from this calibrated model dynamic simulations can be developed to assess the ecosystem impacts of different management scenarios. In this contribution we present the results of five fishing scenarios developed from the calibrated model in 2003. These scenarios include the modification of global fishing effort and of fishing effort by fleet, in addition with the analysis of different scenarios of fishing on target and non target species (with special attention on hake, anchovy and sardine). These simulations are especially relevant in the Mediterranean context due to they take into account the ecosystem structure and functioning as well as the multispecies nature of fishing practices. The application of the ecological modelling in a Mediterranean context is shown as an appropriated tool to investigate Mediterranean fishing management options and to contribute to evolve the actual reactive management of fishing resources into a more adaptive and strategic one.

SC COMMENTS: SC recognise the utility and importance of this approach and stress the need to continue to collect essential data, to increase the data base filling some critical gaps and to collect new data in order to monitor model predictions.

9. REVIEW AND ANALYSIS OF THE REPORT OF THE WORKING GROUP ON STANDARDIZATION OF SELECTIVITY METHODS APPLIED TO TRAWLING IN MEDITERRANEAN SEA (ATSELMED)

An overview of the ATSELMED meeting, Sète, France, 9-11 February, 2005, was presented by J. Sacchi (Appendix G).

SUMMARY OF RECOMMENDATIONS OF ATSELMED:

- Development of studies on square meshes and grids, particularly on multispecies fisheries
- Development of studies on net and fish behaviour
- Evaluation of survival after escapement
- Development of strategies to facilitate the implementation of the selected technical measure
- Combination of different solutions (selectivity devices, time or/and closure areas in the frame of unit management

SC COMMENTS: SC endorsed the recommendations of the ATSELMED Working Group

10. REVIEW OF ASSESSMENT METHODS

Document n° 31: Effect of in situ radiated noise of the platform used on shallow water area on echo sounder data in fisheries-acoustics

SUMMARY: The shallow water area of the coastal fringes is important to take into consideration in fish stock assessment because a great part of the stock, especially for the small pelagic fish is distributed in this area. In shallow water research vessels are prohibited to navigation (usually <20m) and usually only small boats can be used. One of the main source errors in acoustics fish sampling is due to the avoidance reaction generated by the three dimensional noise diagram emitted by the boat. In this paper we highlighted the importance of wind direction and strength in the noise diagram emitted by the boat under in situ condition. A comparison of the noise level of two boats (a research vessel and a speedboat equipped of similar echo sounder) has been made before simultaneous records of echo sounder data: the speedboat is more silent as revealed by in situ hydrophone measurement and near the ICES recommendations. The observation of shoal echo sounder descriptors shows an avoidance reaction as expected more important for the noisier boat: there the schools avoid more the research vessel. The avoidance reaction is characterised by a deeper position of the fish school barycentre, in the water column, detected by the research vessel and a shoal minimum depth higher than for the speedboat. The effect of noise diagram difference is clear on the same shoal descriptors, the difference appears for the vertical position of the barycentre and minimum altitude.

SC COMMENTS: It is recommended to follow ICES procedures in the assessment of the effect of noise. It would be better to use small vessels when surveying shallow areas.

Document No 32. Inter-ship calibration to compare acoustic estimations of small pelagic fish in the Adriatic Sea. - GSA 17

SUMMARY: At present the small pelagic fish biomass and distribution in the Adriatic Sea is estimated, from the Italian cost to the mid - line by R/V “Dallaporta” and from Croatian coast to the mid - line by R/V “BIOS”. Acoustic systems installed on the two vessels are similar, but research vessels have different characteristics and use different nets for fish sampling. With the aim to compare the data collected during acoustic surveys, an inter-ship calibration was carried out in May - June 2005 in the Neretva Channel (Adriatic Sea) within framework of the FAO AdriaMed Project.

The paper describes the procedures and the results of this inter-ship calibration, regarding to collection of acoustic data (Sa), fish samples and environmental data. Acoustic data collected by these two vessels along acoustic transects were highly correlated, and with no significant differences regarding to acoustic measurements (i.e. Sa-values). Some differences were observed in mean size of anchovies sampled by the two pelagic trawls. Regarding to the presence of target species, the study area was almost monospecies (anchovy), therefore no comparisons were possible regarding the possible differences in mean size of the other small pelagic fish sampled by two research vessels. Therefore the

comparison of fish sampling performances regarding to other target species (sardine and sprat) requires further research.

SC COMMENTS: none

11. PRESENTATION OF MEDITS RESULTS

Docucument n° 33: Review of the main outputs of MEDITS

SUMMARY: A series of elaboration using the MEDITS data base was presented. The main aim was to demonstrate how ecological indicators obtained by comparative analysis of this database could be used to extract important information on the level of exploitation of demersal resources in the Mediterranean.

SC COMMENTS: the need to continue and improve this activity at Mediterranean level, thus increasing the covered area was stressed. Moreover the complete exploitation of the results of MEDITS surveys are encouraged, a good example was presented to the SC although a certain caution should be taken in the use of community indicators as a tool for scientific advice to management. The possibility to make the elaborated data available to the whole scientific community was discussed and the SC encouraged steps towards this direction. It should be possible in the near future to use MEDITS abundance indices (scientific CPUEs) for the most important stocks to be used as fishery independent tuning series for analytical (VPA) assessments.

12. PROGRESS ON MAPPING THE DISTRIBUTION OF JUVENILES

Document N° 34 Preliminary characterization of the main demersal assemblages of the MedSudMed Project area.

SUMMARY: Despite the growing interest for the biological properties of the ecosystems and for issues related to conservation of biodiversity and maintenance of a healthy environment, little knowledge is available in the Central Mediterranean on demersal assemblages. A first contribution to the description of these assemblages at regional level is presented. Data were collected during trawl surveys conducted in 2003 by National Institutes of Tunisia, Malta and Italy, covering portions of the GSAs 12, 13, 14, 15 and 16. An important effort of synchronization and standardization was made with the support of the MedSudMed Project. A preliminary analysis of all data logically discriminated the hauls collected on the shelf and on the slope, but also separated the hauls collected in the different GSAs. A finer analysis by depth stratum identified the most coastal hauls and those closely linked to the Banks. Seven main groups of demersal species were identified and it appears that whatever the depth stratum considered, groups of the Southern part of the area are clearly different from those of the Northern part. An interpretation of these results in terms of biology of the species and of substrate is proposed.

SC COMMENTS: SC recognises the need for this kind of ecological analysis in the area of the strait of Sicily.

Document N° 35: Preliminary results on spatial distribution of biomass indices, nursery and spawning areas of *Merluccius merluccius* and *Mullus barbatus* in the MedSudMed Project area (Strait of Sicily –Central Mediterranean)

SUMMARY: Preliminary results on spatial distribution of some critical variables (biomass indices, recruit and spawner density indices) of *Merluccius merluccius* and *Mullus barbatus* populations in the Strait of Sicily are presented at regional level. Data were collected during trawl surveys, carried out by national programs (Tunisia, Malta, Italy and Libya) in the MedSudMed area (GFCM GSAs 12, 13, 14,

15, 16 and 21). An effort to standardize the data collection and processing methodologies was made with the support of the MedSudMed Project. About 290 hauls were performed within the bathymetric range 10-800 m in May-August 2003, covering a global area of 116000 km2. Spawners by haul were identified as female fish with a total length higher than the length at 50% maturity (The common value of 30 cm TL and 15 cm TL for hake and red mullet respectively). Recruit by haul, expressed in terms of young of the year, were estimated on the basis of the analysis of the length frequency distribution. In the case of hake, a species showing an age at maturity of more than 1 year, the spatial distribution of the young fish with length lower than L50% (juveniles) were also considered. Spawning and nursery areas were identified as areas showing the highest values of spawner and recruits indices respectively. All the showed indices were standardized to the maximum value so as to keep separate the areas sampled with different nets.

For both species the highest biomass indices and the highest percentage of the largest specimens were recorded off the North African coast. The main hake nurseries of the northern side of the MedSudMed area were detected off the eastern edge of the Adventure Bank (GSA 16) and off the Maltese Bank (GSA 15). Along the southern coast major nurseries were identified north-west Cape Bon (GSA 12) and in the Sirte Gulf (GSA 21). The most important nurseries of red mullet were found in the shallow bottom off the south-eastern coast of Sicily (GSA 16) and in the inner part of the Sirte Gulf (GSA 21). General distributional pattern were discussed in the perspective of stocks' identification and proposals for future research are advanced.

SC COMMENTS: SC strongly encourages this cooperative effort.

Document n° 36 Nursery area of some demersal species in the Adriatic Sea (GSA 17)

SUMMARY: The results on mapping the distribution of juveniles of some demersal species in the Northern and Central Adriatic Sea (GSA 17) are presented. The investigated species are: *Merluccius merluccius, Mullus barbatus, Pagellus erythrinus, Lophius budegassa, Trisopterus minutus capelanus, Zeus faber, Scyliorhinus canicula, Nephrops norvegicus, Eledone moschata, Eledone cirrhosa* and *Loligo vulgaris.*

Description of the nursery areas of these species was done using data collected throughout Medits trawl surveys from 1994 to 2003. For the interpretation of the data GIS analysis was done using the "Indicator Kriging" method. As a length of recruitment average length of first cohort plus standard deviation was used and calculated using Bhattacharya's analysis of the length frequency data of each species.

The results of the analysis shows that nursery area of some species are spatially well defined while for the majority of the others the recruits are found in the whole area of the distribution.

There is an overlapping of nursery areas for different species. The most important overlapping nursery areas are three: the open Central Adriatic Sea, the Northern Adriatic from the western coast to the delta of the Po river and the channel area of the eastern Adriatic.

SC COMMENTS: none

Document No 37. Mapping of spawning grounds and larvae distribution of anchovy (*Engraulis encrasicolus*) in the MedSudMed Project area. Preliminary results in East Tunisia (GSA13), Malta Island (GSA 15) and South Sicily (GSA 16).

SUMMARY: Anchovy eggs and larvae distribution in the Strait of Sicily is investigated during summer 2004 in the framework of the FAO MedSudMed Project. Data were collected in GSA 13 (Gulf of Tunis), GSA 15 (Malta Island) and GSA 16 (South of Sicily). Two main spawning areas were found in GSA 13 and GSA 16. Larval distribution reflects transport by surface currents. In particular, results from GSA 16 show an egg distribution linked to frontal structures along the path of Atlantic Ionian Stream and the concentration of anchovy larvae in the Southern part of the region where a strong thermocline front is present, resulting from the inflow of water masses of Atlantic origin in the

East Mediterranean basin. First results obtained in GSA 15 show that there is an important concentration of juveniles. This allows completing the general scheme of retention and transport patterns of eggs and larvae, as evidenced in the previous years in GSA 16.

SC COMMENTS: none

13. PROGRESS ON UNDERTAKING PILOT MULTISPECIES STOCK ASSESSMENTS IN SELECTED GSAs.

No document presented

14. REVISION OF THE SHARED STOCKS LIST.

No changes proposed

15. REVISION OF THE PRIORITY SPECIES LIST.

The need to set clear rules for the inclusion in this list was stressed. The coordinator of the SC was asked to draft the criteria for including species in the priority list.

16. TERMS OF REFERENCE FOR THE PERMANENT WORKING GROUP FOR STOCK ASSESSMENT METHODOLOGY

The mandate of this Permanent working group is to develop the point of the ToR of the SCSA: "Review and analyze the assessment methods and propose the most appropriate ones". According to this SC proposes the following ToRs:

- Use of different methods (e.g. biomass dynamic models) to produce assessments using the data obtained in the trawl surveys carried out in the Mediterranean,
- Compare the VPA, echo surveys and DEPM applied to the small pelagics and analyse their reliability and usefulness to assess these resources.
- Explore the reliability and applicability of ecological and bioeconomic models, in particular those that have already been applied in Mediterranean fisheries.
- Study the possibility of fixing the stock assessment parameters for the main species in the same area.

The subcommittee recommends inviting external experts (i.e. ICES specialists) to the Permanent working group sessions.

17. GENERAL COMMENTS AND RECOMMENDATIONS ADDRESSED BY THE SCSA TO SAC

The SC noted:

- the lack of participation from eastern Mediterranean countries
- demersal assessments were presented mainly for western Mediterranean.

- Many documents presented were not assessment and could have been presented in the SCMEE thus balancing the participation to the two sub-committees. The SCSA and SCMEE coordinators should ensure in the future that only assessment or strictly related to assessment documents be presented to SCSA.

The need for the use of trawl survey data together with commercial sampling data to produce more complete and reliable assessments was repeatedly stressed.

An effort to combine information from direct and indirect methods is also recommended for small pelagics

The need to make sensitivity analysis due to uncertainty of natural mortality was suggested.

The SC reminds the scientists that assessments must be presented in a complete way with all the data, parameters, results, conclusions and recommendations. All the documentation must be sent to the facilitator for dispatching in due time.

The documents produced by this meeting will be available at : ftp://cucafera.icm.csic.es/pub/scsa/

Appendix A – List of Participants. General Fisheries Commission For The Mediterranean (GFCM) Scientific Advisory Committee (SAC) 7th Meeting of the Sub-Committee on Stock Assessment (SCSA) FAO, Rome, 26-30 September, 2005

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Appendix B

Agenda

1. Opening of the meeting
2. Adoption of the agenda and arrangements of the session
3. Presentation and discussion of new assessments on demersal stocks (Facilitator: Dr. E. Arneri)
4. Presentation and discussion of new assessments on small pelagics stocks (Facilitator: Dr. S. Somarakis).
5. Review of the outputs of the transversal activities (e,g: SCIS measurement of effort; operational units, SCMEE EAF) and follow-up by SCSA – Joint Session of SCSA with SCMEE
   a. *Overview of the Report of SCIS Workshop on Operational Units and Measurement of Fishing Effort (Tangiers, 4-6 July 2005). Review and analysis of the report of the Working Group on Coryphaena hippurus*
   b. *SCMEE transversal Workshop on Ecosystem Approach to Fisheries (Salammbô, Tunisia, 7-9 September 2005*
6. Pursuing activities on the identification of biological indicators, establishing reference points and testing them on selected fisheries or GSAs – Cont. Joint Session
7. Effects of fishing gear on the marine ecosystems - Cont. Joint Session
8. Biological impact of different fisheries management options - Cont. Joint Session
9. Review and analysis of the report of the Working Group on standardization of selectivity methods applied to trawling in Mediterranean sea (ATSELMED)
10. Review of assessment methods
11. Presentation of MEDITS results
12. Progress on mapping the distribution of juveniles
13. Progress on undertaking pilot multispecies stock assessments in selected GSAs.
14. Revision of the shared stocks list.
15. Revision of the priority species list.
16. Terms of Reference for the Permanent working group for Stock Assessment Methodology
17. General comments and recommendations addressed by the SCSA to SAC
18. General comments and recommendations for the SCSA intersession period
19. Other matters
20. Adoption of the report

Appendix C

List of documents presented

1. Assessment of red shrimp (*Aristeus antennatus*) exploited by the Spanish trawl fishery (1992-2004): in the geographical sub-area GSA 05 (Balearic Islands). A. Carbonell, M. Gaza.
2. Assessment of red shrimp (*Aristeus antennatus*) exploited by the Spanish trawl fishery (1996-2004): in the geographical sub-area GSA 06 (Northern Spain). A. Carbonell, J. L. Pérez Gil, A. Fernández, A. Esteban, M. García-Rodríguez.
3. Stock assessment of red mullet (*Mullus barbatus*) from the trawl fishery off the whole geographical sub-area 06 (Northern Spain). A.M. Fernández, M. García-Rodríguez, J. L. Pérez Gil, A. Esteban, M. González and E. Barcala.
4. Stock Assessment of striped red mullet (*Mullus surmuletus*) from the trawl fishery off the geographical sub-area 05 (Balearic Islands). A. Quetglas, F. Ordinas and E. Massutí.
5. Stock assessment of hake (*Merluccius merluccius*) from the trawl fishery off the geographical sub-area 05 (Balearic Islands). B. Guijarro, J.M. Hidalgo, P. Díaz and E. Massutí.
6. Stock assessment of hake (*Merluccius merluccius*) from the trawl fishery off the geographical sub-area GSA 06 (Northern Spain). M. García-Rodriguez, A. Fernández, J.L. Pérez-Gil, A. Esteban, M. González and E. Barcala.
7. Stock assessment of hake (*Merluccius merluccius*) from the Gulf of Lions geographical sub-area GSA 07 (France). H. Farrugio, E. Massutí, B. Guijarro, F. Ordinas and A. Quetglas.
8. Hake (*Merluccius merluccius*) in Saronikos Gulf (part of GSA 22). C. Karlou-Riga,. I. Anastopoulou and A. Argyrokastritis.
9. Stock Assessment of picarel (*Spicara smaris*) exploited by trawlers and beach seines in the Saronikos Gulf (GFCM – GSA 22Picarel (*Spicara smaris*) in Saronikos gulf GSA 22. C. Karlou-Riga and I. Anastopoulou.
10. Anchovy (*Engraulis encrasicolus*) stock assessment in the GFCM Geographical Sub-Area GSA 01, Northern Alboran Sea. A. Giráldez, P. Torres, L. Quintanilla and J. Baro.
11. Anchovy (*Engraulis encrasicolus*) stock assessment in the GFCM Geographical Sub-Area GSA 06, Northern Spain. A. Giráldez, P. Torres, L. Quintanilla and J. Baro.
12. Sardine (*Sardina pilchardus*) stock assessment in the GFCM Geographical Sub-Area GSA 01, Northern Alboran Sea. A. Giráldez, P. Torres, L. Quintanilla, and J. Baro.
13. Sardine (*Sardina pilchardus*) stock assessment in the GFCM Geographical Sub-Area GSA 06, Northern Spain. A. Giráldez, P. Torres, L. Quintanilla and J. Baro.
14. *Engraulis encrasicolus*, 1993-2004. Gulf of Lions – Acoustic surveys. – GSA 07. Y. Guennégan
15. *Sardina pilchardus*, 1993-2004. Gulf of Lions – Acoustic surveys. – GSA 07. Y. Guennégan.
16. *Sardina pilchardus*, 2004. State of exploitation of the sardine stock off the Mediterranean coasts of Morroco. – GSA 03. O. Kada et N. El Ouamari.
17. Anchovy (*Engraulis encrasicolus*, L.) stock assessment in the Adriatic Sea: 1975-2004. – GSA 17. N. Cingolani, A. Santojanni, E. Arneri, A. Belardinelli, S. Colella, F. Donato, G. Giannetti, G. Sinovcic, B. Zorica, B. Marceta.

18. Sardina (*Sardina pilchardus*, Walb.) stock assessment in the Adriatic Sea: 1975-2004. – GSA 17. N. Cingolani, A. Santojanni, E. Arneri, A. Belardinelli, S. Colella, F. Donato, G. Giannetti, G. Sinovcic, B. Zorica, B. Marceta.

19. Multispecies stock assessment of small pelagic fish (anchovy,sardine and sprat)in the eastern part of Adriatic Sea (GFCM Geographical Sub-Area 17) September,2004. GSA 17. Tičina V., I.Katavić, V.Dadić, L.Grubišić and V.Emrić Tičina.

20. Ichthyoplanktonic and acoustic biomass estimates of the anchovy in the Aegean Sea (June 2003 and June 2004). – GSA 22. Somarakis S., Machias A., Giannoulaki M., Siapatis A., Torre M. Anastasopoulou K., Vassilopoulou V., Kalianiotis A., Papaconstantinou C.

21. Length at first maturity of the Adriatic anchovy (*Engraulis encrasicolus*, L.). – GSA 17. R. Rampa, E. Arneri, A. Belardinelli, E. Caputo, N. Cingolani, S. Colella, F. Donato, G. Giannetti, A. Santojanni.

22. Lengths-at-maturity of anchovy and sardine in the central Aegean and Ionian Seas. - GSA 20-22. Somarakis S., Machias A., Giannoulaki M., Siapatis A., Papaconstantinou C..

23. Regional mapping of anchovy and sardine biomass in the MedSudMed area: Update on the activities conducted so far. - GSA 13, 14, 15, 16. MEDSUMED project.

24. Quantifying ecosystem overfishing in the Mediterranean Sea with a new index of fisheries' impact on marine trophic webs. S. Libralato, M. Coll, S. Tudela, I. Palomera and F. Pranovi.

25. Historical series of small pelagics in the Mediterranean Sea: do they present any recognisable pattern? J. Lleonart and F. Maynou.

26. An overview of the researches carried out in the Northern Adriatic Sea and Venice Lagoon (2000-2005) in the framework of the Ecosystem based approach to fishery management. S. Raicevich, O. Giovanardi , A. Granzotto, S. Libralato & F. Pranovi.

27. Use of fisheries independent data for the definition of the stock status of *Mullus barbatus* utilizing mortality rates based reference points. A. Abella, P. Carpentieri, A. Mannini, M. Ria1, P. Sartor, C. Viva., A. Voliani.

28. Temporal variability and spatial diversity of small pelagic fish biomass in the Northern Adriatic sea. M. Azzali, A. De Felice, I. Leonori and M. Luna.

29. A preliminary contribution on the applicability and the performance of some biological and economic indicators for the Adriatic Sea demersal fisheries. The case of the Operational Units in the western GSA 18. FAO-AdriaMed Project.

30. Assessing the ecosystem impact of fishing activities on the South Catalán Sea by developing dynamic simulations on fishing effort and target species. M. Coll, I. Palomera, S. Tudela and F. Sardà

31. Effect of in situ radiated noise of the platform used on shallow water area on echo sounder data in fisheries-acoustics. Y. Guennegan, P. Brehmer, P. Arzelies, J. Guillard, P.Duformentelle, M. Colon.

32. Inter-ship calibration to compare acoustic estimations of small pelagic fish in the Adriatic Sea. - GSA 17. M. Azzali, V. Ticina, A. De Felice, I. Leonori, E. Paschini, M. Marini, B. Grbec, O. Vidjak, L. Grubisic, A. Pallaoro, F. Matic.

33. Review of the main outputs of MEDITS. J. Bertrand.

34. Preliminary characterization of the main demersal assemblages of the MedSudMed Project area. M. Gristina, G. Garofalo, F. Fiorentino, O. Jarboui, M. BelHassen, S. Zgozi, M. Camilleri, F. Massa, T. Bahri, V. Giacalone.

35. Preliminary results on spatial distribution of biomass indices, nursery and spawning areas of *Merluccius merluccius* and *Mullus barbatus* in the MedSudMed Project area (Strait of Sicily –

Central Mediterranean). G. Garofalo, F. Fiorentino, M. Gristina, M. BelHassen, O. Jarboui, S. Zgozi, M. Camilleri, F. Massa, T. Bahri, V. Giacalone.

36. Nursery area of some demersal species in the Adriatic Sea (GSA 17). R. Gramolini, C. Manfredi, C. Piccinetti, N. Vrgoc, B. Marceta.

37. Mapping of spawning grounds and larvae distribution of anchovy (*Engraulis encrasicolus*) in the MedSudMed Project area. Preliminary results in East Tunisia (GSA13), Malta Island (GSA 15) and South Sicily (GSA 16). B. Patti, A. Cuttitta, A. Bonanno, R. Zarrad, S. Zâag, O. Jarboui, R. M'Rabet, B. Rosso, S. Mizzi.

Appendix D **Stocks assessed in 2005**

	GSA																							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	total
Aristeus antennatus					1	1																		**2**
Mullus barbatus						1																		**1**
Mullus surmuletus					1																			**1**
Merluccius merluccius					1	1	**1**															1		**4**
Spicara smaris																						1		**1**
Engraulis encrasicolus	1					1	**1**										**2**					1		**6**
Sardina pilchardus	1		1			1	**1**										**2**							**6**
Sprattus sprattus																	**1**							**1**
																								0
																								0
																								0
																								0
total per GSA	**2**	**0**	**1**	**0**	**3**	**5**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**3**	**0**	**20**

	Total	Demersals	Small pelagics
Assessments	22	9	13
Stocks (species & GSA)	20	9	11
GSAs	7	4	6
Species	8	5	3
Shared stocks	**6**	**1**	**5**

Appendix E

Data on Length at First Maturity (LFM) of Mediterranean anchovy from the literature and from the new analysis after the recommendation by SCSA 2002 (in bold). Updated from Appendix D of the report of the small pelagic WG in 2004.

GEOGRAPHICAL AREA	LFM (cm)	DEFINITION	APPROACH	REFERENCE	MANAGEMENT UNITS	SAMPLING PERIOD
Northern Alborán Sea	10.9	L50	Maturity key	Giráldez & Abad, 1995	Northern Alborán Sea GSA 1	1990-1991
Algeria coast	11.4	L50	Maturity key	Djabali et al., 1988	Algeria – GSA 4	
Algeria coast	11.4	L50	Maturity key	Hemida, 1987	Algeria – GSA 4	
Castellón coast	11.0		Unexplained	Suau, 1979	Northern Spain - GSA 6	
Catalonia coast	12.6	L50	Maturity key	Pertierra, 1992	Northern Spain - GSA 6	1984-1985
Catalonia coast	12.5	L50	Histological method	Ochoa-Baez, 1998	Northern Spain - GSA 6	1994-1995
Gulf of Lions	11-13		Unexplained	Bertrand, 1991	Gulf of Lions – GSA 7	
Central Adriatic Sea	9.1	L50	Maturity key	Sinovcic, 1992 and 2000	Northern and Central Adriatic – GSA 17	
Gulf of Kavala	11.0	L50	Maturity key	Torre, 1995 and Proyect 97-0048, Final report, 2000	Aegean Sea – GSA 22	1998-1999 1983-1984 1992-1993
Catalonia coast	**11.08**	**L50**	**Maturity key Histological method**	**Palomera et al. 2003**	**Northern Spain - GSA 6**	**2001**
South Sicily	**11.24**	**L50**	**Maturity key**	**Basilone et al. 2003**	**South of Sicily – GSA 16**	**1997-2002**
Central Adriatic Sea (river estuary)	**8.2**	**L50**	**Maturity key**	**Sinovcic & Zorica, 2004**	**Northern and Central Adriatic – GSA 17**	**2003**
Adriatic sea	**8.1**	**L50**	**Histological method**	**CNR_ISMAR & Univ. Ancona, 2004**	**Northern and Central Adriatic – GSA 17**	**2003 and 2005**

Ionian Sea	**10.5**	**L50**	**Histological method**	**Somarakis et al. 2005**	**Eastern Ionian Sea –GSA 20**	**June 1999**
Aegean Sea	**10.4**	**L50**	**Histological method**	**Somarakis et al. 2005**	**central Aegean Sea –GSA 22**	**June 1999**
*** Tunisian coast**	**7.3** **8.5** **7.5**		**Maturity key** **Histological method**	**MedSudMed Report of WG 2004**	**Northern Tunisia – GSA 12** **Gulf of Hammamet-GSA 13** **Gulf of Gabes – GSA14**	**2000-2002**

* Data from the report of the Working Group on basic parameters related to small pelagic fish: length at sexual maturity of anchovy and sardine in the MedSudMed Project area (14-16 April 2004, Mazara del Vallo, Italy).

Appendix F

A PROPOSAL FOR THE REGULATION OF THE *CORYPHAENA HIPPURUS* (L.) FISHERY IN THE MEDITERRANEAN

Whereas *Coryphaena hippurus* has been listed as a GFCM priority species for which regular stock assessment and co-management of the Mediterranean stock is encouraged.

Whereas the GFCM has adopted a policy to manage Mediterranean fisheries through an effort control regime by Operational Units.

Whereas efforts to assess the Mediterranean *Coryphaena hippurus* stock and to study the associated fisheries have taken place through the FAO-COPEMED sub-regional project since 2000.

Whereas the Code of Conduct for Responsible Fisheries encourages a Precautionary Approach in the absence of sufficient scientific information.

AND

Considering that there is a single stock of the migratory species *Coryphaena hippurus* in the Mediterranean.

Considering that the regulations and management of the *Coryphaena hippurus* fishery varies between countries and a regional management regime is not in place.

Considering that there is an increasing interest in the capture of *Coryphaena hippurus* throughout the Mediterranean.

Considering that the fishing operation targeting *Coryphaena hippurus*, involving the use of Fish Aggregating Devices (FADs) and a surrounding net, is conducted in a similar manner in all sub-regions of the Mediterranean.

Considering that certain regions of the Mediterranean are socially, traditionally and culturally dependant on the *Coryphaena hippurus* fishery.

Considering that important parameters in the measurement of fishing effort for the *Coryphaena hippurus* fishery is the number of FADs deployed and the number of fishing trips.

Considering that no robust stock assessment exercise has been carried out to date due to the particular biological and behavioral dynamics of the species and lack of essential data.

Considering that the *Coryphaena hippurus* fishery mostly targets age 0 fish (2 and 8 months old), thus depending on the annual recruitment which is very variable.

Considering that fishing operations in July capture very small fish under 15cm in length which could give a better yield in later months.

Considering that the relationship between maturity and size is not regular for this species.

A Total Allowable Effort (TAE) regional management regime is hereby being established in accordance with the following regulations:

1. FAD fisheries targeting *Coryphaena hippurus* in the Mediterranean can only operate between 15th August to 31st December.
2. The number of FADs deployed within a given sub-regional fishery management zone should not exceed an average of 10 FADs per square nautical mile.
3. The total number of fishing trips for each vessel operating within a given fishery management zone during a given fishing season should not exceed 72 one-day fishing trips or equivalent.

Appendix G

Report of the working group on standardization of selectivity methods applied to trawling in Mediterranean sea (ATSELMED)

IFREMER Sète 9,10 & 11 /02/ 2005

Summary (*)

A working group of the GFCM on the standardization of the selectivity methods applied to trawling in the Mediterranean sea has been organized by IFREMER with the participation of FAO projects, COPEMED and ADRIAMED organizations. Thirty scientists of eight Member States of the CGPM, from Denmark, Finland, Argentina and Colombia, fishing gear technologists or persons in charge of research programmes on the selectivity of fishing gears met in Ifremer Sète.

Several consultations and workshops (SGMED/UE, GFCM,COPEMED,ADRIAMED) underline the need :

- to bring a strong effort for improving the selectivity of the Mediterranean trawl. (the most of trawl fisheries are concerned by catches of undersized fishes and discards),

- to provide reliable and update advices to the fishing industry which makes possible the implementation of technical measures ("to apply as far as possible a process quality to any production of scientific results "(président Berraho - COPEMED, Madrid, July 2003).

I. Objectives

The main objectives of this working group were :

- to strengthen the current knowledge and to determine clearly what it is necessary to adapt to our Mediterranean specificity,

- to define the most appropriate and reliable methodologies and experimental protocols for the different Mediterranean fisheries which must gain the agreement of scientists and fishermen.

This meeting was organized in 4 sessions.

II - Session 1 Case studies - Review of recent selectivity studies

The presentation of studies cases achieved in the Mediterranean was made to get a comprehensive review of difficulties to put in practice the adopted methodologies and the statistical analysis focusing on the reasons of choice of methodologies which are used (experimental and statistic protocols), the encountered difficulties and strategies for implementing the selectivity measures to the professional fleet.

Ten studies were presented on most varied subjects like the study of multispecific inshore fisheries and deep shellfish fisheries dealing with the following items :

- diamond meshes cod-end, square mesh cod-end , square mesh panel, grids, combination square mesh and grids,

- net construction, twine measurements, handling on board,

- selectivity methods (double codend, cover codend, alternated hauls, retention cod-end for grid, selectivity models (Fryer, Select).

III - Session 2: Behaviour and survival after escapement

The objective of this session was to discuss on possible research orientations for the next future in Mediterranean. Two presentations were made highlighting the interest of the study of the fish behaviour for the understanding of the escapement through the cod-end. The first one propose to model all surrounding physical variables and the second one underlines the interest of evaluation of the effects of these variables on survival after escapement and defends a standardization of the methods assessing the consecutive mortality. For this last point, based on an experimentation completed in the Baltic sea, the author stresses that 92% of mortality occur on the first day and point out the cumulative effect on mortality of the temperature of the water.

IV - Session 3 experimental Reliability and constraints

A general presentation of the various statistical methods considered for the study of trawl selectivity was made and their adaptability to the Mediterranean context was discussed.

If most of the various aspects of trawl selectivity are already largely detailed in the CIEM handbook, it seems convenient to insist on their fundamental principles by paying particular attention in an attempt to make out what was essential and possible to adapt to the specific conditions of the various Mediterranean fisheries, in particular, the small mesh size of the cod-ends, the large species diversity and the low level of catches.

V - Discussions and recommendations

From the discussions it emerges that square meshes are indubitably more selective than diamond meshes particularly for most of “round” species. There is henceforth no particular interest to continue on studying diamond meshes selectivity but rather investigate the way to use square meshes. Studies be particularly carried on their selectivity effects on the different species of different shapes (e.g. flatfishes) and evaluated in terms of economy loss for the fisheries.

If the grids can offer unquestionable advantages, particularly for the survival of the escapee fish and for specific fisheries, their conception and their use must be yet improved in particular to avoid problems of obstruction and handling for small vessels,.

About methodology, no experimental methods can be privileged. Alternate hauls or cover cod-end method must be chosen as a function of the experimental conditions, which must be close as possible to the industrial fishing conditions; The selective devices must be designed most carefully, with attention to the choice of materials and construction.

Furthermore participants underlined the importance of taking into account the maximum of variables which are assumed to influence the effectiveness of capture (geometry of the trawl, speed of trawling, etc.) and on other hand the need for the respect of the ISO standards of representation of the physical parameters (trawls, power, etc).

In last a general agreement was obtained on the necessity to place statistic analysis plan from the beginning of the study, with the aim of the better standardization of the results presentation.

VI - Proposals of actions

1 - Selectivity data base

The goal is to draw up a complete list of all the bibliographical information on selectivity studies, including all the technical data and parameters of selectivity available. In a first time, these data will be presented in a table form to make easier their analysis (A draft of this table included in annex is proposed).

2 - Network of technologists

The necessity to have comprehensive information on the fishing technology of the fishery system justify the proposition of the creation a network of Mediterranean technologists to assist other scientists working on stocks assessment and ecosystem conservation.

3 - Practical guide of selectivity study

The objective is to establish in a practical guide-line describing the main steps towards the achievement of a study dedicated to the selectivity of Mediterranean trawls so that the results be more easily comparable, and reliable by the respect of a protocol approved by the scientific community and the fisheries industry. It is not question of a new handbook on selectivity, the one published by the CIEM fully covering the requirements on the matter.

4 - Dissemination of the results to the fisheries industry

For a better implementation, the fisheries industry must be involved in the improvement of the feasibility and effectiveness of selectivity devices so that the fishermen adopt them more easily. The fisheries industry would be associated to the works of the fishing technology group. This proposal could be presented at the next meeting of MEDISAMAC (association of Mediterranean fishermen).

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* Report and documents can be consulted on the FAO web-site : ftp://cucafera.icm.csic.es/pub/scsa/

List of the communications

1. Rhida M'Rhabet et Marouene Dbidoui. "Etude de l'influence de l'ouverture des mailles et de la forme des mailles de la poche sur la sélectivité des chaluts à crevettes tunisiens" (ppt).

2 Corrado Piccinetti, Nicola Ungaro, Antonello Sala, Mario Ferretti. "Approach and methodology used in fishing experiments with square mesh cod-end in Adriatic Sea" (ppt).

3. Enric Massutti, Beatriz Guijarro, Jorge Baro, & Isabel Muñoz : "Selectivity of diamond and square mesh cod-ends in the deep water crustaceans trawl fisheries off Balearic Islands (Western Mediterranean)", (ppt, txt).

4. Jorge Baro, Isabel. Muñoz, Enric Massuti, Beatriz. Guijarro, Manuel Garcia, A. Fernandez. "Selectivity of diamond and square mesh cod-ends in the coastal trawl mixed fisheries off the Spanish Mediterranean" (ppt, txt).

5 Paola Belcari and Claudio Viva. "Study on the effects of fitting square-mesh sections to the selectivity of demersal trawling in Northern Tyrhenian Sea (western Mediterranean)" (ppt).

6 Fabio Fiorentino, Sergio Ragonese, Brian Rosso, Alicia Mosteiro and Matthew Camilleri. "Experiences of trawl selectivity of diamond mesh cod-ends in main target species of the Strait of Sicily" (ppt).

7. Alen Soldo. "Selectivity of bottom trawls used in Eastern Adriatic" (ppt).

8 Francesc Sardà, Nixon Bahamón and Petri Suuronen. "First experiences with grids in the Spanish Mediterranean sea ; success and failures in multi-species trawl fishery" (ppt).

9 Alfonso Izzo. "Experiences of selectivity on hake with escapement grids for juveniles in Argentina" (ppt).

10 Antonello Sala. "Cod-end selectivity, fish escape behaviour and fish morphology in the Mediterranean sea trials of UE project PREMECS-II".

11 Petri Suuronen. " Factors affecting the survival of fish escaping from trawl cod-end". Methods to study survival " (ppt).

12 Angeliki Adamidou & Argyris Kallionotis, "Short presentation of the NETRASEL project concerning the Greek trials" (txt).

13 Rene Holst "Summary of statistical methods for towed gear selectivity analysis (pdf).

14 Antonello. Sala, F.G. O'Neill, G. Buglioni, G. Cosimi, V. Palumbo1 and A. Lucchetti. Development of an experimental method for quantifying the resistance to opening of netting panels (ppt).

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Selectivity studies in Mediterranean sea

DEV = Type of study. Choice: 1=grid, 2=square mesh panel, 3=codend diamond mesh size, 4=codend square mesh, 5=other

MET = Methodology.Choice: 1=cover codend, 2=top cover, 3=global cover, 4=twin trawl, 5=alternate haul, 6=parallel haul, 7= trouser, 8=other.

TR = drawing Trawl (Y/N) **DC = Details on cover** (Y/N) **RG = details on rigging** (Y/N)

COD =details of codend ms = mesh size (mesh opening) mat = material Pa,Pe…
lg = Length (nbr of meshes) cr = circumference (nbr of meshes) y = yarn (Rtex)

TS = Towing Speed **SP = Species**

PAR =Selectivity Parameters OT = other parameter (to precise)

DEV	MET	TR	DC	RG	COD					TS	SP	PAR				Author and year
					ms	mat	lg	cr	y			L50	SR	SF	OT	