



**GENERAL FISHERIES COMMISSION  
FOR THE MEDITERRANEAN**

**COMMISSION GÉNÉRALE DES PÊCHES  
POUR LA MÉDITERRANÉE**



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**GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN**

**SCIENTIFIC ADVISORY COMMITTEE**

**Ninth Session**

**Rome, 24-27 October 2006**

**REPORT OF THE SCS/SCSA/SCSS TRANSVERSAL WORKSHOP  
ON STOCK ASSESSMENT AND OPERATIONAL UNITS\***

**Rome, Italy, 26–28 June 2006**

\*Available only in English

**OPENING AND ARRANGEMENT OF THE MEETING**

1. The Transversal Workshop on Stock Assessment and Operational Units was held in FAO Headquarters in Rome (Italy), from 26 to 28 June 2006. The agenda of the meeting is attached as annex A. Thirty participants attended the meeting (see list in Annex B).
2. Mr Matthew Camilleri, Coordinator of the SCS, opened the meeting and welcomed the participants. Mr Alain Bonzon, Executive Secretary of GFCM, addressed the Workshop and extended a special welcome to the participants from the Eastern Mediterranean.
3. The meeting was split into three thematic sessions, as follows: i) implementation of the OU concept in the Mediterranean fisheries, ii) the use of indicators and Reference Points by OU in the management of fisheries and, iii) approach and data collection to undertake stock assessment by OU. The following participants were selected as moderators of the sessions: Mr Matthew Camilleri (sessions 1 and 2) and Ms Constantina Karlou-Riga (session 3). Mr Felix Marttin, Mr. Ramon Franquesa and Mr Jordi Lleonart served as rapporteurs for the sessions.

**IMPLEMENTATION OF THE OPERATIONAL UNITS CONCEPT IN THE  
MEDITERRANEAN FISHERIES.**

4. Mr Camilleri stressed the importance of the Operational Unit concept as paramount tool for GFCM to exert fisheries management through effort control. It was recalled that not only the segmentation of the fleet should be appraised in economical terms, but that needed to be complemented with biological inputs, hence, the rationale for this transversal workshop. Mr Camilleri also referred to data requirements and related matrices within the EC and ICCAT frameworks and

noted that fleet segments were structured in a similar way as the Operational Units (vessel characteristics, targeted stock, gear used). He further informed the meeting that all EU member countries were obliged to supply these data, and therefore this should facilitate in future the implementation of the OU concept.

5. Mr John Caddy also referred to concepts equivalent to the OU that are used throughout the world, including those used for classifying fleets into consistent or homogenous sub-units, possibly subject to specific regulations in relation to the exploitation of similar groups of species in a given area. He pointed out that the economic analysis of each unit is a necessary step but it is likely that a catch-effort assessment for a species or species assembly will need to pool data for 2 or more OU's, and many have to perform a relative fishing power analysis before adding effort exerted by vessels or OU's. In assessment work, the primary categories are the Geographical Sub Areas (GSA) and unit stocks, and almost certainly, more than one OU will be exploiting a given resource in a given GSA. In addition, the fact remains that fishing power between vessels in an OU is likely to vary considerably from boat to boat. Caddy further recalled that Shepherd J.G. (Fish.Res. 63 (2)) suggested that the fishing power of vessels, seen as their proportional contribution to the fishing mortality on the stock in a given year will require special attention paid to the number of days at sea and weight landed per day. From this, a measure of the relative fishing power exerted can be calculated. Caddy also recalled that, for demersal resources, the meeting on Measurement and Standardisation of Fishing Effort held in Fuengirola (May 2006) suggested that effort should, wherever possible, be converted into fishing intensity (standard days/km<sup>2</sup>) as the direct measure of fishing mortality on the resource.

6. The Workshop acknowledged that it was important to segment the fleets into homogeneous Operational Units, but also that it was highly desirable that information collected by OU on days fished per year be linked to the system to monitor landing per trip, and as possible, to its species composition; e.g. from sales slips or auction sales by vessel belonging to a given OU.

7. Mr Coppola presented the MedStat approach with respect to the data requirements of the Operational Units. He stressed that many countries, with the assistance of the MedFisis project, have reached a point where they will be able to initiate introducing the OU concept in their data collection system.

8. Thereafter, the following presentations were made respectively on:

9. The Outcomes of the Workshop on Measurement and Standardization of Fishing Effort, Malaga, 30-31 May 2006 (by A. Srour)

The "Centro Oceanográfico de Malaga" (Spain) hosted from 30 to 31 May 2006 the SAC/GFCM Transversal Workshop on Measurement and Standardization of Fishing Effort which was attended by 17 experts from six Member countries (EC, Greece, Italy, Malta, Morocco and Spain). The main objective of the Workshop consisted in identifying the most appropriate parameter measures as well as the approach to standardize and calibrate the fishing effort among the OUs identified by GSA. This workshop and its outcome seems to provide an answer to the Commission's request related to the implementation of the Recommendation GFCM/2006/1. Presentations related to the Definition, Measurement and Standardization of fishing effort and capacity and implementing a fishing effort data collection scheme were made by the Consultant (John Caddy) and the participants. The workshop underlined the relevance to integrate the environment and the socio-economic aspects in the Mediterranean fishing effort system. In spite of the practical difficulties to identify an appropriate approach for the calibration and the allocation of the fishing effort across different OUs, the workshop made significant progress by proposing 1- a table with parameters to measure fishing effort both in terms of fishing capacity, fishing activity and, if relevant, number and dimension of fishing gears and; 2- to hold a workshop to develop a common methodology to analyze disaggregated

fishery data on landings and prices/revenues, disaggregated by day, vessel and species, taking into account the progress made on operational units characterization and effort by SAC/GFCM.

10. The Outcomes of the first meeting of the Permanent Working Group on Stock Assessment Methodologies (PWGAM), held in Istanbul (March 2006) (by Ms C. Karlou-Riga).

The objectives of the PWGAM workshop were to analyze the use of trawl surveys data in producing assessments, the usefulness and reliability of VPA, echo surveys and DEPM in assessing small pelagic species, the reliability and applicability of ecological and bioeconomic models in Mediterranean fisheries and also to examine whether stock assessment parameters can be fixed for the main species in the same area. The conclusions adopted in the PWGAM can be then summarized as: a) the setting of an expert group under the SCME/SCSA in order for ecosystems to be defined and described and subsequently Ecosystem Quality Objectives to be proposed; b) encouraging the use of the composite models and survival analysis where fisheries independent data can be elaborated; c) the expansion of indicators as produced by using Medits data in other areas as well and their probable completion by additional ones; d) encouraging the use of VPA and/or echo surveys and/or DEPM for the assessment of the small pelagic species. The reasons for occasional disagreements between VPA and echo-surveys must be identified and presented at SCSA; e) the improvement of ecological and bio-economic models already applied in the Mediterranean; f) the performance of statistical and sensitivity analyses of the growth parameters; and g) the presentation of a document in the next SCSA concerning the revision of the mandate and Terms of Reference for the PWGAM.

11. In the discussion that followed, some participants pointed out that the Operational Unit concept could have been discussed more extensively as a Stock Assessment tool/method in the PWGAM (Istanbul, March 2006). Some discussion followed on whether or not the OU could be considered a method. It was however noted that most of the participants at the PWGAM were coming from the Black Sea, and that the OU concept could be considered as being part of two of the three models discussed (the Composite model, and the direct method).

12. The Workshop suggested to use landings as a method to raise the issue of fishing effort intercalibration.

### **THE USE OF INDICATORS AND REFERENCE POINTS BY OPERATIONAL UNITS IN THE FISHERIES.**

13. This agenda item was introduced on the basis of the following presentations.

14. Case studies for the use of the socio-economic indicators to fisheries management (by R. Franquesa)

This contribution presents 4 potential uses of the economic indicators for management purposes from some case analysis, from the data collected on the west Mediterranean.

1) A first analysis shows that the indicators can provide an adequate picture about the relative importance of each fleet segment in their economic context. The availability of this information can help to adopt or not, some management measures over specific segments or Operational Units. When a measure is adopted, the indicators can further provide the elements for monitoring the administrators' decision.

2) Having available economic indicators from different fisheries, OU and countries, allows comparing and trying to find the different roots of the difficulties in the sector. Based on these comparisons and related knowledge, the administrators will be in better position to adopt particular management measures or administrative decisions, if so required.

3) The economic data collected can be usefully exploited by bio-economic models such as MEFISTO-3. The administration can simulate the impact of the different measures in the

future, without any social or biological cost. The models allow to obtain references on the impact on adoption (or not adoption) of the particular effort or economic measures. The bio-economic simulation models simulate the biological behavior of the resource and the economic behavior of fisheries.

4) The indicators can be used to analyze ex-post the impact of the management measures, when the indicators are used as reference points by the managers. Some of the indicators can be established as absolute point of reference (the economic profit should be referenced equal to zero). The reference point for other indicators can be established in relative terms (for instance, it is possible to adopt a proposal to increase the productivity per vessel as a percentage). In any case the economic indicators can be used to facilitate consensus within GFCM work framework; in turn, a common appraisal would help maintaining or reducing parameters such as the total investment value; the total employment; or the Power Productivity.

The economic reference points can be easily contrasted and controlled. They can contribute to illustrate and summarize reaction and degree of application of an adopted measure.

15. Socio-economic aspects of the Moroccan fisheries (Mediterranean coast) (by I. Malouli).

In the Moroccan Mediterranean waters, fishing activity occurs along 512 km of coastline. The fleet which is based in 8 ports, the fisheries presents several assets, mainly: an important social weight, resources with high commercial value and proximity to the European markets. However, there are several constraints. The marine resources are exploited by a fleet of 646 coastal boats and approximately 2600 small boats (<6m). The annual catch is about 48 000 tons, of which 31000 tons of small pelagic species and 13 000 tons of demersal species. The principal socio-economic indicators used are related to the labor, the level of education and maritime training and also, the evolution of the sales turnover, the invested capital, the costs of production and the raw profits.

The sector allows for approximately 17 000 direct employment and 8000 indirect employment. Overall labor is stagnant for several reasons: the boats are more and more industrialized; the social conditions do not improve; the share system gives more advantages to the ship-owners. As for education, the level of illiteracy remains very high compared to other economic sectors, with an average of about 80%, despite the effort of the Ministry which is setting up several national programs to decrease this high rate. As education became mandatory, it is expected that the next generation of the fishermen will not be illiterate. The maritime training is also mandatory to obtain a fishing permit, but the programs taught are considered inadequate. Generally, women do not participate in the various fishing activities, but they contribute intensively to the fish processing chain. The invested capital in the fishing sector is in the range of Euro 150 million, a figure particularly evolutive over recent years. The sales turnover is estimated at about 66 286 300 Euros. There has been an increasing trend during the last 4 years. The raw profits are positive for all the fleet segments, and the added values are very important as well. The Moroccan Mediterranean Sea presents 6 operational units; all the indicators were analyzed according to these units.

**STOCK ASSESSMENT BY OPERATIONAL UNITS : APPROACH AND DATA COLLECTION**

16. This agenda item was introduced on the basis of the following presentations.

17. "Stock assessment in the SCSA: State of the art" (Jordi Lleonart):

Since its inception, in 1999 and up to 2005, the Subcommittee on Stock Assessment (SCSA) has identified 41 priority species (15 of them actually evaluated) and 38 shared

stocks, involving 28 species in 7 sub areas (plus the whole Mediterranean for large pelagic species), 10 of these stocks have been actually assessed. From 2001 to 2005 the trends of the number of assessed stocks, species and GSA, appeared to be flat or decreasing.

	2001	2002	2003	2004	2005	2001-05
<b>species</b>	13	7	7	9	8	18
<b>small pelagics</b>	4	2	3	2	2	6
<b>demersals</b>	9	5	4	7	5	12
<b>GSAs</b>	12	10	9	7	7	16
<b>assessments</b>	31	19	15	2 1	22	110
<b>stocks</b>	29	19	15	2 2	20	53
<b>shared stocks</b>	3	4	2	2	6	6

The most assessed species are: sardine, anchovy, hake, red shrimp and red mullet. Almost all GSAs in Western Mediterranean have been covered by assessment. In Central Mediterranean stocks in Adriatic, off Tunisia and Greek waters of Ionian Sea have been assessed. In eastern Mediterranean, only stocks in Aegean Sea have been assessed. Length cohort analysis is the method used for most of the assessments. Some VPAs have been recently presented. Statistical methods (time series analysis and GLM) have been applied to Mediterranean stocks and published in scientific journals, but never presented to the SCSA. Bio-economic and ecological modelings are currently being developed and their progress results presented to the SCSA. Since the beginning of the SCSA activities, a set of “assessment forms” were made available to the participants. The aim of these sheets was to standardize as much as possible the presentation of the assessments. These forms were adapted to single species assessments by direct or indirect methods, and consist of sheets to cover the following aspects: biology, fisheries, direct methods (swept area, acoustics, and egg production) and indirect methods (production models, VPA and similar, yield per recruit), including an accurate description of the procedure, software, parameters, data and results. There are two final forms on diagnosis and recommendations. No proposals for amendment of these sheets have been received yet. However the sheets are not always used properly to present assessments. The forms can be downloaded from: [ftp://cucafera.icm.csic.es/pub/scsa/stock\\_assessment\\_forms.zip](ftp://cucafera.icm.csic.es/pub/scsa/stock_assessment_forms.zip).

#### 18. Identification of Operational Units and the collection of dynamic multidisciplinary data (by Ramon Franquesa)

The criteria to determine the fleet segmentation can be affected by different problems such as: 1) no classification remains permanent, because vessels enjoy permanent technical evolution to cope with the economic process by which fishermen tend to catch more at reduced cost; 2) an OU can change its target species objective; 3) the data collection by OU needs a common framework between concerned countries to allow comparison, and, 4) the collections of OU data are useful if time series are available, i.e., relevant analysis or predictions can hardly be made without historical economic data series. If there is no common methodology to collect effort data, for which the OU classification is an essential part, GFCM Members may have difficulty to accept any proposal for effort regulations.

It is urgent to initiate a regular collection of data by OU, despite the need to fine tune the segmentation. This does not imply that the present criteria are definitive: they can be

improved and adapted. The contribution suggests two methodologies to improve the fleet delimitations from an initial process to data collection.

A) At local development level, when in a particular area the level of aggregation is too high, it should be possible to make new desegregation in function of the particular characteristics (biological, legal or economic) of the area;

B) At global development level, to revise the limits and number of present segments.

For case A above, an example could be based in relation to the Stock assessment of the French-Spanish shared stock of hake in the Gulf of Lions. Given the participation of different fleet segments listed in different statistical areas, it is suggested to develop specific sampling on the affected vessels and extrapolate their total weight over the census data of each country and segment affected by the fishery. This would allow providing some information on the implications of the effort measures on these vessels and in the hole of the fleets affected in the area. The collection on routinely basis of data on common segments, is not an obstacle to their desegregation if so necessary. On the contrary it would allow to develop and to provide a clearer vision on their global importance from the economic and social point of view.

For case B, the internal coherence of the trawl fleet segment (E segment comprises trawlers from 12 to 24 meters) of the Murcia Spanish Autonomous Community was analyzed. The method proposed is the *Cluster Analysis* based in the *Euclidean distance* to measure the homogeneity of the segment from the economic perspective. A total of 6 variables were used in the analysis: the investment value (IC) of each vessel, the capacity measure by GRT, and the landings measured in kilograms and in value, the number of fishing days and the Gross Estimated Profits. The different data of each variable were transformed in number index to allow for comparison within the same dimension. The analysis showed in different steps 1) the coherence between indicators used, especially between fishing days, income, capacity (GRT) and value of the investments, and 2) the coherence in the delimitation of the segment proposed, despite the fact that the biggest vessels appeared more heterogeneous although no clear new border for length could be established from the cluster analysis.

Hence, this contribution showed that the homogeneity of the segments at stake within GFCM/SAC can be revised by statistical methods such as the cluster analysis on economic indicators of each individual vessel.

19. Assessment of the status of the coastal ground fish assemblage exploited by the Viareggio fleet (southern Ligurian Sea) (by A. Abella).

An assessment of the coastal ground fish assemblage exploited by the Viareggio fleet (Italy, southern Ligurian Sea) was performed through the use of a Schaefer non-equilibrium surplus production model (ASPIC 5.0). Multivariate techniques of data of catch composition by fishing trip available from a catch assessment survey were used to define homogeneous portions of the fleet. Catch composition by trip allowed to define these fractions of the fleet targeting the same species using the same gear, in the same area and period. After the identification of the different fishing strategies present in the fleet, special attention was paid to the vessels targeting a multispecies mix fishing close to the coast up to 100 meters. Results showed an overfishing status for the species assemblage as well as for a number of single species considered to be the most important in terms of the landings. Even if a modest effort reduction occurred along the analyzed period (1990-2005), a reduction of fishing effort needed to reach the FMSY, would be currently of about 35%. However, under a precautionary point of view, a further reduction should be necessary if uncertainty is to be considered.

20. Dr. Constantina Karlou-Riga, using assessment forms as submitted in the last SCSA (Rome, 26-30 September 2005), presented tables showing how and whether OUs can be extracted from data shown in these forms. During the discussion which followed, it was felt that data are currently missing to ensure that the OU concept is fully integrated within the form. This lack of data can be included in a relative template (template P1) of the assessment forms and concern the fleet segment and the Units of nominal fishing effort exerted by fleet segment and OU. It was also mentioned that the updated assessment forms be presented in the next SCSA. The SCSA coordinator suggested that those forms (\*.doc) be converted into an appropriate electronic system for easy data compilation thus feeding the GFCM databases.

21. Following the presentations above, the Workshop focused on several issues, including:

- the importance of a formal adoption of the fleet segmentation table;
- the need for a data collection routine;
- the Flexibility/elasticity of the operational unit concept;
- the need for data to identify operational units; and
- the need for a data collection protocol.

#### **SUMMARY CONCLUSIONS AND RECOMMENDATIONS OF THE WORKSHOP**

22. The Workshop suggested the following course of action.

- The update of the SAC stock assessment forms (template P1) taking into account fleet segments and Units of nominal fishing effort exerted by fleet segment and OU;
- The conversion of assessment forms (\*.doc) into an appropriate electronic system in order to permit the compilation of the data contained in these forms to feed the GFCM databases;
- The adoption of forms for data collection by OU taking into account the 4 tables adopted by GFCM, the GFCM fleet segmentation and other relevant forms which will together constitute the proposed GFCM Task 1 table (Annex D);
- The testing of this proposed task 1 before the forthcoming Sub-Committee meetings (September 2006) ;
- The encouragement of national initiatives to develop case studies, possibly with the support of the FAO sub-regional projects, aimed to:
  - Apply GLM and other Stock assessment methods for some stocks using the OU concept, giving priority to the shared stocks;
  - Explore the possibility, depending on the available data, of the utilization of approaches such as the non-equilibrium surplus production model ASPIC 5.0 presented during this meeting. Results and management advice derived from this approach are easily understandable to administrators and other stakeholders;
- The organization during the next SCESS meeting of a workshop on the use of socio-economic indicators in fisheries management

#### **ADOPTION OF THE REPORT**

23. The report was adopted on 28 June 2006.

**AGENDA**

1. Opening and arrangement of the meeting
2. Designation of rapporteurs
3. Implementation of the OU concept in the Mediterranean fisheries
4. The use of indicators and Reference point by OU in the fisheries management.
5. Stock assessment by OU: approach and data collection
6. General conclusions
7. Review of workshop and adoption of the preliminary report (recommendations)
8. Adoption of the report

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**List of documents**

Annotated Agenda and Timetable

List of Participants

Report of the Permanent Working Group on Stock Assessment Methodology (PWGAM) and Workshop on Black Sea Assessment of Pelagic and Demersal Fish Stocks, Istanbul, Turkey, 8 -10 March 2006

The Operational Units Approach for Fisheries Management in the Mediterranean Sea (P. Accadia)

Draft report of the SCSI/SCSA/SCESS Transversal Workshop on Measurement and Standardization of Fishing Effort, Fuengirola (Malaga), Spain, 30-31 May 2006

Assessment of the Status of the Coastal Ground fish Assemblage Exploited by the Viareggio Fleet (A. Abella, M. Ria, C. Mancusi)

Definition and Measurement of Fishing Capacity and its Potential Use in the Assessment and Management of Resources in the OU context (J.F. Caddy)

Implementation of the OU Concept in the Mediterranean Fisheries (Case studies on the identification of OUs and the collection of dynamic multidisciplinary data) (R. Franquesa)  
The Use of Indicators and Reference Point by OU in the Management (Case studies for the use of the socio-economic indicators to fisheries management: use of the economic indicators in the Spanish Mediterranean fisheries) (R. Franquesa)



**TERMS OF REFERENCE FOR THE WORKSHOP ON THE USE OF THE SOCIO-ECONOMIC INDICATORS FOR FISHERIES MANAGEMENT IN RELATION WITH THE OU APPROACH**

Rome, 11-14 September 2006

Economic conditions are one of the factors that guiding the decisions on fishing management. But such economic information is not always available in a useful way for fishery management. In this sense a list of economic indicators was approved by the SAC from SCESS proposal.

Under the initiative of the SCESS and with the support of the ADRIAMED and COPMED projects, some pilot studies were undertaken developed in recent years. These studies provided for the collection of data and the estimation of economic indicators in various GFCM countries.

The time has now arrived to test the use of acquired indicators in actual fisheries management. A technical workshop will provide the forum for the analysis from real data and the evaluation of practical situations where the use of these indicators can contribute the adoption of decisions on Fisheries management.

In preparation for this workshop, the following activities will be undertaken:

- The preparation of guidelines to process available data in a way useful for providing information to fisheries managers. These guidelines will provide cover the following topics:
  - Use of indicators for bioeconomic models
  - Use of indicators to establish hierarchy on fleets in relation their profitability, employment or other criteria
  - Use of indicators to predict the economic and social impact of the adoption of measures as fleet reduction, time reduction, or licenses redistribution between fleet segments
  - Use of indicators to establish compensation under action plans projects to involve and stimulate the fishermen participation.
  - Use of indicators to produce reference points and in trends analysis
- The elaboration of case studies by each invited national researcher in which existing management proposals could be analyzed in fisheries sectors having the required economic indicators. The pre-workshop elaboration of national case studies will assure the existence and availability of the relevant data.

These reports will be presented during the workshop and the case studies analyzed by the workshop participants.

The Workshop will produce a final report highlighting key findings and conclusions of the workshop, finalized guidelines, and recommendations for further work, if warranted.

Researchers from the GFCM area with the necessary experience for undertaking such an exercise will be invited to participate in the Workshop. Contributions from individuals outside the GFCM area may be invited to share their experiences in the use of socio-economic indicators in fisheries management.