DRAFT REPORT OF THE SECOND MEETING OF THE WORKING GROUP ON ASSESSMENT METHODOLOGY, ON BASIC METHODS AND PROTOCOLS TO UNDERTAKE ASSESSMENTS WITH DIRECT METHODS

Tajura, Libya, 2-4 June 2008

I. Opening and adoption of the agenda

1. The Second meeting of the Working Group of Stock Assessment Methodology (WGAM), on basic methods and protocols to undertake assessments with direct methods was held in Tripoli, Libya, from 2 to 4 June 2008. It was attended by 18 participants from Algeria, France, Greece, Libya, Malta, Morocco, Italy, Tunisia and Turkey (see list of participants in Appendix 2).

2. Mr. Abdulbaset Abuisa, representative of the Director of the Marine Biology Research Centre (MBRC) in Tajura welcomed the participants and thanked them for attending this meeting.

3. Mr Srour, Deputy Executive Secretary of the General Fisheries Commission for the Mediterranean (GFCM), welcomed the participants and thanked the Libyan Authorities for their kindness in hosting and arranging the meeting. Mr Srour also expressed the appreciation of GFCM for the valuable support of Libya to the SAC activities.

4. Eng. Hussein Marie, the Secretary of the General Authority of Marine Wealth in Libya welcomed the participants to the meeting, wishing them a pleasant stay in Tripoli. He emphasized the importance of this meeting and hence, GFCM efforts aimed at the conservation of the Mediterranean marine resources to ensure a durable food security to the future generations. Mr Marie assured that holding this meeting at this present time comes to address the prevailing crisis of food shortage and escalating food prices all over the world. He reiterated his wishes of a good stay to the participants and declared the meeting opened.

5. The meeting which was chaired by Ms Constantina Karlou-Riga (SCSA coordinator), appointed Mr Othmane Jarboui as facilitator for agenda items 2 and Jacques Bertrand for item 4. The following rapporteurs were nominated:

Item	Rapporteur
1	A. Srour
2	O. Jarboui and A. Srour
3	R. Pace, A. Abella and C. Karlou-Riga
4	R. Pace, A. Abella and J. Bertrand
5	A. Srour, C. Karlou-Riga , J. Bertrand and O. Jarboui
6	A. Srour
7	A. Srour

6. The meeting Agenda was adopted without any changes (Appendix 1).

II. Inventory of surveys at sea performed in the GFCM area aiming to produce assessments of stocks

7. The objective of this session was to draw up an inventory of all the surveys (bottom trawl, echo-survey and eggs and larvae surveys) carried out in the GFCM areas according to the format (sheet) circulated by the SCSA before the meeting.

8. The SCSA coordinator introduced this agenda item by recalling that the main goal of the meeting was aimed to harmonize the basic methods, protocols, data format and software to be used to undertake joint assessments with direct methods. She also gave an overview of the outcomes from the first meeting of the working Group on bottom trawl surveys, held in Rome in March, 2007.

9. The meeting further reviewed the information provided through 9 inventories of surveys (Annex 4) presented during the session. The related presentations made during the meeting are summarized hereafter:

- Trawl surveys

- Status of the international project "MEDITS"

The MEDITS survey (Mediterranean International Trawl Survey) is organized to monitor the demersal resources in the Mediterranean. It intends to produce relevant information to support the fishery policy by collecting abundance data and biological parameters of fish, crustaceans and cephalopods species, as well as sea temperature at each haul. The hauls are positioned following a depth stratified sampling scheme with random drawing of the positions within each stratum. The hauls are made in the same position from year to year. The following depths are fixed in all areas as strata limits: 10 – 49 m, 50 - 99 m, 100 - 199 m, 200 - 499 m, 500 - 800 m. The protocols, including the specifications of the standard gear are described in an instruction manual. This manual, which is available in at www.ifremer.fr/?, has been distributed to the participants during the meeting. The series began in 1994 and was continuously carried out with one yearly survey during the May-July period. Ten Mediterranean countries are fully involved in the project, carrying out about 1200 hauls per year, and taking part to the coordination of the project (including one annual coordination meeting). Some other countries have applied more or less regularly and completely the Medits protocols for national surveys during the last decade (Morocco, Algeria, Libya, etc.). For the time being, the fully standardized Medits survey covers shelves and upper slopes of 17 GFCM-GSAs (No 1, 5-11, 15-20, 22-23, 25). Results from the survey are available at http://www.ifremer.fr/Medits_indices/.

Algeria

The demersal survey has been achieved from March 5 to 24, 2003, on board of the Research Vessel VISCONDES DE EZA (53 meters of length). It aimed to estimate the abundances indications (production in weight by one hour of haulage) for target demersal species. The survey was performed in the Algerian coast, (1280km). The following material has been used:- Echo sounder EM-300, ii) An experimental bottom trawl GOC 73 (20.2 meters of horizontal opening; 2.9 meters of vertical opening and 20 mm of mesh size). The zone of survey was shared in tiles of 25 square nautical miles. The choice of the tiles for realization of hauls was random stratified. The zone of survey was shared in two stratums: A 200 to 500m and B: 5001 to 800mètres. 55 hauls were achieved by day with a speed of 3 knots. Results: 194 species were listed among them: 25 target species composed of 15 species of fish, 06 species of crustacean and 04 species of mollusk.

Libya

The Libyan sea coast extends from the Tunisian boarder in the west, till the Egyptian boarder to the east, covering a length of nearly 2 thousands km long. There are no inland fisheries in Libya. The first phase of surveys during 1965-1972 showed that the commercial catch of fish was 24.7 kg/hour at day time and 26.1 kg/hour at night, 23.3 kg/hour. The average catch of Merluccius merluccius was 6kg/hour. The second set of surveys was conducted during 1994- 2006. In 1994, a FAO- MBRC survey, using Libyan Research Vessel (Nour), surveyed the whole Libyan coast. The survey area was defined as those waters extending to the limits of the continental shelf and slope of about 300 m depth. During the two coverages the hauls from 173 trawl stations yielded 110 species of fish and shrimps. During the first coverage a total of 13.4 ton of fish were caught in 97hauls. The mean catch was 111.53 kg/hour of which 50% were of commercial value, 46% of lesser value and 4% of non commercial value. In the second coverage, 10.3 ton of fish were caught in 56 hauls. The mean total catch was 184.42 kg /hour of which 40% was of species with value, 55% of species with lesser value, and 5% of species with no commercial value. During 2003, MBRC jointly with Greece Research Vessel (Philia) a survey was conducted to study the natural marine resources of the area between Missurata till the Egyptian boarders according to Medits protocol. The most recent survey is in cooperation with Med Sud Med project (2006-) covering the middle southern part of the Mediterranean including the Libyan waters.

Malta (Medits)

Malta has been carrying out the annual MEDITS (Mediterranean International Trawl Survey) in GSA 15 since 2000, but the first two surveys are considered exploratory with only five hauls in 2000 and nine hauls in 2001 compared to the forty-five hauls carried out since 2002. The objectives, the gear, sampling design and the species recorded are those advised by the MEDITS protocol. The forty-five hauls sampled are distributed proportionate to the surface area of each substratum present in GSA 15 as follows: 1 in the 10-49m, 6 in the 50-99m, 13 in the 100-199m, 14 in the 200-499m and 11 in the 500-800 substrata. The survey data management system used till 2006 was SeaTrim, but then ATrIS started to be used. Currently efforts are made to transport all the data into ATrIS. Since some time before this presentation the importance of inter-calibration in MEDITS was being discussed it was explained that the Maltese survey is carried out using the Sant' Anna (the same vessel used for the Sicilian survey) in the presence of Sicilian scientist/s. Furthermore, quality control is ensured when inputting data into the data management system as ATrIS automatically forbids the entry of data when an error is generated. Data checks are also performed once the complete data of every survey is inputted. Malta uses the MEDITS surveys in order to obtain occurrence, abundance indices, biomass indices, sex ratios, richness (Margalef), diversity (Shannon) and evenness indices (Pielou). However, to date no stock assessments were carried out in Malta, the reason being the lack of know how about such analysis. Thus, the importance of courses such as the 'Training course on stock assessment methodologies' to be held in Egypt between the 22nd and 26th of June this year.

Morocco

In the Moroccan Mediterranean, the trawling surveys of the demersal resources are carried out within the framework of the program of studies and follow-up of the main resources. The main objectives of this program are: the estimate of the indices abundance and the follow-up of the spatial and temporal trends for the main species. One to two surveys per year are undertaken with the research vessel of INRH. The area surveyed is located between Sebta in the West and Saidia in the East. The sampling system used is the stratified random. The surveys are carried out according to a network of sampling made up of 55 hauls of trawling in which technical data and biological are collected, in particular; the positions of the haul, the hour and the duration of trawling, speed, the captures, the biology of the species, etc. the gear used are a commercial trawl of local design called the shrimp trawl with an overall length of 57 m and a mesh size of 20 mm. The analysis of data collected during these programs make it possible to obtain a certain number of results which generally concerns, the evaluation of the indices of abundance, the space distribution of the resources, the evolution of this distribution in time and some biological parameters of the main species in particular the demographic structure of the principal species, sexual maturity, the sex-ratio and the length/ weight relationship.

Tunisia

In Tunisian waters, bottom trawl-surveys were started in 1925 but usually surveys have irregular in time and space. Since the acquisition of the Research Vessel (Hannibal), the work at sea became regular. One trawl surveys is carried out annually in all the GSA 12, 13 and 14 or in one or two areas. The main objective of our trawl survey in Tunisian waters is to collect data on the abundance and spatial distribution of the main exploited demersal species in the area surveyed. With time, we can follow the general trends in abundance and distribution of the main species. The sampling protocol is a stratified sampling and inside each strata, the haul positions are randomly chosen. For the gear we used two kind of trawl. The first one a Shrimp Bottom trawl used also by the fishermen in shallower depths, targeting particularly shrimp and cuttlefish. The code-end opened mesh size of this gear is about 40 mm Its vertical and horizontal opening are respectively 16 m and 2.5 m. The second gear is GOV (Grande Ouverture Verticale) particularly used in greater depth, targeting particularly demersal fishes. The code-end opened mesh size of this gear is also 40mm. Their vertical and horizontal openings are respectively 16 m and 6 m. More than 40 demersal species are targeted by our prospecting including particularly fish, Crustacean and Cephalopods such *as Merluccius merluccius, Mullus barbatus, Mullus surmeletus, pagellus erythrinus, Diplodus annularis, Lithognathus moryrus, Pagrus caeruleostictis, Solea aegyptiyaca, Sarapa salpa, Dentex dentex, Pomatomus saltatrix, Boops boops, Sepia officinalis, Octopus vulgaris, Loligo vulgaris, Eledone moschata, Parapenaeus longirostris, Penaeus kerathurus, Metapenaeus monoceros, Nephrops norvegicus, Aristomorpha foliacea,...* . These species are identified by the FAO codification.

Turkey (*trawl survey and other surveys***)**

This summary is based on information available on www.bagtr.org (in Turkish) on surveys using hydraulic dredges, trawl, beam trawl, and on larval surveys in the Black Sea, Marmara Sea, Dardanelle, Aegean Sea and Mediterranean, and on the fisheries in those seas. English summaries of the information on this web site can be obtained from bag@bagtr.org. This web site also has information on selectivity and gear studies in those seas. All the trawl survey is ın the Turkish waters in the Black Sea, Sea of Marmara, Agean Sea, and Mediterranean Sea. Beam trawl surveys

were for deep water pink shrimp (*Parapenaeus longirostris*) in the Marmara Sea. Between 2006 and 2007, the most recent trawl surveys have been from the southern Marmara Sea to the northern Aegean Sea. In addition, an experimental grid trawl survey was conducted in the northern Marmara Sea. Trawler activity was prohibited for a long time in the Marmara Sea by regulation of the Ministry of Agriculture and therefore surveys could not be conducted there. The clam (*Chamelea gallina*) fisheries with hydraulic dredge in the Marmara Sea and in the Black Sea were described. Trawl survey were carried out to evaluate fishing gears, effect of trawling on coastal fisheries, different towing speeds on the catch efficiency and fishing criteria of commercial demersal fish species whiting (*Merlangius merlangus euxinus*) and red mullet (*Mugil barbatus*), spawning season of the Pacific mullet (Mugil so-iuy), and on biological characteristics of turbot (Scophtalmus maeoticus pallas) in the Black Sea. There have been also trawl studies on the selectivity and reproduction around İzmir Bay, in the Aegean Sea and Antalya and in the Iskenderun Bay in the Mediterranean.

- ***Echo-survey (small pelagic surveys)***

Algeria

The assessment of small pelagic resources by direct methods was achieved between February 20 and March 03, 2003, on board of the Research Vessel VISCONDES DE EZA, with the aim to evaluate the biomass of pelagic stocks especially the sardine and anchovy. The prospected area is situated between the two borders East and West, (1280km). The material used for the acoustic assessment is composed of: i)- Scientific echo-integrator EK-500, ii)-Automatic system of data acquirement, iii)- A "net- sonde" to get the depth and the opening of pelagic trawl, iv)- A pelagic trawl of 20 meter of vertical opening. The prospecting of pelagic resources concerned the three (03) zones of study: West, Center and East. It makes the day by echo - integration according to radial perpendicular to the coast. According of echo- integration result, hauls of identification are achieved by the night with a speed of 3.5 to 4.5 knot. 70 radials and 13 fishing operation are achieved. Results: At the time of the pelagic survey, 26 species listed composed mainly of sardine, anchovy, hors mackerel and bogue. The stocks have been estimated to 187 000 tones.

Morocco

Since 1983, the INRH has performed sporadically echo surveys to assess small pelagic resources in the Mediterranean coast of Morocco. However, and due to some technical problems notably the problems of vibrations and of noise, the programme of echo surveys was irregular. The problem was solved by the acquisition of the new research vessel "Al Amir Moulay Abdellah", which allowed maintaining regular and annually echoing surveys since 2002. Thus, 5 surveys were carried out (2003, 2005,2006,2007 and 2008), aimed to produce maps on the distribution of the main small pelagic species such as sardine, anchovy, hors mackerel and Cub mackerel as well as the determination of their abundance indices. The survey covered the Moroccan Mediterranean coast, located between Ceuta and Saidia, covering the continental shelf, locates between isobaths 20 and 400 m, according to a network of the survey constitutes radial spaces of 5 miles nautical. In the zones of high concentrations of small fish pelagic species, the survey was performed using the "zig zag" approach. The results obtained allowed to ensure follow up of the trend of the biomass estimates during these 5 years and also to establish spatial distribution for the main species. In parallel, the biological data was collected for each species (size, weight, sex etc), make it possible

to determine the demographic structure, to deduce the biomass again recruits and to determine some biological parameters relative to each species.

Tunisia

The main objective of the echo-survey in Tunisian waters is to assess small pelagic stocks in the study areas and to follow the spatial distribution of the main exploited species. From the year 2000 until now (2008) we already realized 8 surveys covering all the Tunisian waters. For the experimental fishing operation, we use the semi-pelagic trawl 4FF with a vertical opening estimated at 7m. The power of the research vessel is about 1000 HP. The total time of the fishing operation varies between 30 and 60 minutes at 3 knots. Annually, we prospect the same area (Tunisian waters) including the three Geographic-Sub-Areas (GSA 12, GSA 13 and GSA 14). The minimum depth is around 20m and the maximum depth is about 200m or less. Our sampling protocol is based on parallel transects perpendicular to the coast, the distance between transects is about 5 Miles. The sounder used is SIMRAD EK 500 on 38 KHz. For the data analysis, we use the software MOVIES+. The main target species are: *Sardina pilchardus, Sardinella aurita, Engraulis encrasicolus, Trachurus trachurus, Trachurus mediterranaeus, Scomber scombrus and scomber japonicus*. For each year, we elaborate the maps showing the abundance of the main small pelagic species and we estimate also the total biomass species by species In the stock assessment operation we are mostly interested in the annual catch potential for each species and with comparison with the commercial catches, we can deduce the exploited state. We give in the table below the obtained results year by year.

- *Eggs and larvae surveys*

Tunisia

The main objective of this kind of survey is to study the spatial and temporal distribution of eggs and larvae of three small pelagic species (Sardina pilchardus, Sardinella aurita and Engraulis encrasicolis) particularly in Tunis gulf (GSA12) and in Hammamet gulf (GSA13). From the year 2000 until now (2008), we have realized 8 surveys. This study can help us to determinate the spawning and the nursery areas of the mentioned species. For the experimental fishing operation to collect eggs and larvae, we use bongo net (335 and 505 µm) with vertical opening of 60cm. the speed during the collect is about 3 knots. For each station we try to collect samples of water and we measure the salinity, the temperature, the dissolved oxygen, CTD profile, transparence, turbidity, the current speed, the nutritive salt, the chlorophyll a and the phytoplankton. For each year, we elaborate the maps showing the abundance and the distribution of eggs and larvae of the main small pelagic species. We also, elaborate the maps showing the spatial distribution of the salinity, the temperature, the chlorophyll a, the dissolved oxygen and the phytoplankton.

III. Assessments of stocks by direct methods

10. This agenda item was introduced by presentations by Jacques Bertrand on Indicators: Considerations with regards to the Ecosystem Approach to Fisheries and by Alvaro Abella on the potential utilization of trawl surveys data for stock assessment purposes. These are summarized below:

- Indicators. Considerations with regards to EAF

A lot of scientific analyses have been done with the Medits data since the beginning of the project. Part of them has been published in four special volumes of scientific reviews. Most of them were related to biological approaches concerning the main surveyed species. These works were very important to improve knowledge on biology of the species at the Medits scale, and to better appreciate the characteristics of the Medits data. Furthermore, a specific task in the Medits project has been devoted to carry out research on elaboration of population and community indicators from this data series. The report of a working group devoted to this task (Medits 2007) has been presented during the first WGSAM meeting. From this in depth exploration of the data, the Medits group has considered that the most consistent indices which could be routinely estimated at a large scale from the Medits data were those based on abundance/biomass and on individual length.

To facilitate access to this information, the Medits project has established a website (www.ifremer.fr/---) which includes a general presentation of the Medits survey, a presentation of the methodology used to calculate the indices and a data base of all the indices. The indices included in the website are the following:
For all the selected species:
Natural Logarithm of abundance: Log(N) (Natural Logarithm of the number of individuals in the area)
Total biomass in the area (W)
Average individual weight in the population (Wbar)
For the species for which individual length is collected:
Mean length in the population (Lbar)
Length at the fifth percentile of the length distribution (L 0.05)
Length at the twenty-fifth percentile of the length distribution (L0.25)
Length at the seventy-fifth percentile of the length distribution (L0.75)
Length at the ninety- fifth percentile of the length distribution (L0.95)
Sampling variance of length (Lvar)

The information is accessible by choosing the area (based on the GFCM-GSAs), the species and the index. The reader may load the selected data table for further use. For the time being, eight indices for 29 species for nine GSA are available in the site. The Medits group has also explored different approaches to combine in comprehensive dashboard the indices produced. The research is still in progress. A new proposal made by the Ifremer team and in application with series of surveys carried out along the French coasts from the North Sea to the Mediterranean Sea has been presented to the group. It is founded on combination of abundance and length based indices at population and community levels. In this approach, all the series of indices were statistically tested for linear trend. At the population level, each species might be positioned in one of nine theoretical scenarios combining abundance and length based trends linked with different fishing and environmental effects. Furthermore, trends were statistically tested for four community indices: abundance, geometrical average of abundance, mean size and mean size at the percentiles. Finally, in this approach, the synthesis was made by integrating these population and community trends and the general diagnostic about the area at the beginning of the surveyed period. References: Medits, 2007. Assessment of indicator trends related to exploited demersal fish populations and communities in the Mediterranean. DCR Medits Working group. Nantes (France), 15-18 March 2005 and Kavala (Greece), 2-6 April 2006. Available at http://www.ifremer.fr/docelec/default-en.jsp. 168 p.

- **Potential utilization of trawl surveys data for stock assessment purposes**

Data derived from trawl surveys are very useful for the knowledge on life history and exploitation status of many marine species. Information from trawl-surveys has been utilized for mapping the spatial distribution of the resources and for providing indices of relative abundance over space and time. The analysis of trawl surveys data also allows the evaluation of the impact of fishing on biodiversity. Regarding the more formal assessments of the status of the fishery resources, the traditional source of data has been the commercial activity, because it furnishes information on age structure, effective effort and its spatial and temporal allocation, total catches, etc. Data from scientific cruises has been used almost exclusively for tuning data of VPA or similar approaches. In many Mediterranean countries, information on commercial activity is imprecise, partial or not available. For this reason, several proposals have been made in the last years for the use of trawl surveys data as an alternative source for the assessment of the stocks. From this source there have been derived simple indicators of stock or ecosystem status, time series of abundance have been used searching for trends and to assess the likely consequences of alternative management measures, and also some age or size-based analytical approaches and certain variants of production modeling have been developed. The goal of this paper is the description of indicators of the health of the resources and the definition of sustainable yield or catch rates based exclusively on trawl surveys. Some approaches based on yield per recruit, stock recruitment, surplus production models and on life tables are presented and its suitability for the assessment of the status of the stocks and for yield forecasting is discussed.

11. The importance of using direct methods for stock assessments (fisheries independent methods) by carrying out surveys out at sea was extensively discussed. Stock assessments could be carried out using both solely direct and indirect methods (fisheries dependent). However, it was emphasized that the two methods are complementary and results are expected to be better when both methods are combined. Surveys out at sea are recommended as they compensate for underestimation and under representation of samples that are generally present when using indirect methods.

12. The meeting suggested choosing two or three stock assessment methods suitable to be applied when only survey data is available so as to be presented in the September meeting (Working Group on demersal species). These methods should serve as guidelines for the national experts in order to obtain results that could be easily compared between different areas of the Mediterranean.

13. Several population indices obtained from the MEDITS scientific survey were listed while a new approach that is currently being studied was introduced. This method is based on using abundance and length frequency data and the end result is to detect any changes in trends in a time series. The efficiency of this approach was discussed in detail with the conclusion that such a method only gives a relative view of the stock status however it is very simple to use without the need of several biological parameters. Therefore, it was proposed to include such a method with the suggested stock assessment methodologies to be suggested in the September meeting.

14. The Working Group acknowledged the availability in MEDITS website of Mediterranean population indices from trawl survey series. It expressed the relevance of this information for the future work of the SAC subsidiaries and wished that MEDITS experts could contribute notably to the next SCSA/Working Group on demersal species scheduled to be held in Turkey (September 2008).

15. A brief review of the stock assessments carried out using surveys at sea by each country present in the meeting was made. It resulted that the number of stock assessments already performed is very limited, especially in the case of demersals by the use of trawl surveys data, where the number of target species is much larger than in pelagic surveys. However, after the discussion developed, it was

shown that among those demersals the stock of *Merluccius merluccius* (hake) has been in some cases assessed ., while sardine and anchovy are those assessed using pelagic surveys data

16. Further discussion on the approach to select relevant methods to assess stock by using data from trawl surveys, the meeting suggested the four methods presented in the table 1 (below) in order to be presented in the meeting next September which will focus on the assessment of *Merluccius merluccius* and associated species using the suggested methods.

Table 1: The potential utilization of trawl surveys data for stock assessment purposes

MINIMUM DATA NEEDED	DATA QUALITY, PARAMETERS AND ASSUMPTIONS	METHOD	REFERENCE POINT	MAIN ADVANTAGES	CRITICAL ASPECTS
Time series of Z and index of abundance (Kg/km2) for a single GSA. Size structure, Growth parameters	Data series should show contrast in Z	Dynamic Biomass Models (non-equilibrium)	Z_{MBP}	Allows the calculation of a precautionary reference point. No need of specification of S/R nor of M although they are implicit in the models	The exploitation strategy is assumed not to have changed during the period. Estimation of Z is difficult for the species
Time series of Z and index of abundance (Kg/km2) for several GSA's. Size structure for each area, growth parameters	Contrasting Z between areas. Similar pristine production and evolution under changing Z for all the areas	Composite model	Z_{MBP}	Allows the calculation of a precautionary reference point. No need of specification of S/R nor of M although they are implicit in the models	The exploitation strategy is assumed not to have changed during period. Estimation of Z is difficult for the species
Growth parameters, L/W relationship, an estimate of M, selection curve, age of first maturity	Assumes that all individuals above the size at which 100% of fish are selected have the same probability to be fished	Dynamic pool models Y/R, B/R, SSB/R	Fmax, F0.1, F%SSB, FMSY only in the case S/R relationship is modelized	Simple approach In some cases it is possible to assume a declining vector of M with age	Not suitable in the case the species is exploited with more than one gear due to the impossibility to model, without fisheries-dependent information, such exploitation pattern
Data series of estimates of Spawning Stock and corresponding Recruitment	Assumes that the quantification of both spawners and recruits can be properly done	Sissenwine& Shepherd method	Zmed, Zlow, Zhigh	Simple approach with modest data requirements. Empirical. Considers reproduction aspects related to the ability of the stock of self-renewal	Overestimation of the mortality rate that should guarantee self-renewal in the case all the data are representative of situations of high fishing pressure
Size frequencies, growth parameters	In general, constant F and M have to be assumed for the completely recruited age classes	Exploitation rate	E=0.4?	Very simple	The value of E considered as a limit for guarantee self-renewal is species-specific and also dependent on exploitation pattern (i.e. tc)

The above analysis was done in order to select a set of models potentially useful for a stock assessment when only trawl surveys information is available.

17. Variants of surplus production models that use exclusively data of total mortality rates and an index of abundance from trawl surveys have been tested in some areas of the Mediterranean. They allow estimating the Z corresponding to the Maximum Biological Production (MBP). BP includes both the production removed by fishing and the losses due to natural mortality. The Z_{MBP} reference point is considered precautionary and it is always lower than the value corresponding to the MSY. These models do not need of assumptions on the likely relationship between spawning stock and the size of the future recruitment.

18. Dynamic pool models have been frequently used for a preliminary assessment of demersal stocks in the area. Their success is mainly due to the fact they need a modest amount of information. They allow to define reference points easy to calculate as Fmax and F0.1, the last one being in general considered precautionary. The yield per recruit approach is however not efficient for the analysis of sustainability without the definition of a stock/recruitment relationship. If this relationship is available and included in the model, an estimation of Maximum Sustainable Yield and Fmsy can be done.

19. Through simulations it is possible to define a threshold F that reduces the spawning biomass to a certain percentage of its pristine biomass. They also allow predicting the % of the MSY fishing at this or at other rate. In the Mediterranean context, considering a general lack of good knowledge on the population dynamics and fisheries of many stocks, approaches like that, that are less information-demanding, should have broad potential. There are however some problems that have to be solved before their utilization. The definition of a fishing mortality vector at age, especially when the species is exploited with more than one gear is necessary. Moreover, it has been observed that these models are very sensitive to changes in this input parameter and hence, results may be quite different if alternative values are used. According to the comparative study of Caddy and Mahon (1995), the Limit Reference Point %SPR was found to be positively correlated with natural mortality and negatively with some indices of size. In this case, fast-growing short-living species should require higher percentages of the survival fraction of the spawning biomass to guarantee an adequate stock replacement. This implies lower fishing mortality. Finally, it is necessary to stress that the use of an age-invariant (and low) value of M may have important repercussions on the results of the analyses with this approach.

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20. Other approaches that neither need a big amount of data nor formal models, are the variants of the Sissenwine and Shepherd (1987) method, which allows the identification of a mortality rate (in this case total mortality Z) that should guarantee adequate and sustainable yields. Zcrash and Zmed linked to the replacement of the spawning biomass are estimated. Zmed corresponds to the line representing an average survival, S/R=1, at which the stock replaces itself. At this Z, recruitment overbalances, in about half of the years, the losses due to mortality. Zcrash is the Z corresponding to the intersection of the yield and fishing mortality relationship with the Z-axis estimated by a Z-based production model. If fishing is maintained at the Zmed rate, it is assumed that the stock will be sustained. Zmed is considered a limit reference point. Also in this case, in order to be able to use data reflecting contrasting enough situations as regards the exploitation rates, yearly estimates of spawners and recruits from different sub-zones of the GSA9 were considered independently and not merged as a single couple of S and R for the whole GSA.

21. The achievement of reliable results with the approach, however, is strongly conditioned by the range of stock abundances for which spawner-recruit data are available.

22. Certain values for the exploitation rate (F/Z) can be considered as candidates for reference points. Values of E=0.4 or lower have been proposed as precautionary exploitation rates. These rates have been defined by analyzing information of stocks responses when exploited at different rates. There are however some problems for the generalized utilization of such type of reference values. The first is that this value is species specific, and may be affected by local ecological and environmental

characteristics that may make the same value adequate or not for the same species in different areas. There is a further reason that probably is as important as the previous considerations regarding the exploitation pattern of the species. Without the specification of the characteristics of this pattern, it is almost impossible to define an optimal E value even if an intrinsic equal resilience may be hypothesized for the species. It is clear that a given E will not have the same impact if removals (recruitment to the fishery) start at younger age classes or only regard older individuals.

23. It was concluded that, depending on the available data, species, exploitation pattern and contrasting situations within the available time series, different fisheries-independent approaches can be preferred. The use of at least one of the two variants of the surplus production models described is considered possible in several areas. In the case of certain species in some areas for which the assumption of constant probability to be captured over the fully recruited age class can be hypothesized, yield per recruit and related analyses can be performed assuming a typical trawlers exploitation pattern described by the gear selection probability and a full probability of capture for older ages without the use of any information on exploitation pattern. In such circumstances, it is in any case advisable to consider the changes in M with age. This is because the assumption of a constant (and low) natural mortality rate for modeling and simulation of alternative management choices can be considered unrealistic in fisheries where age at first capture occur early. As regards specifically European hake, it is almost impossible to perform an assessment and to assess the likely consequences of alternative management choices with dynamic pool models without the definition of a realistic exploitation pattern. It is not possible to obtain this information however without good information from the analysis of commercial fisheries data. In such circumstances, the two models based on surplus production may be preferred.

IV. GFCM framework for the harmonization of different methods, protocols, data format and quality control

24. The inventory of surveys performed before the meeting showed that many surveys at sea are being carried out in the GFCM area. Besides trawl surveys including MEDITS, surveys at sea aiming to evaluate the state of small pelagic stocks are also carried out. The existence of many protocols was highlighted. The inventories submitted to the meeting are presented in Annex 4 to this report.

25. However in order to perform joint assessments, the harmonization in protocols, basic methods, data format and quality format is urgently needed. For accomplishing this task, two tables were elaborated (one for trawl surveys (table 2) and the other for echo surveys for small pelagic species (table 3)) and compiled, on the basis of the inventories received and the information provided by the participants at the meeting, showing the similarities and differences between the methods, protocols, data format and quality control employed in different sub-areas. The basic table considered for this work is shown in Annex 3.

26. This exercise generated a proposal of general frame for a common protocol to harmonize the surveys at sea in the Mediterranean. The Scientific Advisory Committee will have to consider this proposal in order to finalize it and to recommend it to next GFCM session. Furthermore, the GFCM secretariat was required to circulate the above mentioned framework for collecting information on missed surveys in this analysis.

27. The Working Group was informed on the meeting of MEDIAS, the goal of which was to standardize the surveys on small pelagic (echo surveys and eggs-larvae) as performed by EC countries. Aiming to having common approaches in the GFCM area, the meeting encouraged the presentation of the outcomes from MEDIAS meeting in the next SCSA meeting (September 2008).

28. The meeting noted that, in addition to providing information for stock assessment, annual standardized surveys will be useful to monitor the status of the ecosystem. Where conditions are relatively stable, surveys may not be needed every year for stock assessment purposes, but annual

surveys may be necessary for ecosystem monitoring.

Table 2. Proposal of a GFCM protocol for the trawl surveys in the Mediterranean

Parameter	Current situation	**Suggestion of the Working Group**	Argument/Rationale
Sampling frequency	• Annually • Sporadic	**annually**	•
Sampling Season	• May-July • May-October • June-July and November-December • June-July • July-August • Seasonally • Feb-March and Nov.	**Spring-summer**	• Recruitment period for a lot of species • Weather condition • Large period to allow geographical coverage
Gear details ➢ Vertical Opening: ➢ Horizontal Opening: ➢ Codend mesh size:	• 2-2,5 m • 6 m • 2,5 • 0,5-2 • 2,5 • 17-19 m • 8-13 • 2,5-20,2 • 20 mm • 40 mm	**Two options, without conclusion in this meeting** **- Only one gear for the whole Mediterranean (VO: 2-2.5 m; HO: 17-20 m; MS: 20 mm)** **- One to two gears depending on depth strata (VO: 2-6 m)**	- Variation due to the need in performing surveys in different depth - Facility to compare data coming from different gear characteristics - Sampling recruits - Information for EAF
Sampling design	• Stratify by depth/random n in strata • Stratify by depth	**Stratified by depth/random allocation proportion to the area of strata**	• To minimize variation in estimates
Haul duration	• 30 min and 1 hr for depth>200 m • 30-60 min	**30 min to 1 hr depending on depth**	•Variability of abundance •Bottom characteristics
Towing speed	• 3 knots • 2 knots	**3 knots**	•
Method of storage data	• Data exchange format • Standard data sheet	**A standard format for data recording**	• Facilitate common analyses and comparisons
Data verification	• Specific software • Manual checking	**Country responsibility**	• Data quality
Sampling intensity	• 1/60 nm-1/200 nm2 • 55-80 hauls • 1/251 km2 • 40-60 hauls	**To be defined depending on species distribution and areas**	• Statistically relevant • Financial constraints

Table 3. Proposal of a GFCM protocol for the Echo-surveys in the Mediterranean

Parameter	Current situation	Suggestion of the Working Group	Argument/Comment
Sampling frequency	• Annually • Sporadic	Annual	• To follow evolution of distribution and stock abundance
Sampling Season	• Winter • April-May • June-September • Summer • February and Oct • Monthly between Sept and May	Dependent on target species and weather conditions	• To assess new recruits as well as adult stock need to carefully choose the sampling period.
Acoustic equipment ➢ Echosounder: ➢ Echointergrator	• Simrad EK500, 38 khz • Simrad EK60, 38 khz (• BI 60 • ER 60	Same frequency (38 Khz) Country responsibility Country responsibility	38 khz already used by those who completed inventory No effect on results No effects on results
Gear details ➢ type: ➢ Vertical Opening: ➢ Horizontal Opening ➢ Codend mesh size:	• Semi-pelagic • Pelagic • Purse seine • 7 m (semi-pelagic trawl) • 18 and 22 m (semi-pelagic trawl) • 20 m (semi-pelagic trawl) • 30-35 m • 18 mm (pelagic)	Flexible pelagic or semi-pelagic trawl that can sample a wide depth range 7-20 m dependent on the type of gear Not important factor 12 to 18 mm	Objective is generally to confirm species composition and evaluate length composition. The range 12-18mm allows catching all the size ranges. 12mm suggested in MEDIAS.
Sampling design	• Parallel lines and perpendicular to the coast 5nm apart • Parallel lines and perpendicular to the coast 5nm apart (zig zag near the coast and when large concentrations are found • Parallel lines and perpendicular to the coast 4-8nm apart • Zigzag transects	• Parallel lines perpendicular to the coast 4-10 nm apart depending on length of the transects combined with zigzag pattern for coastal areas and when fine scale information is needed	Increase the probability of detecting fish schools in the distribution area. Depth and abundance Zigzag allows the collection of fine scale information in shallower depths or when schools are detected.

	alternately parallel in 10 nm apart • Parallel lines and perpendicular to the coast 12 nm apart • Parallel lines and perpendicular to the coast 10 nm apart and zigzag inside the Gulfs • Parallel lines and perpendicular to the coast 10 nm apart • Parallel lines and perpendicular to the coast 7,5 nm apart (zig zag near the coast and when large concentrations are found		
Target species	• mainly S.pilchardus, S.aurita, Eng.Encras., T.trachurus and Scomber sp.	• Sardines, anchovy and associated species	• GFCM priority species list
Prospecting speed	• 8-11 kt	• 8-11 kt	• Noise • Weather conditions
Towing speed	• 3 to 4 knots (mainly)	• Depends on the target species, 3-4 kt generally suitable for most species. For chub mackerel (*Scomber japonicus*) speed needs to be faster.	• MEDIAS recommends 3.5-4.5 • In commercial mid-water fishery for mackerel towing speed is generally 6kt or more
Method of storage data	• Specific software • Standard sheets	• Country responsibility	•
Depth range	• 20-200 m • 20-400 m	• At least 20-200m	• Cover the known or inferred area of distribution of the target species • Shallower than 20m unlikely to be able to be covered with same vessel as 20-200m (biomass less than 20m can be important)
Data verification	• specific software • Manual	• Country responsibility	•

V. Conclusions and recommendations

29. The Working group reached the following main conclusions:

- The important information provided through the inventories showed that many countries in the GFCM area are carrying out surveys at sea, with common objectives, however a lot of information was missing because not all countries participated;
- The Working Group reiterated the importance to standardize and harmonize survey protocol in order to be able to perform regional analyses and noted that standardizing and harmonizing survey protocol has the potential to increase the understanding of the functioning of the ecosystems in the Mediterranean;
- The data coming from surveys at sea can be used in performing assessments for the state of stocks and monitoring the ecosystem, in addition to other methods. Methods presented at the Working Group can provide management benchmarks based exclusively on survey information.
- Information reviewed during the meeting showed that the protocols which are being used by different countries have many similarities on the basis of methodologies and outcomes;
- A framework for a common protocol was adopted on the basis of available information. The need to draft the technical guidelines in achieving a common protocol in the future was stressed;
- Once a protocol has been adopted and guidelines developed, the Working Group noted the need to evaluate the feasibility and usefulness of inter calibrations of surveys for shared stocks;

30. For shared stocks it may be useful for neighboring countries to conduct their surveys in a coordinated manner to evaluate the whole resource synoptically, possibly with the support of regional projects.

31. The meeting made the following recommendations:

- Potentially useful methods were suggested for the evaluation of the state of stocks by the use of trawl surveys data. Specifically for the joint assessment of hake and associated species in the next Working Group on demersal species, two methods using exclusively trawl survey data were suggested: the non equilibrium biomass dynamic model and the composite model. Methods using survey and commercial data should also be used;
- The framework for a common protocol shall be forwarded to the next sub-committee on stock assessment for further discussion and adoption;
- The GFCM secretariat is invited to circulate the above framework and the inventories to the countries. Scientists from countries that have not supplied information should do so before the next subcommittee on stock assessment (September 2008);
- The scientists are encouraged to use recommended methods to assess stocks and to provide scientific advice;
- The scientists are invited to attend the coming WGs on demersal and small pelagics and make available data from MEDITS and other survey programmes. Scientists involved in MEDIAS were also invited to attend the coming SC meeting.

VI. Any other matters

32. The participants thanked the Libyan Authorities for their hospitality and kindness in hosting the meeting and expressed their appreciation for ensuring excellent condition of work.

VII. Adoption of the report

33. The conclusions and recommendations were adopted on June 4, 2008. The whole report will be circulated within one week and comments are expected one week after reception of the report.

ANNEX 1

Agenda

1. Opening and arrangement of the meeting

2. Inventory of surveys at sea performed in the GFCM area aiming to produce assessments of stocks

    - Review of the available information
    - New information submitted at the meeting

3. Review of outcomes from surveys at sea to be used in assessments

    - Bottom trawl surveys: Indicators (e.g. biomass indices), mortality, trends, reference points
    - Small pelagic surveys (echo surveys, eggs-larvae): Biomass, spawning biomass, trends and reference points

4. GFCM framework for the harmonization of basic methods, protocols, data format and quality control

5. Conclusions and recommendations of the meeting

6. Any other matters

7. Adoption of the report and closure

ANNEX 2

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ANNEX 3

Summary table of the information submitted before and during the meeting

Trawl surveys

	MEDITS	TUNISIA	MOROCCO	MALTA	ITALY	FRANCE	GREECE	LIBYA	TURKEY	ALGERIA
Sampling frequency	Annually since 1994	Sporadic since 1970, Annually since 2000	Annually since 1985 and in MEDITS from 1999 to 2004	Annually since 2000 in MEDITS	Annually in MEDITS since 1994 and in GRUND 2 times a year since 1985, while once a year since 1994	Annually since 1982, included MEDITS since 1994	Annually in MEDITS since 1994 and sporadically since 1980	Sporadically between 1965 and 1995 in MEDITS in 2003 and in MEDSUDMED surveys for 2006 and 2007	Sporadically since 1960 decade	1982 1997 2003 2004
Sampling Season	May-July	May-October (in some years 2 times)	Medits: June-July National: Nov-Dec	Medits: June-July	Medits: June-July Grund: October	Medits: June-July	Medits: June-July	Till 2006: Seasonally Since 2006: July and SAugust	Seasonally	2003: Feb-Mar 2004: Nov
Gear details	Vertical opening: 2 -2.5 m Horizontal opening: 17-19 m	Vertical opening: For CREVETIER 2.5 m, for GOV: 6 m Horizontal	Vertical opening: Horizontal opening Codend mesh size:	Vertical opening: 2 -2.5 m Horizontal opening: 17-19 m	Vertical opening: For Grund around 1 m, for Medits as	Vertical opening: 2 -2.5 m Horizontal opening: 17-19 m	Vertical opening: 2 -2.5 m Horizontal opening: 17-19 m	Vertical opening: GOV: Horizontal opening Codend mesh	Vertical opening: For Beam trawl: 0.5 – 2m For Boat	Vertical opening: GOC 73: 2.9 m Horizontal opening:

	Codend mesh size: 20 mm (stretched)	opening: CREVETIER : 8 m, for GOV: 8 m Codend mesh size: 40 mm (stretched)	20 mm (stretched)	Codend mesh size: 20 mm (stretched)	usually Horizontal opening For Grund: Differs in the past between 12 and 20 m, for Medits as usually Codend mesh size: For Grund 40 mm (stretched)	Codend mesh size: 20 mm (stretched)	Codend mesh size: 20 mm (stretched)	size: 40 mm (Streched)	seine: 8 m Horizontal opening: For Beam trawl: 2.5m For Boat seine: 13 m Codend mesh size: In the Black sea: 40 mm Aegean Sea : 44 mm For beam trawl: 32 mm in the Marmara Sea	GOC: 20.2 GOV: 20 m Codend mesh size 20 mm streched
Sampling design	Stratify by depth/randomn in the strata	Stratify by depth/randomn in the strata	Stratify by depth /randomn in the strata	Stratify by depth /randomn in the strata	Stratify by depth /randomn in the strata	Stratify by depth /randomn in the strata	Stratify by depth /randomn in the strata	Stratify by depth	Stratify by depth /randomn in the strata	Stratify by depth /randomn in the strata
Haul duration	30 min > 200 m in depth : 1 hr	30-60 min	30 min > 200 m in depth : 1 hr	30 min > 200 m in depth : 1 hr	30 min > 200 m in depth : 1 hr	30 min > 200 m in depth : 1 hr	30 min > 200 m in depth : 1 hr	1 hr	Beam trawl: 3 hrs Boat seine: 1 ½ hr Trawlers : 30 min	30 min > 200 m in depth : 1 hr

Towing speed	3 knots	3 knots	3 knots	3 knots	3 knots	3 knots	3 knots	3 knots	2 knots	3 knots
Method of storage data	Data exchange format	Standard data sheet	Standard data sheet	Data exchange format	For Medits: Data exchange format For Grund: Standard data sheet	Data exchange format	Data exchange format	Standard data sheet	Standard data sheet	Standard data sheet
Data verification	Specific software	Manual checking	Manual checking	Specific software	Specific software	Specific software	Specific software	Manual checking	Manual checking	Manual checking
Sampling intensity	1 per 60 nm – 1 per 200 nm	GSA12: 55 GSA 13:65 GSA14: 80	55 hauls 1 per 251 km^2	1 per 60 nm – 1 per 200 nm	1 per 60 nm – 1 per 200 nm	1 per 60 nm – 1 per 200 nm	1 per 60 nm – 1 per 200 nm	?	Between 40 and 100 hauls	?
Comments										

Small pelagics – echo surveys

	TUNISIA	MOROCCO	MALTA	ITALY	FRANCE	GREECE	LIBYA	TURKEY	ALGERIA
Sampling frequency	Sporadic since 1982, annually since 1998	Sporadic 1983, annually since 2003	Between 2004 and 2007	In Adriatic since 1975 annually, in Sicily since 1998 annually	Annually since 1993	Sporadic since 1995, annually since 2003	--	Annually between 2000 and 2005 and sporadic after 2005	1982 1997 2003 2004
Sampling Season	Since 1998 in summer Since 2006 in winter	April-May	June-Sep	June-Sep	Summer	Summer	--	Monthly from Sep-May	Feb and Oct
Acoustic Equipment	Echosounder: Simrad EK500, 38 Khz	Echosounder: Simrad EK60, 38 Khz Echointegrator: BI 60	Echosounder: Simrad EK60, 38 Khz	Sicily:Echosounder: Simrad EK60, 38 Khz Adriatic: Echosounder: Simrad EK500, 38 Khz	Echosounder: Simrad EK500, 38 Khz Echointegrator: ER 60	Biosonic DTX		No information available	Echosounder: Simrad EK500, 38 Khz
Gear details	Semi-pelagic trawl 4FF : Vertical opening: 7 m Mesh size:	Semi-pelagic trawl Japanese kind : Vertical opening: between 18 and 22 m Horizontal opening: 30 – 35 m	Pelagic: Mesh size: 18 mm (stretched)	Pelagic: Mesh size: 18 mm (stretched)	Pelagic: Mesh size: 18 mm (stretched)	Pelagic: Mesh size: 18 mm (stretched)		Purse seine:	Pelagic Vertical opening : 20 m
Target Species	Sardina	Sardina	Engraulis	Engraulis	Engraulis	Engraulis		Sardina	Sardina

	pilchardus Sardinella aurita Engraulis encrasicholus Scomber scombrus Scomber japonicus, Trachurus sp., Boops boops	pilchardus Engraulis encrasicholus Trachurus sp., Scomber japonicus,	encrasicholus Sardina pilchardus	encrasicholus Sardina pilchardus	encrasicholus Sardina pilchardus	encrasicholus Sardina pilchardus		pilchardus Sardinella aurita Engraulis encrasicholus Scomber scombrus Scomber japonicus, Trachurus sp.,	pilchardus Engraulis encrasicholus Trachurus sp., Boops boops
Sampling design	Parallel lines perpendicular to the coast 5nm apart	Parallel lines perpendicular to the coast 5nm apart (zigzag near the coast and when large concentrations are found	Parallel lines perpendicular to the coast 4-8 nm apart	Zigzag transects alternately parallel in the Adriatic 10nm apart, in the Sicilian channel, parallel lines perpendicular to the coast 4-8nm apart	Parallel lines perpendicular to the coast 12 nm apart	Parallel lines perpendicular to the coast 10 nm apart, zigzag inside the Gulfs		Parallel lines perpendicular to the coast 10 nm apart	Parallel lines perpendicular to the coast 7.5nm apart (zigzag near the coast and when large concentrations are found
Towing speed	3kt	3.2kt	3.5-4kt	3.5-4kt	3.5-4.5kt	3.5-4kt		2.5kt	3.5-4.5kt
Depth range	20-200m	20-400m			20-200m			20-200	20-200m
Sampling intensity (echointegration)		Every nm							

Method of storage data	Specific software	Specific software	Specific software	Specific software	Specific software	Specific software		Standard sheets	Specific software
Data verification	Specific software	Specific software			Specific software			Manual inspection	Specific software
Comments									

ANNEX 4

Inventory forms and national reports

Algeria (*trawl survey***)**

Overview of the survey

Survey title	Assessment of the demersal resources on the Algerians coast		
Survey code	ARGELIA 0203-DP;	**Type of survey (bottom trawl, echo-survey, etc.)**	- Demersal
Country	ALGERIA	**Institute in charge**	Ministry of Fishing and fisheries resources
Area	GFCM GSA N°	Period: March 2003	**Season of the survey**: spring
Details of the survey. **Link to**:	http://www.....		

Overview of the series

In this table, give a list of the cruises performed in the frame of the survey series (one row by cruise). Period: date of beginning and end of the survey. Type of vessel / R/V : Research Vessel, C/V: Chartered Vessel

period	**vessel**	**Type of vessel (R/V or C/V)**	**Gear**	**N° Tows planned**	**N° Valid hauls**	**Comment**
March 05 to-24, 2003	B/O Viscondé de Eza	Research Vessel	bottom trawl	55	52	3 cancelled

Detailed information

Main objective *(general objectives of the survey. Types of information collected during the survey):*

Prospecting and assessment of the extent of the national fisheries resources

Complementary objective (if any):

The assessment of the abundance indications (production in weight per hour of activity) of the main demersal species.

Gear detail *(Describe the gear. If possible, add a plan of the sampling gear and its rigging): Area(describe in detail the area, including minimum and maximum depth):*

The fishing gear used in this survey it: Experimental bottom trawl GOC73.
The dimensions: 58,6 m of boltrope inferior
47,5 m boltrope of the floats
20 mm of mesh size;
The panels of type MORGER WS8, 2,5m^2, 350 kg,
Horizontal opening = 20,2 m
Vertical opening = 2,9 m

Area
The area is limited by the Tunisian border to (08° 38 ' 40 ' ' E) (36° 55 ' 30 ' ' N) and (35° 05 ' 00 ' ' N) (2° 12 ' 40 ' ' W)
Six areas are prospected:

Alger	241 SKm
Mostaganem	379 Skm
Beni saf	1204 Skm
Skikda	275 Skm
Annaba	786 Skm
Ras tenes	?

The strates :
A stratum: 200 – 500 meter;
B stratum: 501- 800 meter ;

The prospected surface is of 1600 000 hectares

Sampling design *(Describe the number of hauls and method used to select the sampling location)*

The number of fishing operation is 55, achieved between 200 and 800mètres depth. The used method corresponds to the MEDITS method;
The choice of the hauls is random stratified;
The fishing operation is achieved by day; with a speed of 03 knot;
The time of fishing operation is 60 minutes;
The sounder used is EM-300

Species recorded *(Indicate the number and main groups of species recorded (e.g. all fish, crustacean, etc)*

The total number of species captured is 194:
25 species of fish of high commercial value;
15 species of fish;
06 of crustaceans
04 of mollusk

Survey data management system *(Describe the data storage and compilation method):*

The compilation of data is automatic, reliable and exact;
Working to 30khz, the waves can reach 10 to 5000m;
The obtaining of data makes in continues;

Quality control *(Indicate the type of quality control applied to the survey, one protocol application, gear design, dated, etc.)*

Not available

Estimates *(Give indicators estimated and possible trends)*

Indications of abundance:

5-45 Kg/h for all cash of fish;
2-20kg/h all cash of crustacean;
6 - 30kg/h all cash of Mollusk

Detail

Red mullet 10-20 Kilogram per hour of fishing;
The hakes more than 20 Kg/h
The sea bream 40 Kg/h
The crustacean more than 20 Kg/h
The langoustines: 2 kg/h;
Octopuses more of 30Kg/h;
The Sepia: more of 12 Kg/h

Assessment of stocks *(Give assessment of stocks "yew any" by using survey dated)*

Not available

Position of hauls (*Include has map with haul position)*

Available on printed support

Position of graphs/tables heart various estimated

Available on printed support

Algeria (Echosurveys)

Overview of the survey

Survey title	Assessment of the pelagic resources on the Algerian coast		
Survey code	ARGELIA 0203-CP	Type of survey (bottom trawl, echo-survey, etc.)	Pelagic
Country	ALGERIA	Institute in charge	Ministry of Fishing and fisheries resources
Area	GFCM GSA N°	**Period**: February 2003	**Season of the survey**: winter
Details of the survey. **Link to**:	http://www.....		

Overview of the series

In this table, give a list of the cruises performed in the frame of the survey series (one row by cruise). Period: date of beginning and end of the survey. Type of vessel / R/V : Research Vessel, C/V: Chartered Vessel

period	vessel	Type of vessel (R/V or C/V)	Gear	N° Tows planned	N° Valid hauls	Comment
February 20 to march 03 2003	B/O Viscondé de Eza	Research Vessel	Pelagic trawl	13	70	

Detailed information

Main objective *(general objectives of the survey. Types of information collected during the survey):*

Prospecting and assessment of the extent of the national fisheries resources

Complementary objective (if any):

Evaluation of the biomass of pelagic resources especially the sardine and anchovy;

Gear detail *(Describe the gear. If possible, add a plan of the sampling gear and its rigging): Area (describe in detail the area, including minimum and maximum depth):*

Gear

Same pelagic trawl used by Algerian fisherman
Vertical opening of 20 meter

Area

The area is limited in the east by the Tunisian border to (08° 38 ' 40 ' ' E) (36° 55 ' 30 ' ' N) and Moroccan border (35° 05 ' 00 ' ' N) (2° 12 ' 40 ' ' W) in the west

The depth of fishing between 30 and 200 metre

The stratum :

A stratum: 40 – 100 metre
B stratum: 101-200 metre;
C stratum: 201-500 metre
D stratum: 5001 - 800/1000 metre

Sampling design *(Describe the number of hauls and method used to select the sampling location)*

13 fishing operation
70 radial vertical to the coast

Species recorded *(Indicate the number and main groups of species recorded (e.g. all fish, crustacean, etc)*

26 species catched in total;
The biggest part is constituted of sardine, anchovy, hors mackerel and bogue .

Survey data management system *(Describe the data storage and compilation method):*

Echo sunder EK-5000 ;

net sonde to obtain information about opening of trawl and fishing depth.
Automatic system of data on PC;
Use of the program computer EK-log to get the diagrams of data (digital echograms)
ARCVIEW : for the mathematical treatment of the geographical data;
Realization of the radial perpendicular to the coast outdistances between the radial 7.5 nautical miles.
The prospecting it makes in the day and the fishing by night with speed of 3.5 -4.5 knot;

Quality control *(Indicate the type of quality control applied to the survey, one protocol application, gear design, dated, etc.)*

Non available

Estimates *(Give indicators estimated and possible trends)*

The rate of the cash is of:
Sardine 74,1%
Anchovy 22,05%
Hors mackarel 2,01%
Bogue 1,78%

Assessment of stocks *(Give assessment of stocks "if any" by using survey data)*

Zone I: Ghazaouet to Cape ténès: 80 000 tons
Zone II: Cape Ténès to Azzeffoun 69 000 tons
Zone III: Bejaia to Elkala 38 000 tons

Total **187 000 tons**

Position of hauls
Include a map with haul positions

Available on printed support

Position of graphs/tables for various estimates

Available on printed support

France (PELEMED- Echo-surveys)
(Submitted after the meeting)

Overview of the survey

Survey title	*Echo survey of small pelagics in the NW Mediterranean*		
Survey code	PELMED	Type of survey	Type of survey
Country	France	Institute in charge	IFREMER
Area	*GFCM GSA No*	Period	July
Details of the survey. Link to:		http://www.....	

Overview of the series

In this table, give a list of the cruises performed in the frame of the survey series (one row by cruise). Period: date of beginning and end of the survey. Type of vessel: R/V: research vessel, C/V: chartered vessel.

Numbers for each year are number of transects done in each GSA

GSA	Country	Vessel name	Vessel code	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
6	FRA	R/V THALASSA	THA	21													
7	FRA	R/V THALASSA	THA	10													
8	FRA	R/V THALASSA	THA	6													
9	FRA	R/V THALASSA	THA	11													
7	FRA	R/V L'EUROPE	LEU		9	9	9	9	9	9	9	9	9	9	9	9	9

Detailed information

Main objective *(General objectives of the survey. Types of information collected during the survey) :*

Monitoring of the small pelagic resources in the Gulf of Lion. Produce relevant data to support the fishery policy. Abundance indices of all pelagic species (anchovy, sardine, mackerels, horse mackerels, sardinella, sprat). Biological parameters for these species. Protocol is the same since 1993 and is very close to "Medias" one.

Complementary objective (if any):

Spatio-temporal distribution of small pelagic resources in the Gulf of Lion in relation with environmental conditions.

Gear details (d*escribe the gear. If possible, add a plan of the sampling gear and its rigging) :*
Area (d*escribe in detail the area, including minimum and maximum depth) :*

The acoustic sampling is done with echo-sounders ER60 SIMRAD with 4 frequencies (38, 70, 120 and 200kHz)

The sampling gears for identify proportion of fish species in a structure are :

A four panels pelagic trawl, used generally in deep water (more than 40m depth with 27m of vertical opening and side mesh of 12mm in the cod end.

A four panels bottom trawl, used generally in shallow water (less than 40m depth with 17m of vertical opening and side mesh of 12mm in the cod end.

Area *(describe in detail the area, including minimum and maximum depth) :*

The survey is carried out in the gulf of Lion on the shelf and a part of the shelf break

Sampling design *(describe the number of hauls and the method used to select the sampling locations)*

Acoustic prospection along transects is done from 10m to 400m dept, at day time, with a speed of 8 knots. Transects are perpendicular to the coast and separated by 8 NM. Each time we encounter a new structure, a haul is done, generally near the bottom.

Species recorded (*Indicate the number and main groups of species recorded (e.g. all fish, crustaceans, etc.):*

All small pelagic fishes (anchovy, sardine, mackerels, horse mackerels, sardinella, sprat). Other species are classified as "others".

Survey data management system (d*escribe the data storage and compilation method):*

Acoustic data are stored ping by ping with Movies software in a standard "HAC" format.
Data are processed by "Elementary Distance Sample Unit" of 1 NM long. SA values of fish are split in "deviations classes". Then assessment could be done in two ways:

by homogeneous zones (generally a costal and an offshore zone)

by ESDU, by attributing a reference haul for each ESDU and each type of deviation

Trawling operation data are also collected in a standard format with Raptri software.

All these data are stored in an Access data base (Barracuda).

Quality control (*Indicate the types of quality control applied to the survey (on protocol application, gear design, data, etc.)*

At each level of the protocol exist some controls; some of them are automatic but mainly an expert procedure is required

Estimates (*Give indicators estimates and possible trends)*

For all the selected species

Number of individuals in each area : **N** (in thousands of fish)

Total biomass in each area: **W** (in kg)

Average individual weight in the population: **Wbar** (in g)

Mean length in the population: **Lbar** (in cm)

Length/weight relationship

For certain years and species, age composition and maturity

By haul

Proportion of species

Length distribution for main small pelagic species

Assessments of stocks (*Give assessments of stocks (if any) by using surveys data)*

Stock assessments are usually presented in SAC pelagic working group and updated every year for anchovy and sardine

Position of hauls

As hauls are opportunistic, position change every year relating to fish detection

Position of graphs/tables for various estimates

Libyan National report on state of fisheries surveys

Libya is one of the north *Africa c*ountry, occupies an area of about, 1 759 000 km^2 with a population of exceeds 5 millions, the sea coast extends from the Tunisian boarder in the west, till the Egyptian boarder to the east, covering a distant of nearly 2 thousands km long. Because of the natural topographical structure of the sea coast of Libya, it plays an important role in the biodiversity of the Mediterranean.

There are no inland fisheries in Libya; so most of the fish caught come by trawl fishing from the fishing grounds between Missurata – Abukamash. The other coast regions, between Missurata till Egyptian boarder, are mostly rocky, (untrawlable fishing grounds). Despite that, it was able to produce an average of 34 thousands tons of good and valuable fish.

Forwarding below summary of some reports and studies carried on Libyan waters:-

1- On 1958, Mr. Bourgeois prepared a report on (The state of Marine fisheries in Libya) presented to the FAO, under Doc. No.,8/7/58/2/1334.

2- An expedition of Tunisian Research Vessel "Dauphin" 1965, in a scientific cruise to the western region of the Libyan coast, from Djerba to Zleiten. Results of this expedition were published under different topics and authors; (Pérés, 1967; Azzuuz, 1969, and many others).They found that the commercial catch of fish was, 24.7 kg/hour at day time, and 26.1 kg/hour at night.

3- An expedition of French research vessel (Thallasa), started from Lampidusa Island down to gulf of Gabes, and advancing to the east till Zweitina, in the gulf of Sirte. The resulted of the commercial catch was, 23.3 kg/hour. The average catch of *m.merluccius* was 6kg/hour.

4- In 1972, the Japanese vessel (Hoyo – Maru) was used to explore the area located in the basin Sicilia/Tunis/Libya, and divided the area into six sectors, the study summarized that although the small exploration period most of the fishes caught was of small sizes.

5- By using two Libyan research vessels (El-Bahit and El-muktashif) in the western region of Libya between Misurata in east up to the Gulf of Tunis in the west was studied, the results were submitted in many issues Sogreah, 1977).

6- The eastern region of Libyan coast, from Gminis till the Egyptian boarder was studied during, 1974-1976, by the assistance of Romanian Marine Institute, using their research vessel, Delta-Dunari, (Contransimex, 1977).

7- The middle region of Libyan coast, from Missurata tillBinghazi (Gulf of Sirte), was studied during 1975 by German scientific team, for exploring and test fishing grounds in gulf of Sirte using the trawler(Meike), (Instrupa,1975).

8- In 1995, according to the agreement between Libyan government and FAO, using Libyan Research Vessel (Nour), experts from FAO with collaboration of researchers from MBRC, a study of the whole Libyan coast was held,

9- During 2003, joint team of experts from MBRC and Greece marine center, using Greece Research Vessel (Philia) a survey had been done to study the natural marine resources of the area between Missurata till the Egyptian boarders according to Medits protocol.

10- An activity is going on under the project Med Sud Med (2006-) studying the south area of the Mediterranean including the Libyan waters, by using RV (Urania).

Libyan marine resource assessment:-

Another programme of fish resource assessment was initiated with collaboration of FAO experts and researchers of marine biology research center using RV NOUR serving as working and investigation platform.

Survey area:-

The survey area was defined in terms of those waters extending to the limits of the continental shelf and slope of about 300 m depth .

Research vessel and fishing gear:-

Research vessel used was RV NOUR and has the following specification:-

LOA	49M
Width	10m
Mean draft	4.55m
Tonnage, gross	599 GRT
Tonnage , net	164 NRT
Maximum speed	13 kn
Cruising speed	11kn
Autonomy	22 days at 11kn
Fresh water	51m3
Fuel	153 m3
Accommodation	21 crew

The types of fishing gears are described below:-

- High vertical opening trawl (HVO 36+47) with 47.20m ground rope and a 36m head line and code end mesh of 50mm with inside lining of 20mm for survey work. This trawl was used in the soft grounds deeper than 100m. The one hour swept area 11.67 Ha at trawling speed.
- Exploration trawl (EXP 28 + 37) trawl with 37.30m ground rope and 28.60m head line and cod end mesh of 40mm with inside lining of 20mm. This trawl is used for grounds inside 100m contour line where chances of finding rough bottom are greater. The one hour swept area =9.24 Ha.

Survey design:-

A survey design based on stratified random selection of stations was adopted. The allocation of hauls by strata was originally to be derived from a preliminary reconnaissance survey with trawl stations as preselected depth along predetermined transects.

Allocation of trawl stations by depth

Depth strata	Sampling intensity
0 – 59m	55%
60 – 99m	20%
100 – 199m	15%
> 200m	10%

Selection of trawl stations:-

The entire survey area was divided into 3+3 nautical miles square each square is referenced by its south - west corner coordinates and the average depth read from navigation charts. LOTUS 123 was used to generate the set of coordinates along the coast line from 11 40.613 E to 17 59.129E. Squares were arranged in rows oriented from the coast to the north, to reach 300m depth.

A random number generator was used to select trawl stations within the list of positions, taking into account the sampling intensity in each depth stratum.

Species and catches:-

During the two coverage executed along the Libyan coast hauls from 173 trawl stations yielded 110 species of fish and shrimps.

During coverage (I) A total of 13.4 ton of fish were caught in 97hauls. The mean catch was 111.53 kg \ hour of which 50% were of commercial value , 46% of lesser value and 4% of non commercial value

In coverage (II), 10.3 ton of fish were caught in 56 hauls. The mean total catch was 184.42 kg \hour of which 40% of higher value, 55% of lesser value, and 5% of non commercial value.

Biological data :-

Length frequencies of some species of interest were collected during survey. FiSAT (FAO – ICLARM stock assessment tools) was used.

Among species for which information was collected Hake (Merluccius merluccius) , Red mullet (Mullus barbatus), and Horse mackerel (Trachurus trachurus) were processed . Length frequency measurements of all hauls of the same cruise were pooled irrespective of the depth.

From this survey we found that most trawl able areas are located to the west of Missurata, and in waters outside of a coastal band reaching 30 – 50 meters deep in places. In gulf of Sirte free trawlable grounds available in areas deeper than 200 meters. Inside this limit, it is likely that some fairways could be found through the implementation of a detailed ground survey with accurate positioning. In the east, the step slope and bottom roughness leave little opportunities to find trawling ground. The present findings generally confirm the conclusion of similar studies conducted earlier for that portion of the coast.

The potential level MSY exploitation of the stock of demersal fish between the border with Tunisia and the latitude of Missurata and between the coast and the limits with Tunisian \ Maltese waters or the 300 meters isobaths amounts 12,600 ton . The stock appears near to a state of full exploitation.

Malta (Medits)

Overview of the survey

Survey title	MEDITS (Mediterranean International Trawl Survey)		
Survey code		Type of survey (bottom trawl, echo-survey, etc.)	Bottom trawl
Country	Malta	Institute in charge	MCFS (Malta Centre for Fisheries Sciences)
Area	*GFCM GSA No* 15	Period May-July	*Season of the survey* Summer
Details of the survey. Link to:		http://www.sibm.it/	

Overview of the series

In this table, give a list of the cruises performed in the frame of the survey series (one row by cruise). Period: date of beginning and end of the survey. Type of vessel: R/V: research vessel, C/V: chartered vessel.

Period			**Vessel**	**Type of vessel (R/V or C/V)**	**Gear**	**No. Tows planned**	**No. Valid hauls**	**Comments**
Year	**Start**	**End**						
2000	7th Jun	8th Jun	Sant' Anna	C/V	Trawl GOC 73	5	5	Trial survey
2001	24th May	25th May	Sant' Anna	C/V	Trawl GOC 73	9	9	Trial survey
2002	17th Jul	24th Aug	Sant' Anna	C/V	Trawl GOC 73	45	45	
2003	16th Jul	12th Aug	Sant' Anna	C/V	Trawl GOC 73	45	45	
2004	17th Jun	4th Jul	Sant' Anna	C/V	Trawl GOC 73	45	45	
2005	11th Jul	21st Jul	Sant' Anna	C/V	Trawl GOC 73	45	45	
2006	17th Jun	27th Jun	Sant' Anna	C/V	Trawl GOC 73	45	45	
2007	13th Jul	23rd Jul	Sant' Anna	C/V	Trawl GOC 73	45	45	

Detailed information

Main objective *(General objectives of the survey. Types of information collected during the survey):*

To produce basic information on benthic and demersal species in terms of population distribution as well as demographic structure, on the continental shelves and along the upper slopes at a global scale in the Mediterranean (Bertrand et al., 2002).

Complementary objective (if any):

The samples and data gathered from this survey can be useful for other studies, such as litter surveys.

Gear details (d*escribe the gear. If possible, add a plan of the sampling gear and its rigging):*

IFREMER GOC 73 bottom trawl net: width 22m; height of vertical opening, 2m; length, 40m; stretched mesh size at cod-end, 20mm). For detailed description of the gear refer to Appendix I.

Area (*describe in detail the area, including minimum and maximum depth):*

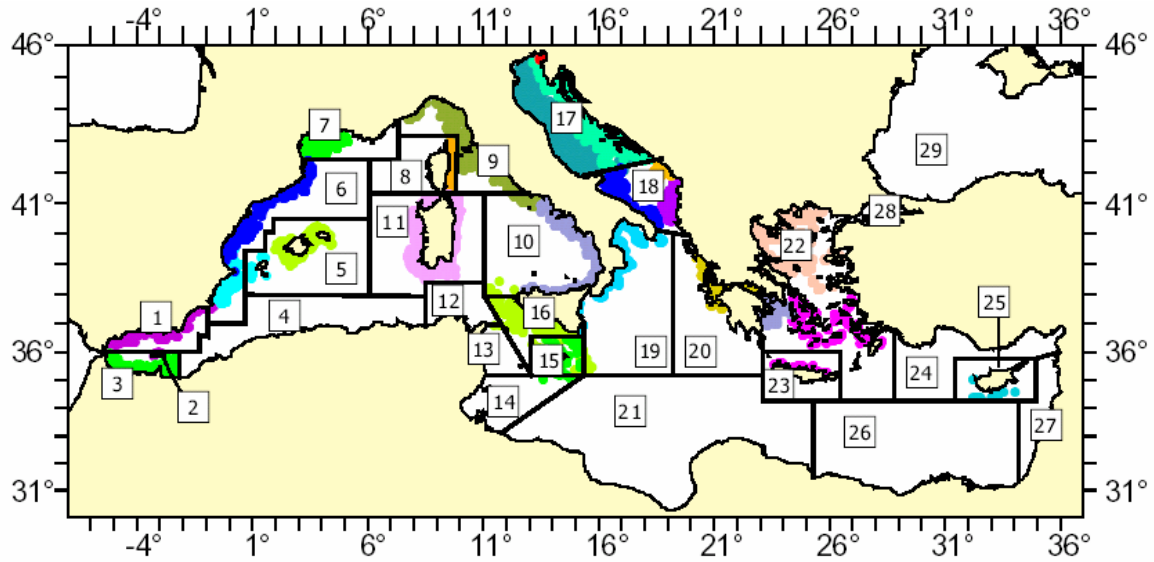

Fig. 1 Map showing the GFCM GSAs including GSA 15. Adapted from IFREMER (2007).

The borders of GSA 15 are bound by a rectangle whose corners are located at:

Latitude	Longitude
13°30'00"	36°30'00"
13°30'00"	35°00'00"
15°18'00"	36°30'00"
15°18'00"	35°00'00"

GSA 15 includes the Maltese Fisheries Management Zone (FMZ), which extends to 25 nautical miles from the baseline of the Maltese Islands. The depth in this area reaches up to circa 1,000m in certain locations (Fig. 2).

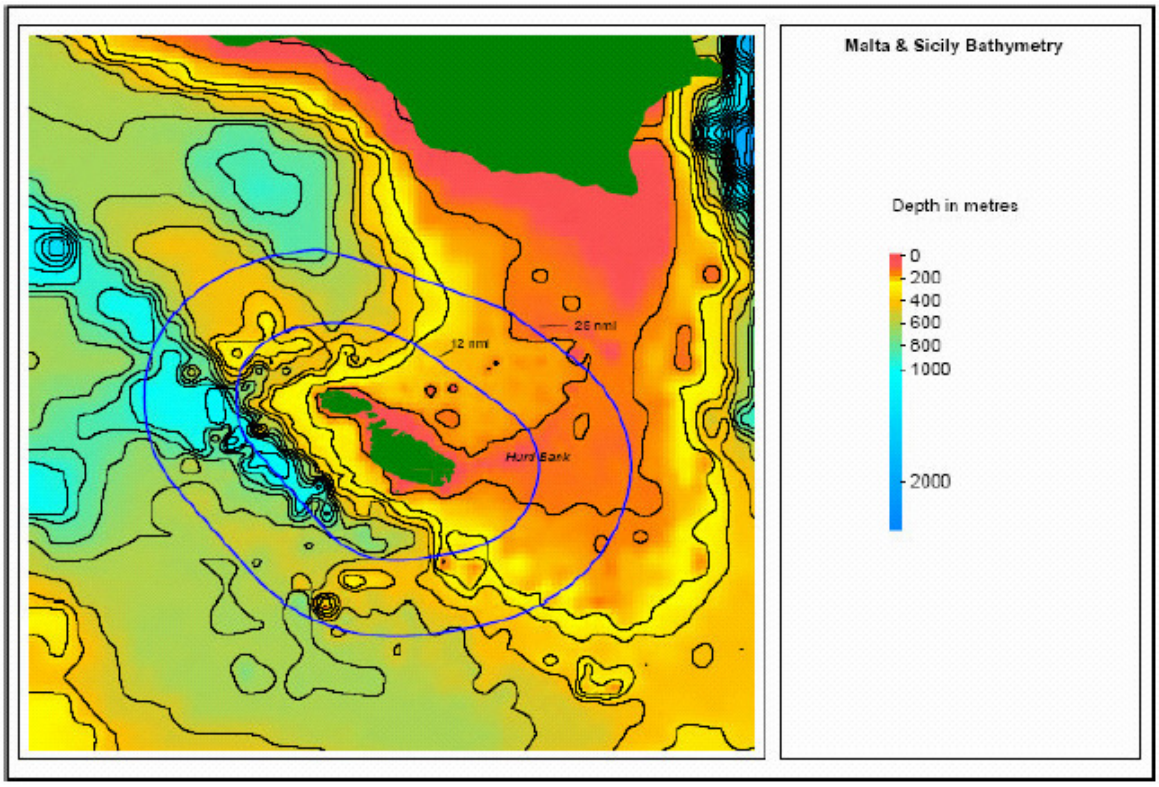

Fig. 2 A map showing the bathymetry around the Maltese Islands. Adapted from Department of Fisheries and Aquaculture (2000).

Sampling design *(describe the number of hauls and the method used to select the sampling locations):*

45 stations are sampled per survey, whose selection was carried out according to the MEDITS protocol (IFREMER; 2007) (Appendix II).

The following is the stratification scheme employed in GSA 15:

Depth (m)	**Surface area (km^2)**	**No. of hauls**
10-50	152	1
50-100	1,437	6
100-200	3,076	13
200-500	3,353	14
500-800	2,526	11
Total		**45**

Species recorded (*Indicate the number and main groups of species recorded (e.g. all fish, crustaceans, etc.) :*

Abundance and weight are recorded for all species of fish, crustaceans and cephalopods, while length, weight, sex and maturity stage is obtained for all of the 38 reference species (Appendix II).

Survey data management system (d*escribe the data storage and compilation method):*

Until 2006 data was stored using SeaTrim. Last year's data (2007) was stored using ATrIS. At present the 2000-2006 data is being imported into ATrIS (AdriaMed Trawl Information Survey) and the data which failed to be imported is being inputted.

Quality control (*Indicate the types of quality control applied to the survey (on protocol application, gear design, data, etc.)*

The gear design of the trawl net was tested by Fiorentini *et al.* (1999) while escapement from the main body of the bottom trawl was analyzed by Dremier *et al.* (1999).

The MEDITS sampling in GSA 15 is carried out in collaboration with the IAMC-CNR Mazara del Vallo in order to enhance inter-calibration of the work at sea.

The data is checked while being inputted into ATrIS as inserted data follow the rules given by the Administrator and an error results when data are not significant for the described phenomenon. Furthermore, the software includes checks such as consistency verification between catch and biological data, length/frequency distribution so that length/weight anomalies could be easily detected, hauls length validation and length/sexual maturity relationships. All these checks are performed once the data of a whole survey has been inputted into the ATrIS.

Estimates (*Give indicators estimates and possible trends)*

Occurrence
Density index
Biomass index
Sex ratio
Richness (Margalef)
Diversity (Shannon)
Evenness (Pielou)

Assessments of stocks (*Give assessments of stocks (if any) by using surveys data)*

None were carried out yet.

Position of hauls
Include a map with haul positions.

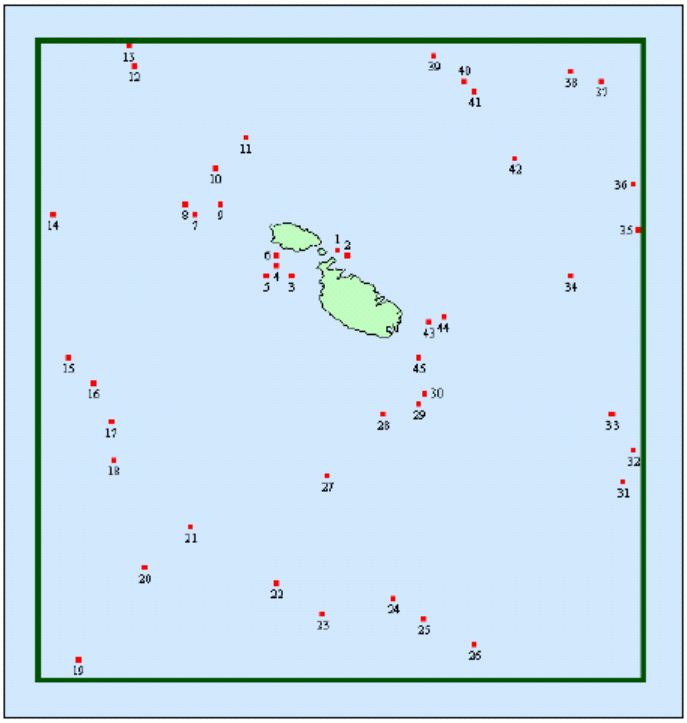

Fig. 3 Map showing hauls positions.

Position of graphs/tables for various estimates

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References

Bertrand J.A., Gil de Sola L., Papacostantinou C., Relini G., Souplet A. (2002). The general specifications of the MEDITS surveys. Scientia marina, 66 (2): 9-17.

Department of Fisheries and Aquaculture (2000). Maintaining the Maltese Fisheries Management Zone. [WWW document]. URL http://www.mic.org.mt/EUINFO/subjects/Fisheries/pp08att1.pdf#search='Malta%20Fisheries%20management%20zone'

Dremiere P.Y. Fiorentini L., Cosimi G., Leonori I., Sala A., Spagnolo A. (1999). Escapement from the main body of the bottom trawl used for the Mediterranean international trawl survey (MEDITS). Aquatic living resources, 12 (3): 207-217.

Fiorenitini L., Dremiere P.Y., Leonori I., Sala A., Palumbo V. (1999). Efficiency of the bottom trawl used for the Mediterranean international trawl survey (MEDITS). Aquatic living ressources, 12 (3): 187-205.

IFREMER [Institut Français de Recherche pour l'Exploitation de la Mer] (2007). International bottom trawl surveys in the Mediterranean (MEDITS), Instruction manual (Version 5).

Appendix I

Gear details

All the contents in this appendix were adapted from IFREMER (2007).

The trawl

The sampling gear is a bottom trawl (IFREMER reference GOC 73) made of four panels (Fig. 4). This gear was calculated to be operated by a vessel with a towing power of at least 368 kW (500 ch) and 4.5 tons of bollard pull.

The mesh numbers in height correspond to well finished and joined netting sections; the joining mesh should then be subtracted when cutting. The numbers of mesh in width do not include the side seams and those should then be added when cutting.

The floats of the headline, which are 40, should resist to an immersion of 1300 m. Their diameter should be around 20 cm, their individual buoyancy of 2.7 kgf (□5%), the total buoyancy of the 40 floats being around 108 kgf (□5%). The 40 floats should be distributed along the headline as follow (Fig. 5 and 9): from the end of each wing, one float every 1.50 m, 5 times; then one pair of floats every 1.50 m on the whole remaining length; in the headline bosom a small adjustment of the spacing is necessary. With this number of floats the vertical opening of the trawl should reach 2.4 to 2.6 m depending on the horizontal opening.

The weighting chain of 120 kg (3 □40) should be secured to the foot rope every 17 cm (with a hanging height of at most 8 cm). A supplementary chain of 15 kg (around 6.50 m and a diameter of 10 mm) should in addition be secured symmetrically on both parts of the belly bosom in the same way as the first one (garland of 17 cm in length).

The rigging

The general drawing of the rigging is given in Fig. 5. Various details of mounting and connection are shown in Fig. 6. The upper legs length is 30 m; the lower legs length is 29 m, plus the adjustment chain of 1m.

To maintain the geometry of the trawl as constant as possible two bridles length are defined according to the depth. They are given in the following table:

Depth (in meters)	10 - 200	200 - 800
Bridles length (in meters)	100	150

Accordingly with some experiment made on board the RV/L'Europe in June 2000, it is recommended to increase the bridle length to 200 m in depths deeper than 500 m. This modification is not compulsory but it can favor a better and faster contact of the trawl with the ground.

The doors

The doors are also normalized. They are of type Morgere WHS (Fig. 7). The adopted doors correspond to the size number 8. The warp is shackled in the fore hole of the bracket sheet (see arrow 1 in Fig. 7). The short parts of the external crowfoot are shackled in the most back part of the backside sheets, upper and lower (see arrow 2 in Fig. 7). The length of the back-strops (shackles not included) is as follows:
long external back-strops: 1.60 m
short upper and lower back-strops: 0.65 m (□10%).

Warp diameter and length

Taking the characteristics of the trawl and the rigging into account the warps should have a diameter of 16 mm, at least of 14 mm, at most of 20 mm. The length of warps to be shot is determined by the depth. The recommended relationship between depth and warp length is given in Fig. 8. Although in certain peculiar circumstances some adaptations can be made to this relationship, it is recommended to respect the depth/warp length ratio as far as possible.

For the vessels which are not equipped with a device to measure the length of shot warp, it is recommended to standardize the position of the last mark on the warp, for example at the most back warp block.

Complementary equipments

The systematic use of a device to control the trawl geometry (vertical and horizontal openings, contact with the bottom) is highly recommended. The sensors should be positioned as shown in Fig. 9. If it is not possible, measurements of the trawl geometry should be made at various depths on board each vessel at the beginning of the survey to establish a graph. For each haul it will noted in the data files if the indications of trawl opening are estimated or measured *in situ*.

A security device allowing getting back the trawl by the codend can be installed. As far as possible, it is recommended to secure this lazy line as shown in Fig. 9 and to take care of its fixations.

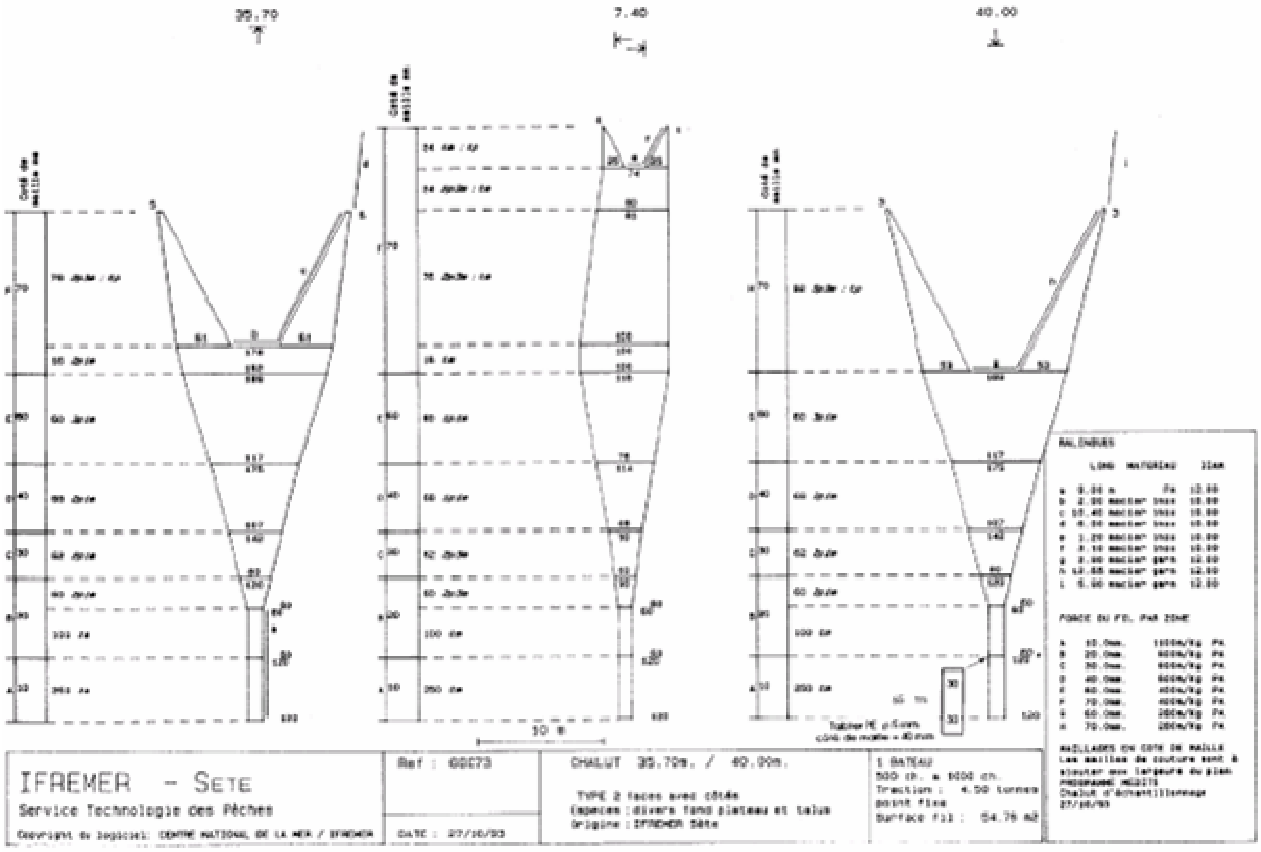


Fig. 4 Plan of the trawl GOC 73. The mesh sizes are indicated in bar length.

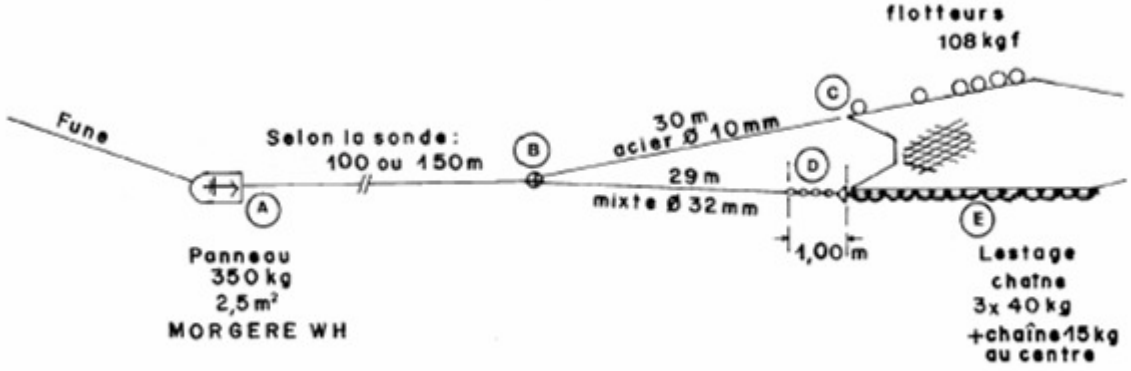


Fig. 5 Diagram of the rigging.

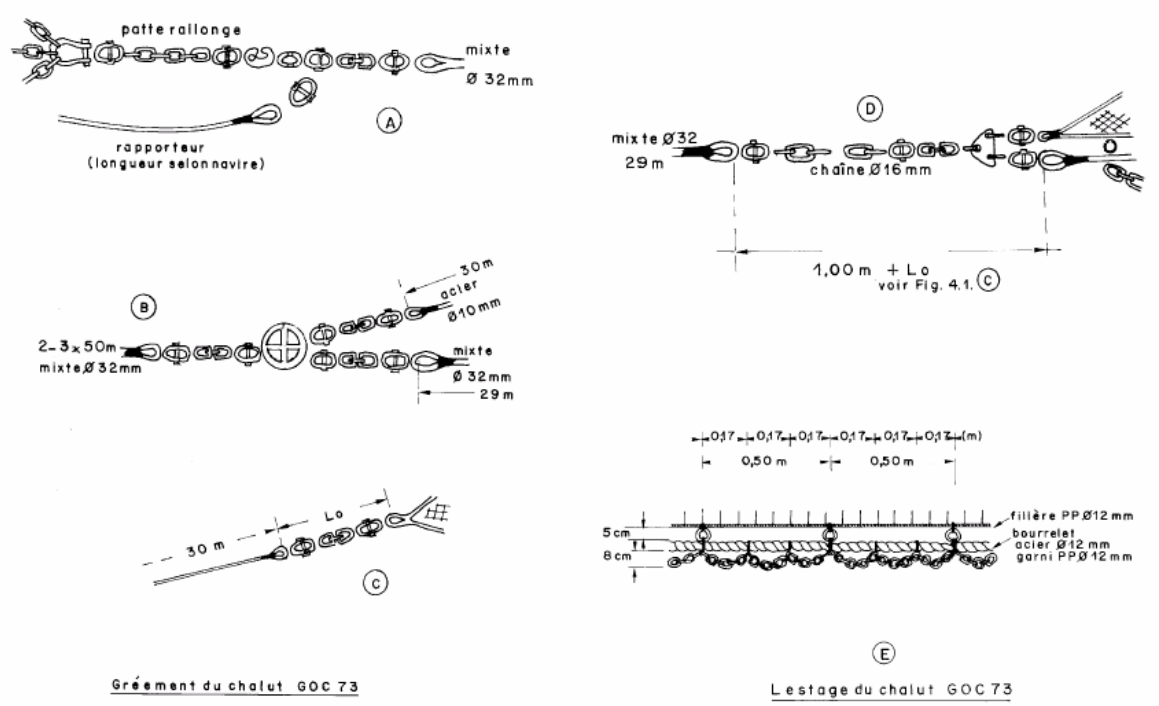


Fig. 6 Various details of the rigging.

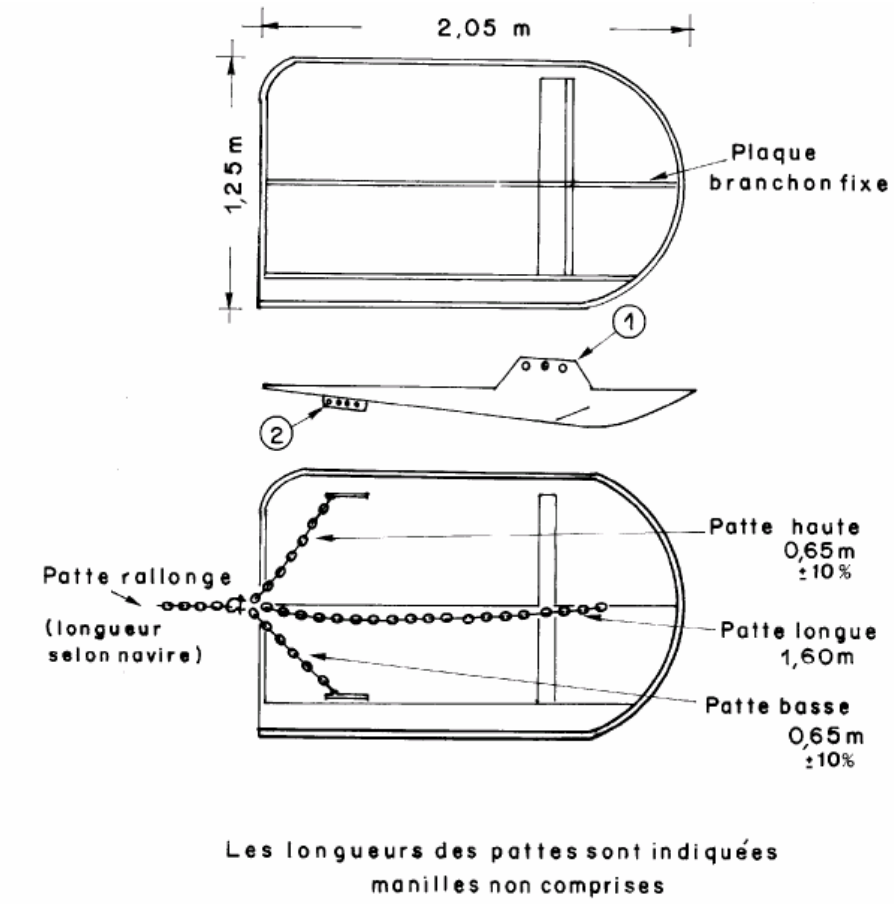
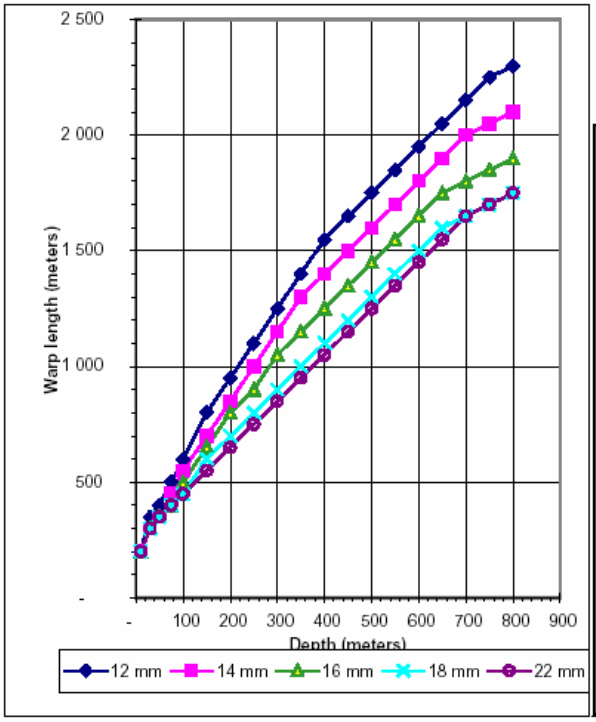


Fig. 7 Drawing of a door Morgere WHS (2.6 m^2, 350 kg).

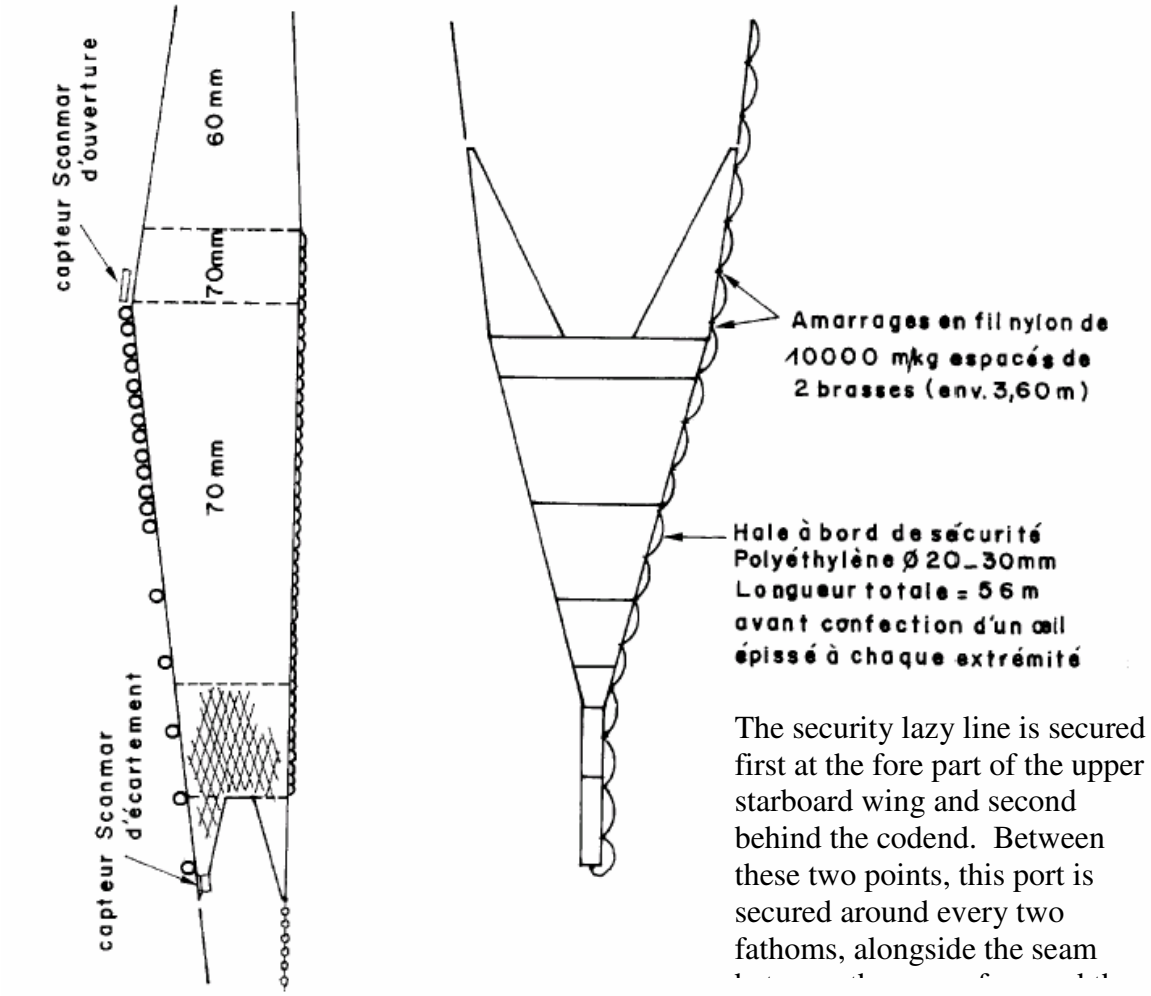


Relation ship between depth and warp length

Warp lentgh in meters

Depth (m)	12 mm	14 mm	16 mm	18 mm	22 mm
10	200	200	200	200	200
30	350	300	300	300	300
50	400	350	350	350	350
75	500	450	400	400	400
100	600	550	500	450	450
150	800	700	650	600	550
200	950	850	800	700	650
250	1 100	1 000	900	800	750
300	1 250	1 150	1 050	900	850
350	1 400	1 300	1 150	1 000	950
400	1 550	1 400	1 250	1 100	1 050
450	1 650	1 500	1 350	1 200	1 150
500	1 750	1 600	1 450	1 300	1 250
550	1 850	1 700	1 550	1 400	1 350
600	1 950	1 800	1 650	1 500	1 450
650	2 050	1 900	1 750	1 600	1 550
700	2 150	2 000	1 800	1 650	1 650
750	2 250	2 050	1 850	1 700	1 700
800	2 300	2 100	1 900	1 750	1 750

Fig. 8 Relationship between depth and warp length for the trawl GOC 73.



The security lazy line is secured first at the fore part of the upper starboard wing and second behind the codend. Between these two points, this port is secured around every two fathoms, alongside the seam

Fig. 9 Position of the geometry sensors and drawing of the lazy line.

Appendix II

Adapted from IFREMER (2007).

Method used to select the sampling locations

Hauls are positioned following a depth stratified sampling scheme with random drawing of the positions within each stratum. The number of positions in each stratum is proportional to the surface of these strata. Except in the case of peculiar problems (damages noted in previous years, etc.), the hauls are made in the same position from year to year. The decision to make a haul in a given place should not be influenced by the presence of fish shoal eventually detected with the sounder or the sonar.

The following depths are fixed in all areas as strata limits:
10 - 50 m,
50 - 100 m,
100 - 200 m,
200 - 500 m,
500 - 800 m.

Furthermore the strata are limited by lines more or less perpendicular to the coast, depending on the geographical characteristics of each area. It is strongly recommended to strictly maintain the same scheme between years.

The *Posidonia sp.* grasslands are excluded from the sampling scheme and should never been trawled.

Appendix III

Reference species

Table 1. List of the reference species adapted from IFREMER (2007).

Scientific name	Date[1]	CODE	Common name	
			Français	**English**
Aspitrigla cuculus	1998	ASPI CUC	Grondin rouge	Red gurnard
Boops boops	2006	BOOPBOO	Bogue	Bogue
Citharus linguatula	1994	CITH MAC	Feuille	Spotted flounder
Eutrigla gurnardus	1994	EUTR GUR	Grondin gris	Grey gurnard
Galeus melastomus	1998	GALU MEL	Chien espagnol	Blackmouth catshark
Helicolenus dactylopterus	1994	HELI DAC	Rascasse de fond	Rockfish
Lepidorhombus boscii	1994	LEPM BOS	Cardine à quatre taches	Four-spotted megrim
Lophius budegassa	1994	LOPH BUD	Baudroie rousse	Black-bellied angler
Lophius piscatorius	1994	LOPH PIS	Baudroie commune	Angler
Merluccius merluccius	1994	MERL MER	Merlu commun	European hake
Micromesistius poutassou	1994	MICM POU	Merlan bleu	Blue whiting
Mullus barbatus	1994	MULL BAR	Rouget-barbet de vase	Red mullet
Mullus surmuletus	1994	MULL SUR	Rouget-barbet de roche	Striped red mullet
Pagellus acarne	1994	PAGE ACA	Pageot acarné	Axillary seabream
Pagellus bogaraveo	1994	PAGE BOG	Dorade rose	Blackspot seabream
Pagellus erythrinus	1994	PAGE ERY	Pageot commun	Common pandora
Sparus pagrus	> 1996	SPAR PAG	Pagre commun	Common seabream
Phycis blennoides	1994	PHYI BLE	Phycis de fond	Greater forkbeard
Raja clavata	1994	RAJA CLA	Raie bouclée	Thornback ray
Scyliorhinus canicula	1998	SCYO CAN	Petite roussette	Smallspotted catshark
Solea vulgaris	1994	SOLE VUL	Sole commune	Common sole
Spicara flexuosa	1994	SPIC FLE	Gerle	Picarel
Spicara smaris	1998	SPIC SMA	Picarel	Picarel
Trachurus mediterraneus	1994	TRAC MED	Chinchard à queue jaune	Mediterranean horse mackerel
Trachurus trachurus	1994	TRAC TRA	Chinchard d'Europe	Atlantic horse mackerel
Trigla lucerna	2006	TRIGLUC	Grondin-perlon	Tub gurnard
Trigloporus lastoviza	1998	TRIP LAS	Grondin camard	Streaked gurnard
Trisopterus minutus capelanus	1994	TRIS CAP	Capelan	Poor-cod
Zeus faber	1994	ZEUS FAB	Saint-Pierre	John dory
Selacians[2]	2006			
Aristaeomorpha foliacea	1994	ARIS FOL	Gambon rouge	Giant red shrimp
Aristeus antennatus	1994	ARIT ANT	Crevette rouge	Blue and red shrimp
Nephrops norvegicus	1994	NEPR NOR	Langoustine	Norway lobster
Parapenaeus longirostris	1994	PAPE LON	Crevette rose du large	Deep-water pink shrimp
Eledone cirrhosa	1994	ELED CIR	Poulpe blanc	Horned octopus
Eledone moschata	1997	ELED MOS	Elédone musquée	Musky octopus
Illex coindetti	1994	ILLE COI	Encornet rouge	Broadtail squid
Loligo vulgaris	1994	LOLI VUL	Encornet	European squid
Octopus vulgaris	1994	OCTO VUL	Pieuvre	Common octopus
Sepia officinalis	1994	SEPI OFF	Seiche commune	Common cuttlefish

1 Year in which the species was introduced in the list (or removed if the year is preceded by >).
2 It is recommended to carry out the observations referring to this list to all the selacian species in the GSAs where it is technically possible. To allow coherent analyses of the results, it is highlighted that the decision to enlarge or not biological observations on selacians must be applied consistently during all the surveys. Before 2006 the selacian reference species were *Galeus melastomus*, *Raja clavata* and *Scyliorhinus canicula*.

Morocco (Trawl surveys)

Overview of the survey

Survey title	Prospecting of the demersales resources of the Moroccan Mediterranean by basic trawling		
Survey code	MED0407	Type of survey (bottom trawl, echo-survey, etc.)	Bottom trawl
Country	Morocco	Institute in charge	Institut National de Recherche Halieutique
Area	*GFCM GSA No 3*	Period	*From02/04/2007 to 09/04/2007*
Details of the survey. Link to:		http://www.....	

Overview of the series

In this table, give a list of the cruises performed in the frame of the survey series (one row by cruise). Period: date of beginning and end of the survey. Type of vessel: R/V: research vessel, C/V: chartered vessel.

Period	**Vessel**	**Type of vessel (R/V or C/V)**	**Gear**	**No. Tows planned**	**No. Valid hauls**	**Comments**
From 02/04/2007 to 09/04/2007	Charif Alidrissi	R/V	Chalut à crevette	55		

Detailed information

Main objective *(General objectives of the survey. Types of information collected during the survey) :*

The objectives of the survey are (i) the estimate of the abundance indices of the principal resources exploited in the area; (ii) determination of the space distribution of these resources; (iii) the study of the demographic compositions and the follow-up of the biological parameters for the principal species. For each feature of trawl, technical data are collected like the geographical positions of spinning and turn, the hour and the duration of fishing, the course, the speed of trawling, the length of released cable, etc. The speed of trawling is fixed at 3 nodes. The captures are sorted, weighed and counted to species and feature of trawl. Counting is total for weak captures or is estimated starting from the weight of 50 individuals when the captures are too abundant. Measurements in the faces are taken with lower cm overall length for fish. For molluscs, it is the length of coat which is taken with the mm. The cephalothoracic length is taken for pink shrimp.

Gear details (d*escribe the gear. If possible, add a plan of the sampling gear and its rigging):*
Area (d*escribe in detail the area, including minimum and maximum depth):*

The gear used is a trawl of the bottom of local design called the trawl with shrimp of which the overall length is 57 m and the bottom is 20 mm grid.

The prospecting by basic trawling related to the part of the adjacent sea of Alboran at the Moroccan coast which extends from Saidia in the East until Ceuta in the West. This zone, spread out over approximately 512 km, presents a certain number of irregularities related on the morphology of the coast and bathymetry. The funds are with muddy predominance. Along the coast, the aspect of the continental shelf changes appreciably. It is narrower in the Al Hoceima West and relatively little extended to the East. Indeed, in the West of Al-Hoceima, the isobath of 300 m is generally with 6 miles of the coast. Beyond this depth, the slope tends to soften; the line of 800 m is located at 28 miles of the coast. In the East of Al-Hoceima, the isobath of 300 m is at 20 miles and the line of 800 m is with 56 miles. Because of its proximity of the Straits of Gibraltar, this zone is characterized by a particular hydro dynamism due to the contact with water of the Atlantic Ocean: the water of the Mediterranean, heat and salted, leaves in-depth, whereas the water of the Atlantic, cold and less salted, enters on the surface. At the time of its course in the sea of Alboran, the water Atlantique jet causes two swirls anticyclones.

Sampling design *(describe the number of hauls and the method used to select the sampling locations)*

On the whole, 53 stations of trawling were carried out coast (18 m) up to 625 m of depth. The features of the trawl are carried out only during the day for one duration fixed at 30 min for the stations located in depths which are lower than 200 m and 1 hour for the stations which are beyond 200 m. The prospections were carried out by the ship of research of the INRH "Charif Al Idrissi". They were carried out according to a network of sampling made up of 55 stations chosen beforehand and located by means of a differential GPS on board boat. The choice of the positions of the stations of trawling was done by chance for each layer of depth.

Species recorded (*Indicate the number and main groups of species recorded (e.g. all fish, crustaceans, etc.):*

On the whole, 117 species were indexed during this program including 88 fish, 13 crustaceans and 11 cephalopods.

Survey data management system (d*escribe the data storage and compilation method):*

At the wet laboratory, the collected data are recorded on cards prepared especially for this use. These data are seized, later on data-processing tool under format access.

Quality control (*Indicate the types of quality control applied to the survey (on protocol application, gear design, data, etc.)*

Once the collected data is seized on machine readable medium, a checking is done by another person to correct the possible faults of seizure.

Estimates (*Give indicators estimates and possible trends)*

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Assessments of stocks (*Give assessments of stocks (if any) by using surveys data)*

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Position of hauls

Include a map with haul positions.

Network of sampling in the zone ranging between Saidia and Ceuta

Position of graphs/tables for various estimates

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Morocco (Echo-survey)

Overview of the survey

Survey title	CAMPAGNE DE PROSPECTION ACOUSTIQUE DES PETITS PELAGIQUES DE LA MÉDITERRANÉE MAROCAINE		
Survey code	ACOUMED0403 ACOUMED0506 ACOUMED0507	Type of survey (bottom trawl, echo-survey, etc.)	Echo-survey
Country	Morocco	Institute in charge	Institut National de Recherche Halieutique
Area	*GFCM GSA No* 11.3	Period : April-May	*Season of the survey : spring*
Details of the survey. Link to:		http://www.....	

Overview of the series

In this table, give a list of the cruises performed in the frame of the survey series (one row by cruise). Period: date of beginning and end of the survey. Type of vessel: R/V: research vessel, C/V: chartered vessel.

Period	**Vessel**	**Type of vessel (R/V or C/V)**	**Gear**	**No. Tows planned**	**No. Valid hauls**	**Comments**
10 to 15 may 2003 11 to 20 my 2006 26 April to 02 may 2007	"Al Amir Moulauy Abdellah »	R/V	pelagic semi trawl (standard Japanese).			Les panneaux utilisés pour ce chalut sont de type O.B (Al), 1.44 m² (216.4 kg).

Detailed information

Main objective *(General objectives of the survey. Types of information collected during the survey):*

.. The objectives of the survey are:

Establishment of the space distribution cards of the principal species the small pelagic one
Determination of their indices of abundance
The estimate of the biomass of their stocks.....

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Complementary objective (if any):

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Gear details (d*escribe the gear. If possible, add a plan of the sampling gear and its rigging):*
Area (d*escribe in detail the area, including minimum and maximum depth) :*

For better determining the resources of small pelagic of the Moroccan Mediterranean and ensuring a good acoustic cover, the network of prospection in the Moroccan Mediterranean covered all the continental shelf of the area ranging between Saîdia in the East and Ceuta in the West, of which the depths are located between 20 m and 400 m.

Sampling design *(describe the number of hauls and the method used to select the sampling locations)*

This network consists of radial parallels, separated by 5 miles nautical and radial in Zigzag. This strategy of prospection as ZigZag, where the network of prospection becomes tighter (distance between radial is 2.5 miles nautical) related to the zones with strong pelagic fish detections. That makes it possible to have a maximum of data relating to the indices of abundance on the detected fish benches.
Species recorded (*Indicate the number and main groups of species recorded (e.g. all fish, crustaceans, etc.)*

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Survey data management system (d*escribe the data storage and compilation method):*

The tool of échosondage used for the acoustic prospection is the EK60, regulated at a frequency of 38KHz with one pulsates duration of 1 ms. The data of echo-integration are collected for each 5 nautical miles. Integrator BI60 is used for the analysis and the allowance of the values of integration SA (m2 /nm2) for each species on the basis of characteristic of the echo traces and the specific composition of the captures carried out at the time of fishing of control. The value of the index of reflexion TS applied to convert the data of integration SA into a number of fish is that of "Herring" of the North Sea, which was used for all the pelagic species at the time of the acoustic campaigns carried out by N/R Dr. Fridtjof Nansen on the level of the Moroccan Atlantic. TS = 20Log L - 72 (dB)
Quality control (*Indicate the types of quality control applied to the survey (on protocol application, gear design, data, etc.)*

Sardina « Sardina pilchardus »
Anchovy « Engraulis encrasicolus »
Trachrus « Trachurus trachurus »
Scomber « Scomber joponicus »
Estimates (*Give indicators estimates and possible trends)*

At the time of the "scrutinizing" and one basing itself on the data of scientific fishing (specific composition), acoustic energy (SA) corresponding to the total values of the indices of abundances is allotted to the various species which compose the benches of detected fish. The data of the frequencies

of size collected for each species at the time of the operations of sampling are balanced with the total capture. These data are transformed expressed as a percentage for each class of size, to be then used in the ventilation of the total biomass on the various classes of sizes.

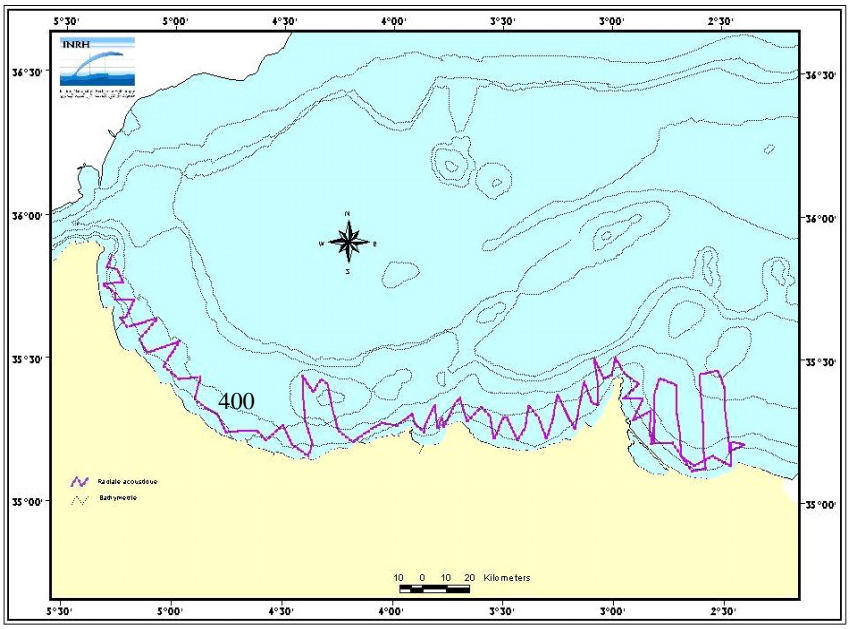
For each targeted species, the surfaces of distribution are first of all drawn up according to the distribution of the variable of integration SA allocated with the species. On the level of each surface "H", abundances Ni and the biomasses Bi relative to each class of size "I" are first of all calculated by the relations (1) and (2) following (Toresen and Al, 1998), Neither = C * SAh * Ah * (nor / neither (Li)2) (1) Bi = Nor * Wi (2)
SAh is the average of the coefficients it's taken on the radial ones inside the surface H.
Ah is the surface expressed in nm2.
Li is the centre of the class-interval of size I.
nor is the frequency of the individuals of class I listed after having shared all the samples taken inside the surface

Assessments of stocks (*Give assessments of stocks (if any) by using surveys data)*

the estimates of biomass shows a certain stability of the stock of the sardine which is regarded as the major species of small pelagic, whereas the chinchard records a remarkable increase in its biomass during the year 2007

Position of hauls

Include a map with haul positions.



Position of graphs/table

Tunisia (trawl surveys)

Overview of the survey

Survey title	Experimental Trawl Survey in Tunisian waters		
Survey code	DemSud ; DemEst and DemNord	Type of survey (bottom trawl, echo-survey, etc.)	Bottom Trawl
Country	Tunisia	Institute in charge	INSTM
Area	*GFCM GSA No 12 ; 13 and 14*	Period (2000 – 2007)	*Season of the survey (all seasons)*
Details of the survey. Link to:		http://www.....	

Overview of the series

In this table, give a list of the cruises performed in the frame of the survey series (one row by cruise). Period: date of beginning and end of the survey. Type of vessel: R/V: research vessel, C/V: chartered vessel.

Period	**Vessel**	**Type of vessel (R/V or C/V)**	**Gear**	**No. Tows planned**	**No. Valid hauls**	**Comments (Survey Code)**
Feb-March 2000	Hannibal	R/V	Crevettier and GOV		22	DemNord2
May-June 2000	Hannibal	R/V	Crevettier and GOV		72	DemSud2
Feb-March 2001	Hannibal	R/V	Crevettier and GOV		35	DemEst3
June 2001	Hannibal	R/V	Crevettier and GOV		40	DemSud3
June –Sep 2002	Hannibal	R/V	Crevettier and GOV		33	DemNord4
Sep-Oct 2002						
April-May 2002	Hannibal	R/V	Crevettier and GOV		31	DemEst4
Jun 2003	Hannibal	R/V	Crevettier and GOV		49	DemSud4
July 2003	Hannibal	R/V	Crevettier and GOV		29	DemEst5
May-August 2003	Hannibal	R/V	Crevettier and GOV		27	DemNord5
May 2004	Hannibal	R/V	Crevettier and GOV		66	DemSud5

August-Sep 2004	Hannibal	R/V	Crevettier and GOV		39	DemEst6
Sept 2004	Hannibal	R/V	Crevettier and GOV		42	DemNord6
March-Nov 2005	Hannibal	R/V	Crevettier and GOV		36	DemSud6
May 2005	Hannibal	R/V	Crevettier and GOV		58	DemNord7
Sep-Dec 2005	Hannibal	R/V	Crevettier and GOV		49	DemSud7
April-May 2006	Hannibal	R/V	Crevettier and GOV		44	DemEst7
June 2006	Hannibal	R/V	Crevettier and GOV		52	DemNord8
Sep-Dec 2007	Hannibal	R/V	Crevettier and GOV		37	DemSud8
	Hannibal	R/V	Crevettier and GOV		111	DemNord9

Detailed information

Main objective

The main objective of our trawl survey in Tunisian waters is to collect an available data on the abundance and spatial distribution of the main exploited demersal species in the prospected area. With the time, we can follow the general tendency of these two parameters.

Complementary objective (if any):

Some specific information can be also collected such us the demographic structure of the populations, the sex, the maturity and a global information on other non target species and the benthic population in the prospected area.

Gear details (d*escribe the gear. If possible, add a plan of the sampling gear and its rigging):*
Area (d*escribe in detail the area, including minimum and maximum depth):*

For the gear we used two kind of trawl. The first one a Shrimp Bottom trawl used also by the fishermen in small depth, targeting particularly shrimp and cuttlefish. The code-end opened mesh size of this gear is about 40 mm Its vertical and horizontal opening is respectively 16 m and 2.5 m. The second gear is GOV (Grande Ouverture Verticale) particularly used in more important depth, targeting particularly demersal fishes. The code-end opened mesh size of this gear is also 40mm. Its vertical and horizontal opening are respectively 16 m and 6 m.

Sampling design *(describe the number of hauls and the method used to select the sampling locations)*

The data are collected using a random sampling with depth stratum. For each GSA, we identify 4 stratum, the sampling. The total number of hauls is about 150, this number can differ with the area surface and each year we prospect the same positions and we our sampling protocol didn't take into account the abundance of the species. It is a systematic sampling protocol.

GSA	Nb. Strata	Depths
12	4	50-100, 101-300, 301-500, >500
13	4	50-100, 101-200, 201-400, >400
14	4	30-50, 51-100, 101-200, >200

Species recorded (*Indicate the number and main groups of species recorded (e.g. all fish, crustaceans, etc.) :*

More than 40 demersal species are targeted by our prospecting including particularly fish, Crustacean and Cephalopods such as Merluccius merluccius, Mullus barbatus, Mullus surmeletus, pagellus erythrinus, Diplodus annularis, Lithognathus moryrus, Pagrus caeruleostictis, Solea aegyptiyaca, Sarapa salpa, Dentex dentex, Pomatomus saltatrix, Boops boops, Sepia officinalis, Octopus vulgaris, Loligo vulgaris, Eledone moschata, Parapenaeus longirostris, Penaeus kerathurus, Metapenaeus monoceros, Nephrops norvegicus, Aristomorpha foliacea, …. In our data base, we identify all these species by a specific code (FAO code).

Survey data management system (d*escribe the data storage and compilation method):*

On the sea, the specific information's are recorded on the specific sheets, the information concern particularly the general information of haul (geographic positions, the depth, the speed, the time,…), the information on the catches (quality (species and demographic structure) quantity) and some biological information (sex, maturity stage).All this information are registered in a specific Access database linked with GIS software to produce Distribution maps.

Quality control (*Indicate the types of quality control applied to the survey (on protocol application, gear design, data, etc.)*

Estimates (*Give indicators estimates and possible trends)*

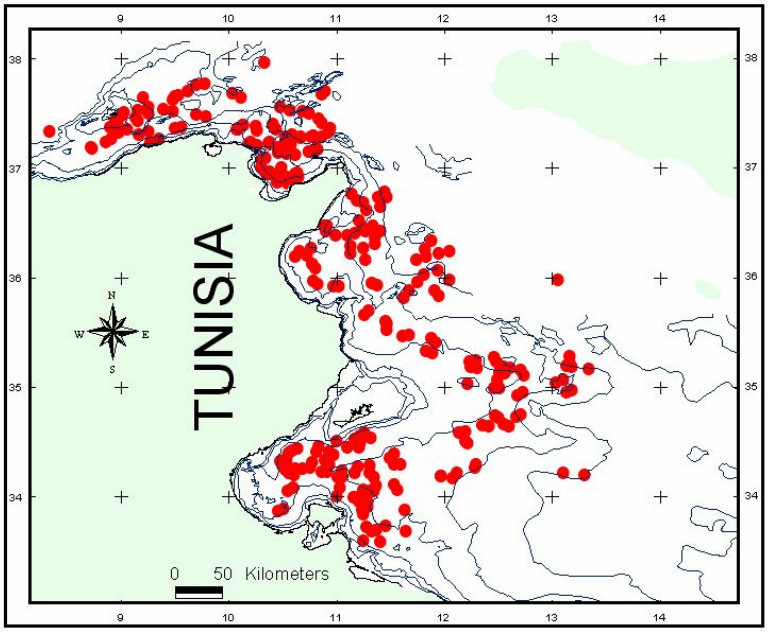
- *Occurrence*
- *Density index (kg/h, kg/km2, Nb/h, Nb/km2)*
- *Density according to the sex and maturity stage for some species*
- *-Benthos index*

Assessments of stocks (*Give assessments of stocks (if any) by using surveys data)*

Until now, we didn't produce any stock assessment using this data.

Position of hauls

Include a map with haul positions.



Position of graphs/tables for various estimates

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Tunisia (Echo-survey)

Overview of the survey

Survey title	Experimental Trawl Survey in Tunisian waters		
Survey code	OASIS	Type of survey (bottom trawl, echo-survey, etc.)	**Echo-survey**
Country	Tunisia	Institute in charge	INSTM
Area	*GFCM GSA No 12 ; 13 and 14*	Period (2000 – 2007)	*Season of the survey (Summer and winter)*
Details of the survey. Link to:		http://www.....	

Overview of the series

In this table, give a list of the cruises performed in the frame of the survey series (one row by cruise). Period: date of beginning and end of the survey. Type of vessel: R/V: research vessel, C/V: chartered vessel.

Period	**Vessel**	**Type of vessel (R/V or C/V)**	**Gear**	**No. Tows planned**	**No. Valid Transects**	**Comments (Survey Code)**

July 2000	Hannibal	R/V	Pelagic		33	OASIS4
July-August 2001	Hannibal	R/V	Pelagic		33	OASIS5
July-August 2002	Hannibal	R/V	Pelagic		33	OASIS6
Mars-April 2003	Hannibal	R/V	Pelagic		20	OASIS7
June –July 2004	Hannibal	R/V	Pelagic		33	OASIS9
July-August 2005	Hannibal	R/V	Pelagic		20	OASIS10
Nov-Dec 2006	Hannibal	R/V	Pelagic		33	OASIS11
July-August 2007	Hannibal	R/V	Pelagic		33	OASIS12

Detailed information

Main objective *(General objectives of the survey. Types of information collected during the survey) :*

The main objective of the echo-survey in Tunisian waters is to assess small pelagic stocks in the study area and to follow the spatial distribution of the main exploited species.

Complementary objective (if any):

Our main experimental survey was done in the hot season (summer) but the last year (2006), we have done our echo-survey in cold season (winter) to see if there are any differences.

Gear details (d*escribe the gear. If possible, add a plan of the sampling gear and its rigging) :*
Area (d*escribe in detail the area, including minimum and maximum depth) :*

For the experimental fishing operation, we use the semi-pelagic trawl 4FF with a vertical opening estimated at 7m. The power of the research vessel is about 1000 cv. The total time of the fishing operation is varied between 30 and 60 minutes with a speed of 3 knots. Annually, we prospect the same area (Tunisian waters) including the three Geographic-Sub-Areas (GSA 12, GSA 13 and GSA 14) (See map below).The minimum depth is around 20m and the maximum depth is about 200m or less.

Sampling design *(describe the number of hauls and the method used to select the sampling locations)*

Our sampling protocol is based on parallel transects and perpendicular to the line coasts, the distance between transects is about 10 Miles. The sounder used is SIMRAD EK 500 on 38 KHz. For the data analysis, we use the software MOVIES+.

Species recorded (*Indicate the number and main groups of species recorded (e.g. all fish, crustaceans, etc.) :*

The main target species are: Sardina pilchardus, Sardinella aurita, Engraulis encrasicolus, Trachurus trachurus, Trachurus mediterranaeus, Scomber scombrus and scomber japonicus.

Survey data management system (d*escribe the data storageand compilation method):*

Quality control (*Indicate the types of quality control applied to the survey (on protocol application, gear design, data, etc.)*

Estimates (*Give indicators estimates and possible trends)*

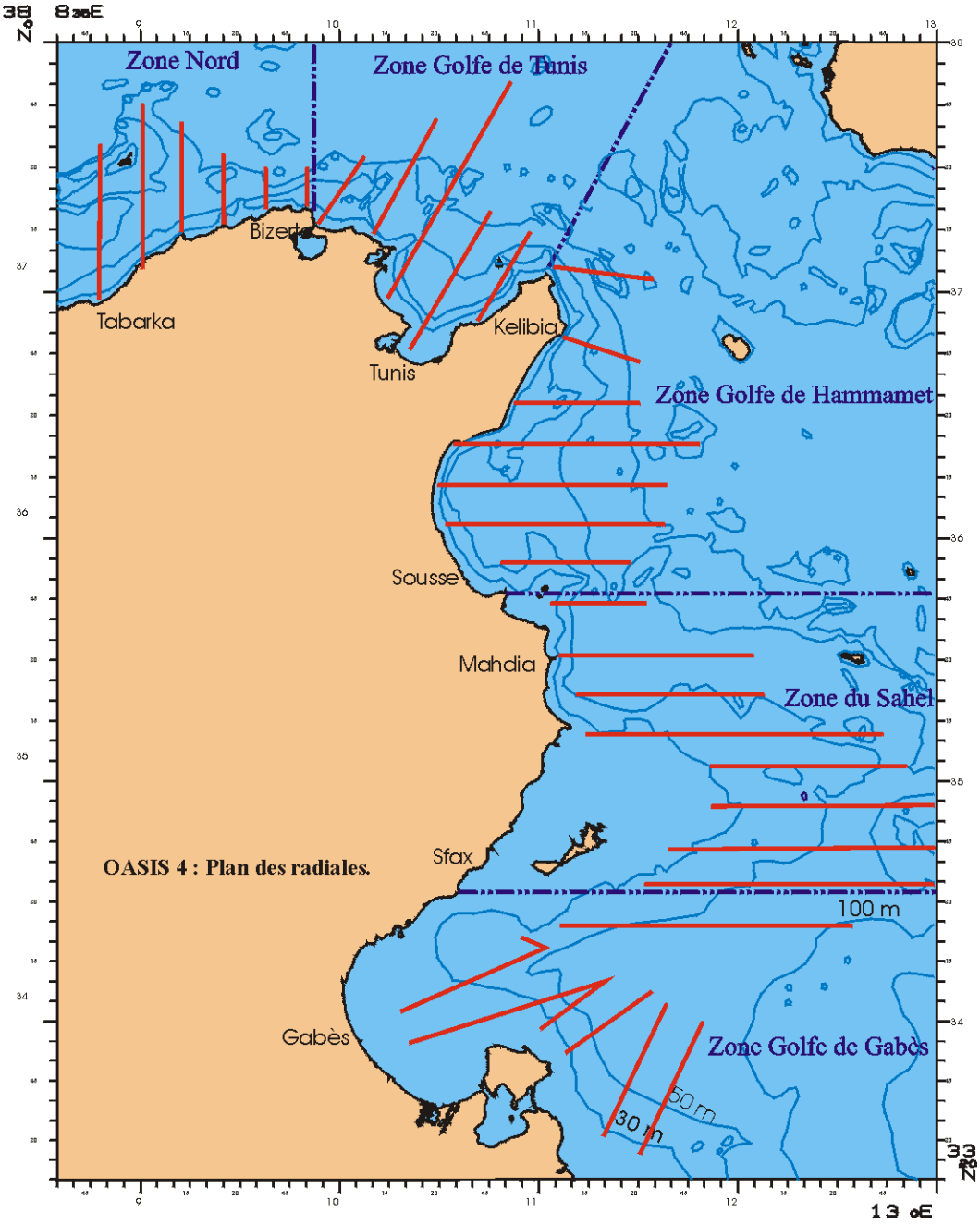
For each year, we elaborate the maps showing the abundance of the main small pelagic species and we estimate also the total biomass species by species.

Assessments of stocks (*Give assessments of stocks (if any) by using surveys data)*

In the stock assessment operation we are mostly interested to the annual catch potential for each species and with comparison with the commercial catches; we can deduce the exploited state. We give in the table below the obtained results year by year.

Position of hauls

Include a map with haul positions.



Position of graphs/tables for various estimates

Example of the obtained result on the exploitation Potential of small pelagic fishes in Tunisian waters (2004).

	Gabes gulf	Sahel	Hammamet gulf	Tunis gulf	North	Total	%
Sardine	11215	1543	11982	2448	1481	28669	22
Sardinella	2722	605	130	154	68	3680	3
Anchovy	5045	438	6486	1929	948	14847	11
Horse mackerel	8049	6210	5778	4745	2517	27300	21
Maquereau	12381	1235	8126	3052	116	24910	19
Bogue	6046	5227	1388	363	257	13281	10
S/T	45458	15258	33890	12691	5387	112687	85
Others	8243	9287	674	834	511	19548	15
Total	53701	24545	34565	13526	5897	132233	100

%	41	19	26	10	4	100	

Tunisia (Egge-larvae)

Overview of the survey

Survey title	Experimental Survey in Tunisian waters		
Survey code	ESPOIRS	Type of survey (bottom trawl, echo-survey, etc.)	**Eggs-larvae**
Country	Tunisia	Institute in charge	INSTM
Area	*GFCM GSA No 12 ; 13 and 14*	Period (2000 – 2006)	*Season of the survey (all season)*
Details of the survey. Link to:		http://www.....	

Overview of the series

In this table, give a list of the cruises performed in the frame of the survey series (one row by cruise). Period: date of beginning and end of the survey. Type of vessel: R/V: research vessel, C/V: chartered vessel.

Period	**Vessel**	**Type of vessel (R/V or C/V)**	**Gear**	**No. Tows planned**	**No. Valid Transects**	**Comments (Survey Code)**
August 2000	Hannibal	R/V	Bongo		22	ESPOIRS0
August 2002 October 2002	Hannibal	R/V	Bongo		29	ESPOIRS1
February 2003	Hannibal	R/V	Bongo		29	ESPOIRS2
April 2003	Hannibal	R/V	Bongo		29	ESPOIRS3
August 2004 July 2005	Hannibal	R/V	Bongo		29	ESPOIRS4
July 2006	Hannibal	R/V	Bongo		71	ESPOIRS5
	Hannibal	R/V	Bongo		68	ESPOIRS6
	Hannibal	R/V	Bongo		40	ESPOIRS7

Detailed information

Main objective *(General objectives of the survey. Types of information collected during the survey):*

The main objective of this kind of survey is to study the spatial and temporal distribution of eggs and larvae of three small pelagic species (Sardina pilchardus, Sardinella aurita and Engraulis encrasicolis) particularly in Tunis gulf (GSA12) and in Hammamet gulf (GSA13). This study can help us to determinate the spawning and the nursery areas of the mentioned species. .

Complementary objective (if any):

In our studies we try also to correlate the spatial and temporal distribution of eggs and larvae to the environmental factors us salinity, temperature and current and to the distribution of zooplankton and phytoplacton in the area.

Gear details (d*escribe the gear. If possible, add a plan of the sampling gear and its rigging):*
Area (d*escribe in detail the area, including minimum and maximum depth):*

For the experimental fishing operation to collect eggs and larvae, we use bongo net (335 and 505 µm) with vertical opening of 60cm. the speed during the collect is about 3 knots. For each station we try to collect samples of water and we measure the salinity, the temperature, the dissolved oxygen, CTD profile, transparence, turbidity, the current speed, the nutritive salt, the chlorophyll a and the phytoplankton. .Our prospecting concern particularly Tunis gulf and Hammaet gulf (See map below).

Bongo net (60 cm (335 ET 505 µm))

Sampling design *(describe the number of hauls and the method used to select the sampling locations) As showed in the maps below, the sampling protocol is based on the grilled stations separated by the same distance.*

Species recorded (*Indicate the number and main groups of species recorded (e.g. all fish, crustaceans, etc.):*

The main target species are: Sardina pilchardus, Sardinella aurita and Engraulis encrasicolus.

Survey data management system (d*escribe the data storage and compilation method):*

Quality control (*Indicate the types of quality control applied to the survey (on protocol application, gear design, data, etc.)*

Estimates (*Give indicators estimates and possible trends)*

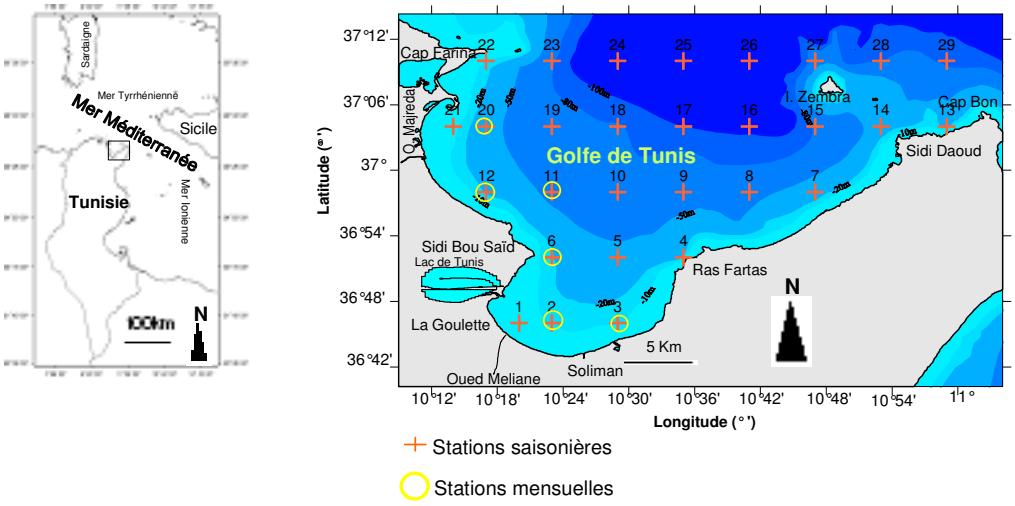
For each year, we elaborate the maps showing the abundance and the distribution of eggs and larvae of the main small pelagic species. We also, elaborate the maps showing the spatial distribution of the

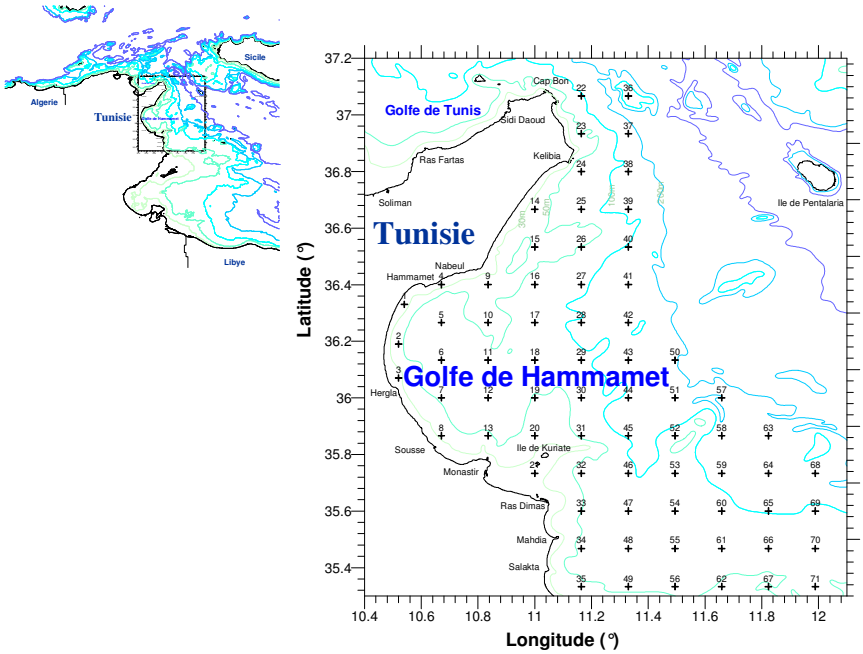
salinity, the temperature, the chlorophyll a, the dissolved oxygen and the phytoplankton.

Assessments of stocks (*Give assessments of stocks (if any) by using surveys data)*

Until now, we didn't use the data to estimate the biomass of the small pelagic species. In the future, we will plan to apply the DEPM.

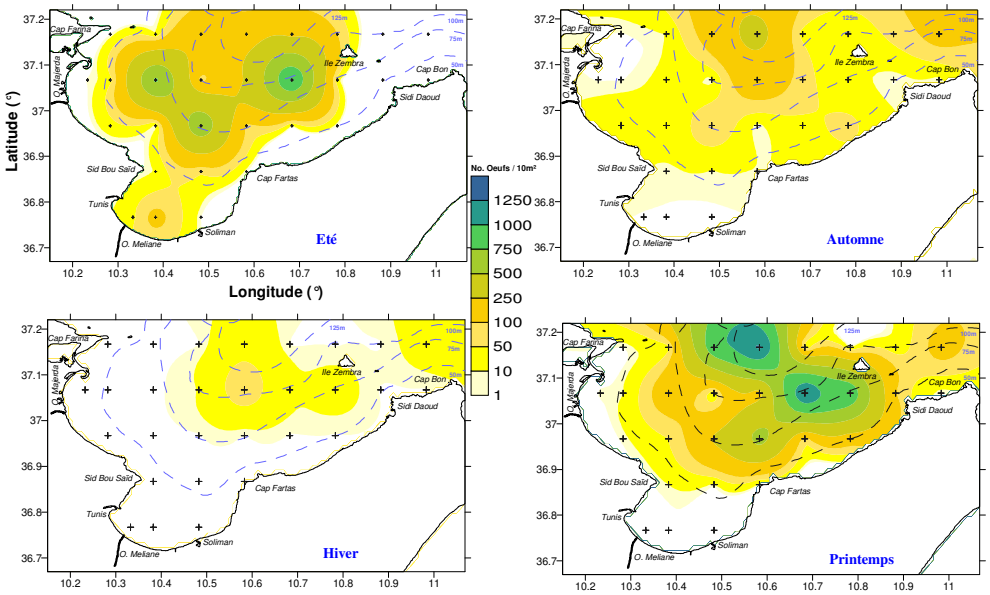
Position of hauls



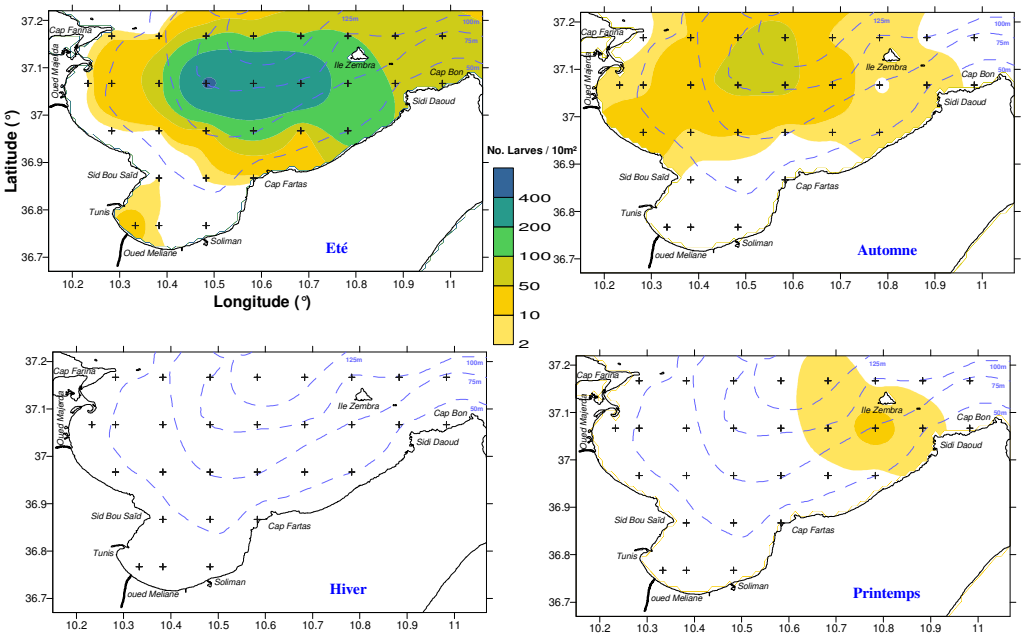


Position of graphs/tables for various estimates

Some example of eggs and larvae distribution on Tunisian waters**.**



Spatial distribution of eggs of anchovy in Tunis gulf (2004).



Spatial distribution of larvae of anchovy in Tunis gulf (2004).