

**REPORT OF THE SUB-REGIONAL WORKING GROUP ON DEEP WATER
BIOLOGICAL RESOURCES IN THE EASTERN MEDITERRANEAN
ATHENS, GREECE 12 – 15 JUNE 2012**





**FOOD AND AGRICULTURE
ORGANIZATION
OF THE UNITED NATIONS**



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**ITALIAN MINISTRY OF AGRICULTURE, FOOD
AND FORESTRY POLICIES**



**Hellenic Ministry of
Foreign Affairs**

**Hellenic Ministry of Rural
Development and Food**



GCP/INT/041/EC – GRE – ITA

Athens (Greece), March 2013

The conclusions and recommendations given in this and in other documents in the *Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean* series are those considered appropriate at the time of preparation. They may be modified in the light of further knowledge gained in subsequent stages of the Project. The designations employed and the presentation of material in this publication do not imply the expression of any opinion on the part of FAO or donors concerning the legal status of any country, territory, city or area, or concerning the determination of its frontiers or boundaries.

Preface

The Project “Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean- EastMed is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by Greece, Italy and EC.

The Eastern Mediterranean countries have for long lacked a cooperation framework as created for other areas of the Mediterranean, namely the FAO sub-regional projects AdriaMed, MedSudMed, CopeMed II and ArtFiMed. This made it more difficult for some countries in the region to participate fully in international and regional initiatives for cooperation on fishery research and management. Following the very encouraging experience of technical and institutional assistance provided to countries by the other FAO sub-regional Projects,

EastMed

was born to support the development of regional cooperation and the further development of multidisciplinary expertise necessary to formulate appropriate management measures under the FAO Code of Conduct for Responsible Fisheries and the principles of the Ecosystem Approach to Fisheries (EAF) to ensure rational, responsible and participative fisheries management

The project’s **longer-term objective** is to contribute to the sustainable management of marine fisheries in the Eastern Mediterranean, and thereby to contribute to supporting national economies and protecting the livelihoods of those involved in the fisheries sector.

The project’s **immediate objective** is to support and improve the capacity of national fishery departments in the sub-region to increase their scientific and technical information base for fisheries management and to develop coordinated and participative fisheries management plans in the Eastern Mediterranean sub-region.

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Publications

EastMed publications are issued as series of Technical Documents (GCP/INT/041/EC – GRE – ITA/TD-00) and Occasional Papers (GCP/INT/041/EC – GRE – ITA/OP-00) related to meetings, missions and research organized by or conducted within the framework of the Project.

Occasionally, relevant documents may be translated into national languages as EastMed Translations (GCP/INT/041/EC – GRE – ITA/ET-00)

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ABSTRACT

The Sub-regional Working Group on Deep Water Biological Resources in the Eastern Mediterranean was held in Athens Greece, from 12 to 15 June 2012. The meeting was attended by scientists from Egypt, Greece, Italy, and Turkey. The meeting started with presentations on the descriptions of the fishing fleets (e.g. trawlers, vessels using shrimp traps) which target deep water demersal resources on the continental slope (500 – 800 m) in the Eastern Mediterranean, including the management actions currently in force. Studies on the available information on the distribution and biology of the main species, targeted by the fisheries (e.g. *Aristaeomorpha foliacea*, *Aristeus antennatus*, *Plesionika* spp., *Helicolenus dactylopterus*, etc.), in the Eastern Mediterranean were also presented. An interesting study was also presented on the Italian distant deep water fisheries in the Central – Eastern Mediterranean. The participants recognised the importance of the occurrence of shared stocks in deep waters, which are exploited by several countries. However the group highlighted the problem that there is a lack of information on basic data such as catch and effort, from the fleets exploiting the demersal resources. In this respect the group agreed to firstly start collecting some basic data in the region, and devised a standard questionnaire which will be used to interview the fishers on their fishing activity in deep waters and the respective catches. This will give the basic data on which further scientific analysis and advice for management of the deep water demersal resources could be given.

Table of Contents

1. Opening of the meeting and designation of the Chairperson.....	7
2. Presentations on descriptions of the fishing fleets (e.g. trawlers, vessels using shrimp traps) which target deep water demersal resources on the continental slope (500 – 800 m) in the Eastern Mediterranean, including the management actions currently in force.....	8
3. Compilation of a list of studies and surveys on deep water demersal resources in the eastern Mediterranean.....	8
4. Presentations of data on the distribution and biology of the main species targeted by the trawl fishery (e.g. <i>Aristaeomorpha foliacea</i> , <i>Aristeus antennatus</i>), in the Eastern Mediterranean	12
5. Presentation of data on the distribution and biology of the main species targeted with other fishing gears (e.g. shrimp traps for <i>Plesionika</i> spp)	23
6. Identification of shared stocks on the continental slope in the Eastern Mediterranean....	26
7. Determination of the problems in the collection of catch, effort and biological data & 8. Solutions and methodologies on how the problems in data collection could be solved...	26
9. Development of a workplan within the framework of the EastMed project on which actions are required in order to improve the management of the deep water resources...	27
10. References.....	30
Annex I List of participants	32
Annex II Agenda.....	34
Annex III Terms of Reference	36
Annex IV Questionnaire	37

REPORT OF THE SUB-REGIONAL WORKING GROUP ON DEEP WATER BIOLOGICAL RESOURCES IN THE EASTERN MEDITERRANEAN

ATHENS, GREECE

12 – 15 JUNE 2012

1. Opening of the meeting and designation of the Chairperson

During the third co-ordination meeting of the EastMed project held in Bari, Italy, from the 19th to the 20th of April 2012, the countries proposed new activities to be carried out in the 3rd year of the project. Within these proposals, there was also the organization of a working group on deep water biological resources in the Eastern Mediterranean. The objectives of the working group was to discuss, exchange ideas and collaborate in order to improve the knowledge on deep-water resources, to identify gaps in data, assessment and management and to assist in the establishment of a management regime for these resources in the Eastern Mediterranean. The working group on deep-water biological resources in the Eastern Mediterranean was held in Athens, Greece, from the 12 to 15 June 2012. The meeting was attended by scientists from some of the countries participating in the project namely Egypt, Greece, Italy and Turkey. The list of participants is given in Annex I.

Mrs Konstantina Karlou-Riga, Coordinator of the EastMed Project, welcomed the participants and thanked them for attending the meeting. She presented the scope and objectives of the working group, emphasizing the importance of fisheries research for the sustainable management of fisheries resources in an area characterized by the lack of information and scientific advice. She introduced the agenda (Annex II) and the terms of reference (Annex III). The agenda was adopted by the participants without any changes. The participants appointed Mr. Argyris Kallianiotis, as chairman. After the appointment of the chairman all the participants introduced themselves to the meeting.

Mr. Kallianiotis emphasized the importance of the working group on deep water biological resources, which particularly for Greece could offer a big opportunity for investigating the possibility of exploring those resources with important economic benefits for the country. He highlighted the research work which has already been done in the Ionian Sea and that a considerable number of projects have been held both in partnerships with Italy and within the framework of the European Union. The problem was that although research has been conducted there is a lack of joint management for the deep water biological resources, which was the reason for setting up the working group. The chairman pointed out several points that should be discussed, including:

- Definition of the deep water zones
- Which fisheries are considered to have impact on deep water resources?
- Which resources seem to be the most vulnerable?
- The existing gaps
- Ghost fishing
- Shared stocks in the region
- The issue of *Pagellus bogaraveo*

2. **Presentations on descriptions of the fishing fleets (e.g. trawlers, vessels using shrimp traps) which target deep water demersal resources on the continental slope (500 – 800 m) in the Eastern Mediterranean, including the management actions currently in force.**

Deep-water fisheries and resources and management actions related in the Eastern Mediterranean with particular emphasis in the Eastern Ionian

by Mytilineou Ch., Anastasopoulou A., Kapiris K. & Kavadas S.

Deep-water fisheries and resources have been studied extensively during the last decades all over the world. Deep-water fisheries are very limited in the Eastern Mediterranean Sea, with the exception of the case of the Italian fleet. Some deep-water resources, such as red shrimps, have been studied in the areas where they are exploited; however, a large amount of biological information is still lacking. In the Greek waters, deep-water fisheries are very sporadic, carried out by bottom trawlers targeting red shrimps, *Aristaeomorpha foliacea* and *Aristeus antennatus* (Figure 1a) and by gill netters, long liners and hand liners targeting *Pagellus bogaraveo* (Figure 1b) and *Merluccius merluccius*. The depth where these fisheries are conducted ranges between 400-800 m. Deep-water fishing activities of the Greek fleet seem to be more important in the Eastern Ionian than in the Aegean Sea. Italian trawlers are also operating in both areas, but the landings are not registered. Problems and proposed solutions related to the collection of catch, effort, biological information and management measures were also discussed.

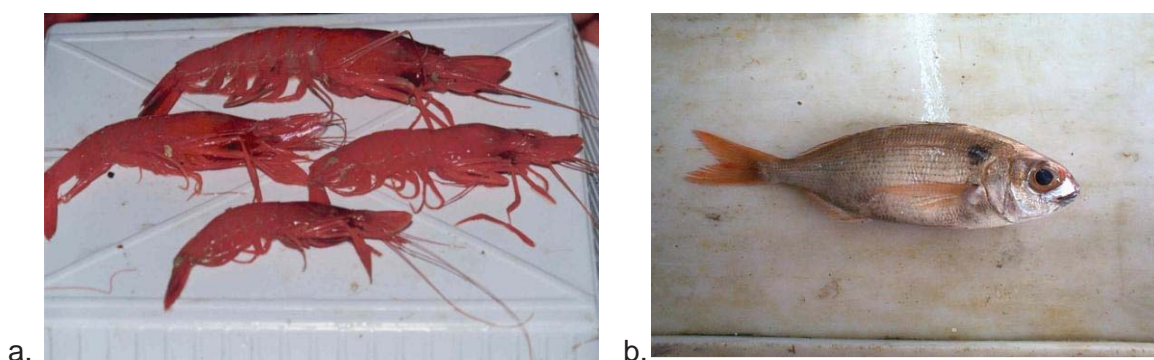


Figure 1. *Aristeus antennatus* (a) & *Pagellus bogaraveo* (b)

3. **Compilation of a list of studies and surveys on deep water demersal resources in the eastern Mediterranean**

Scientific projects carried out in the deep waters of the Eastern Ionian Sea by the Hellenic Centre of Marine Research (HCMR)

by Kapiris K., Mytilineou Ch. and Anastasopoulou A.

In this presentation all the scientific projects carried out by the Institute of Marine Biological Resources of the Hellenic Centre for Marine Research (HCMR) related to the deep water resources were presented. All the projects have been implemented in the Ionian

Sea and are running from 1996 until almost the present day. Almost all the programs have been realized with the cooperation of other partners, such as the University of Bari, University of Cagliari, CEMARE, University of Ireland, IFREMER, CSIC, CONISMA, IEO, COISPA, etc. The main goal of the Institute is to continue the research of these resources in the Ionian Sea and to be actively involved in new research projects related to the deep water communities of the Aegean Sea. The sustainable exploitation of these resources is undoubtedly included among the aims of HCMR.

Experimental fishing using fish traps in South East Aegean Sea

by Kallianiotis A.

In the period 2000-2001, experimental fishing was conducted using fish traps, in the sea area between the islands of Astypalea, Kalymnos and Kos at depths from 300-600 m (Figure 2). Sampling stations placed along a transect from the South-West of Kalymnos to the area between Astypalea and Anafi Islands.

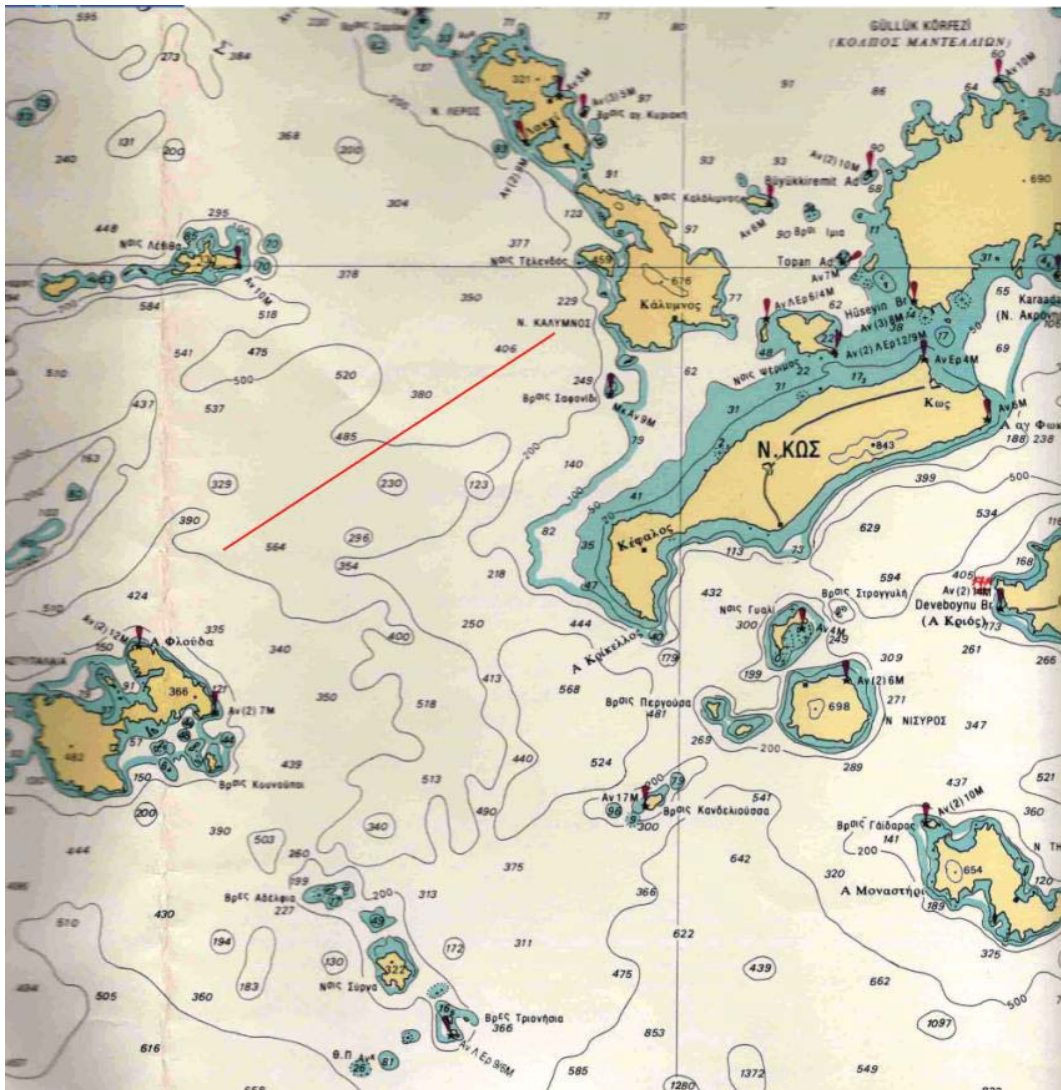


Figure 2. Location of the experimental fishing

For the needs of sampling, creels were imported from Scotland, where they are used to catch Norway lobster in relatively shallow waters (Figure 3). In the southern Aegean where the creels were intended to be used, the distribution range of the species covers bigger depths. The main objectives of the experimental fishing were to find the density of the target species of crustaceans and fish in the area of Southeastern Aegean, to evaluate the performance of the imported traps in conditions different than those for which they were constructed and also to examine the ability of their use by the coastal fleet, which has limited capacity to fish in deep waters.



Figure 3. Creels used in Scotland for Norway lobster fishery

The results showed that starting from the shallowest area of 300 meters up to depths of 600 meters, there was a continuous overlapping of different species associations where crustaceans and fish were included. From the crustaceans the genus *Plesionika* was found to occupy the entire area from 300-600 meters, with different species composition depending on the depth. *Nephrops norvegicus* was caught in the deeper limit of the sampling zone, between 500 and 600 meters, with greater abundance in deeper waters. Apparently the species distribution continues in the deeper zone of the region. In the same area almost with the same density, *Pagellus bogaraveo* and *Helicolenus dactylopterus* were also caught, of which the length composition was directly proportional to the depths between 300 and 600 meters. In the deeper limit of 500 m depth, the abundance of the *H. dactylopterus* was larger and probably the range of the species extends into even deeper waters. These findings show that fishing with traps in deep waters, can be an alternative fishing method for large mainly coastal vessels, having sufficient power to haul the traps from these depths.

A compilation of projects carried out in Ionian Sea and dealing with deep sea resources

by Spedicato M. T.

A number of studies related to the distribution and evaluation of deep waters resources carried out in the Ionian Sea by scientists of different Institutions from eastern and western sides are enumerated including relevant literature records. The following projects can be considered as the most important: 1) INTERREG-II –DiReMaRe, which was carried out in 1999-2001 by CoNISMa, HCMR, COISPA and which aimed in studying the distribution of renewable deep marine resources; 2) the REDs project, which was carried out at European level during 2003-2004, involving 7 partners and which focused to the status of deep-sea red shrimps populations in the central and eastern Mediterranean sea and 3) the RESHIO project, which was carried out during 2000-2001 by HCMR and the University of Bari (Italy), aiming in the exploration of pristine red shrimp resources and comparison with exploited ones in the Ionian sea. The group was also informed that in the framework of the MAREA (Mediterranean Alieutic Resources Evaluation and Advice) Consortium, which has been formed to assist the European Commission in different specific projects, an Inventory of existing data has been established where also information regarding project relevant to EastMed has been stored. The group was also informed that within the MAREA framework, the ongoing project MEDISEH is focused on the compilation and mapping of environmental and fisheries related information in the Mediterranean Sea by means of Geographical Information Systems (GIS). This project can provide relevant information on the shared stocks in the Ionian Sea, while the forthcoming project STOCKMED in the MAREA framework, which is focused on ‘Identification of distinct biological units (stock units) for different species and among different GFCM-GSAs’ will give a clear picture on the shared stocks including those in the Ionian Sea. In addition, the MEDITS project that is a standardised source of information in many areas of the Mediterranean can be considered a forum in which specific research projects can be launched. Thus synergies can be put forward to cooperate at improving the level of knowledge on the shared stocks in the area. Some information obtained at anecdotal level were also given regarding the activity of a small number of vessels (<10 vessels ~25m LFT) from the south Adriatic sea that seasonally and irregularly operate a deep fishery in the Ionian sea since 10-12 years. The behaviour of these vessels is opportunistic, depending also upon the competition with other fleets.

Discussion

A question was raised if there are any Spanish - type traps used in the area. The Greek scientists mentioned that some Spanish - type traps were introduced during the last years, before the legislation was established. They also mentioned that in the new legal framework, the operational use of the traps is described in details. Despite that legislation, the use of Spanish - type traps on Pandalidae, still takes place in Kalymnos, Symi and Tilos. In those islands, vessels are small and the fishers prefer to sell their catches in the local market. Spanish vessels, on the contrary, fish in the whole region of the Mediterranean; they freeze the catches in deep freeze in order to conserve them and transfer them back to their country. The Greek scientists raised the point on whether the exploitation in deep water is cost effective. The chair commented that such an activity demands big vessels which eventually could be equipped with the needed traps.

4. Presentations of data on the distribution and biology of the main species targeted by the trawl fishery (e.g. *Aristaeomorpha foliacea*, *Aristeus antennatus*), in the Eastern Mediterranean

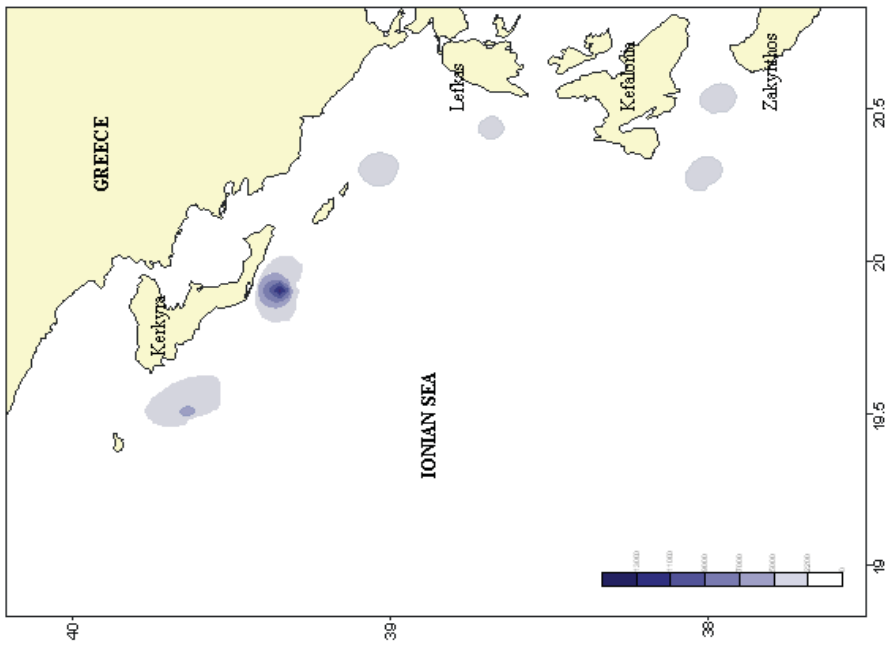
Distribution and biology of the most important species in the deep waters of the Eastern Ionian Sea, mainly for *Aristaeomorpha foliacea* and *Aristeus antennatus*

by Kapiris K., Mytilineou Ch. and Anastasopoulou A.

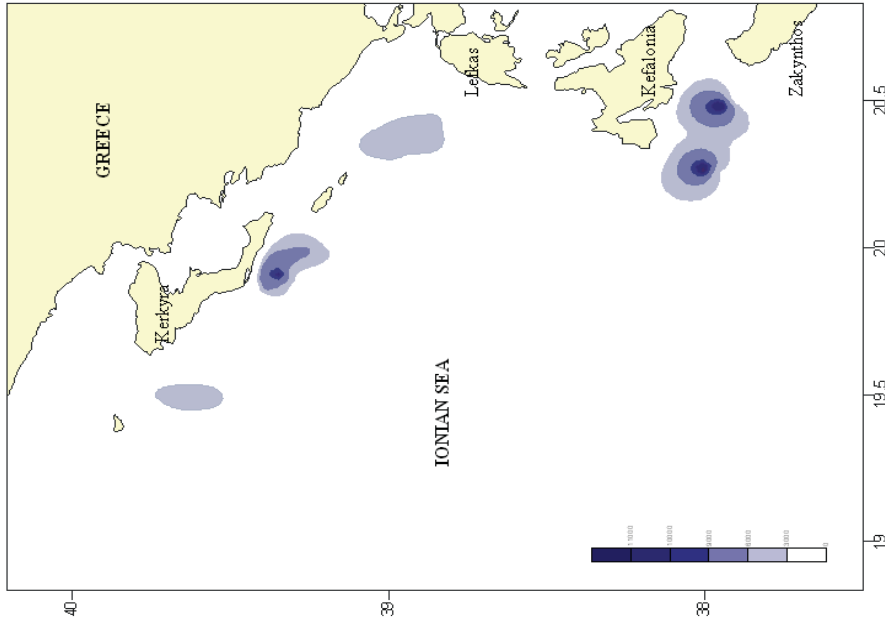
A detailed description of the project's scientific results carried out in the deep waters of the Ionian Sea was given. The general objectives of the various projects, the methodology used and the most important results were provided. The abundance, the biomass and the catch of the experimental surveys of all deep water resources were presented, with a focus mainly on both deep-water shrimps [*Aristaeomorpha foliacea* (Figure 4 & 6) and *Aristeus antennatus* (Figure 5 & 7)].

The new records of some species (fish, crustaceans, cephalopods) in the whole area of the Ionian Sea and the catch differences between the unexploited deep-water resources of the Greek Ionian and the other exploited areas such as the Western Ionian Sea, present particular interest. Concerning both aristeids, analytical biological data estimated from samples caught in the E. Ionian Sea were given, including growth, age estimation, length frequency distribution, length-weight relationships, morphometry, feeding and reproductive studies. Additionally, for comparing reasons, similar data from exploited areas of Western and Central Mediterranean were presented.

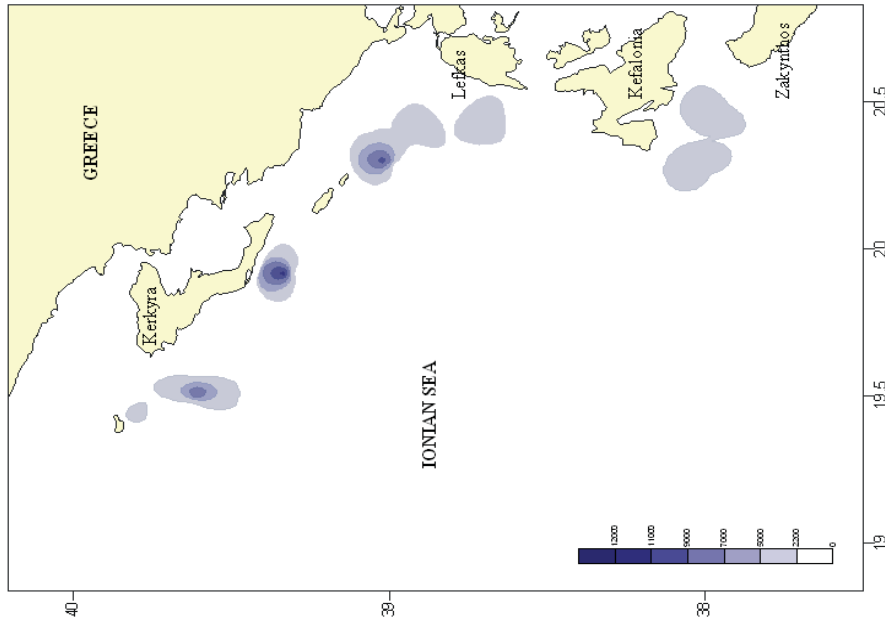
April 2000



July 2000



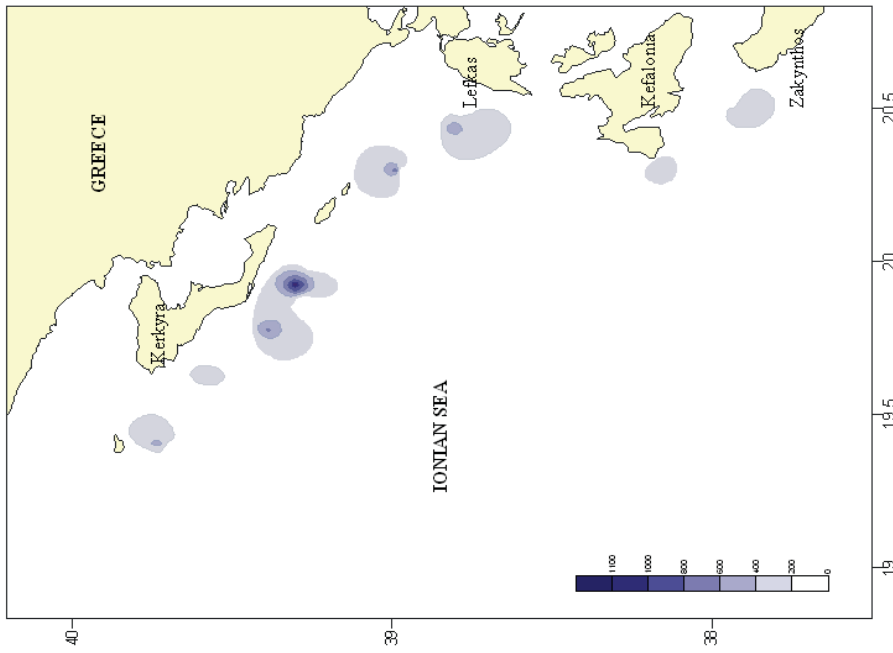
September 2000



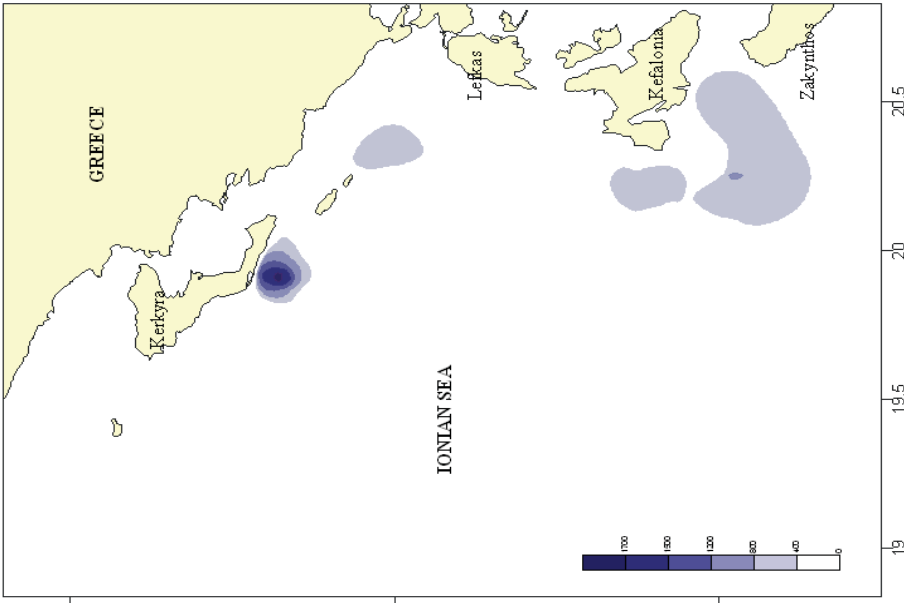
Area	Survey	Depth zone				
		300-500m	500-700m	700-900m	>900m	
Greek Ionian Sea	September-October 1999	0.00	1.54	2.49	0.03	
	April 2000	0.00	4.29	1.79	0.00	
	July 2000	0.01	5.71	2.81	0.00	
Italian Ionian Sea	September 2000	0.00	5.84	1.23	0.00	
	August 2000	0.00	0.57	0.00	0.00	

Figure 4. Geographical distribution (N/Km^2) of *Aristaeomorpha foliacea* in the Eastern Ionian Sea, north part

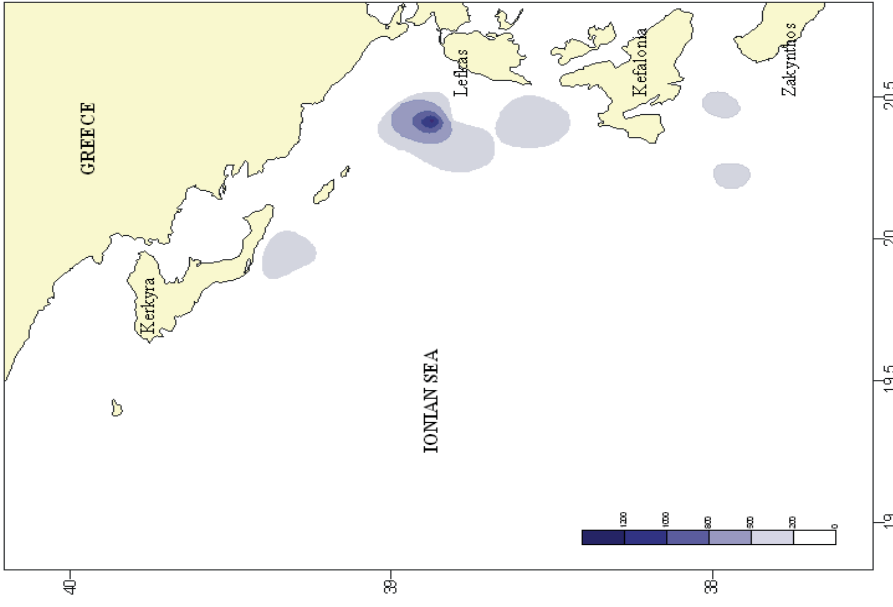
April 2000



July 2000



September 2000



Area	Survey	Depth zone			
		300-500m	500-700m	700-900m	>900m
Greek Ionian Sea	September-October 1999	0.00	0.00	0.60	0.03
	April 2000	0.00	0.53	0.74	0.01
	July 2000	0.00	0.65	1.07	0.05
Italian Ionian Sea	September 2000	0.00	0.39	0.29	0.03
	August 2000	0.00	2.34	0.50	0.03

Figure 5. Geographical distribution (N/Km^2) of *Aristeus antennatus* in the Eastern Ionian Sea, north part

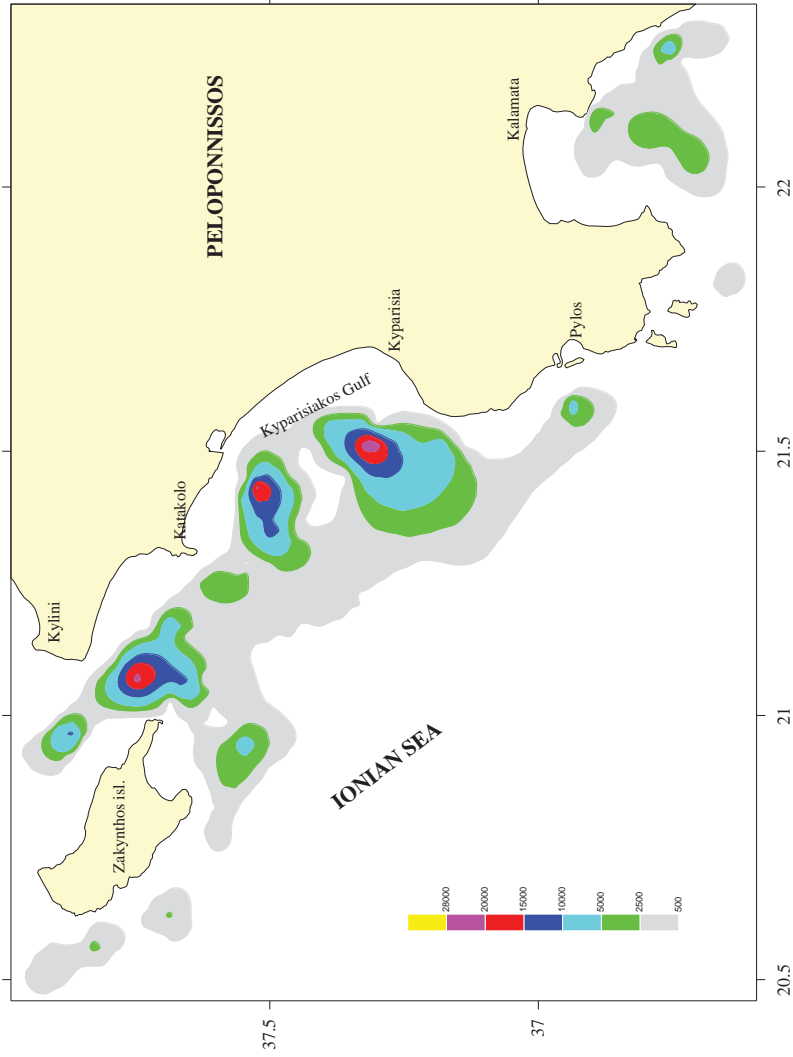


Figure 6. Spatial distribution and abundance (N/Km²) of *Aristaeomorpha foliacea* in the Greek Ionian Sea during September 2000 (exploratory survey), south part

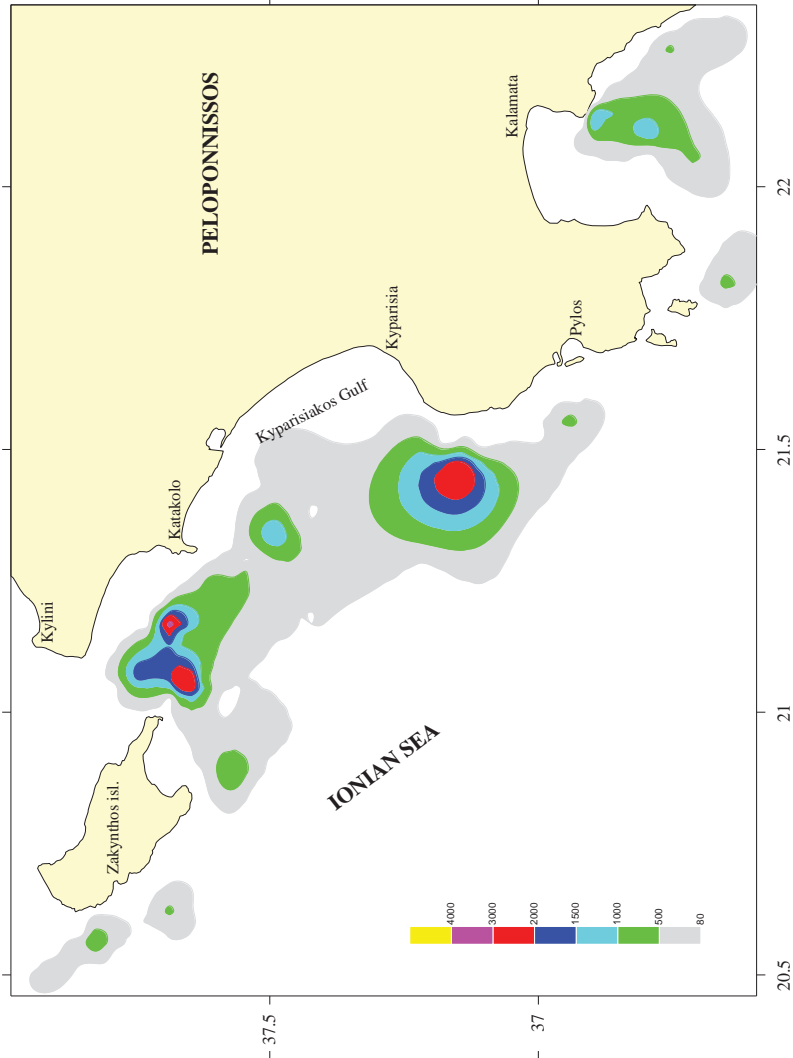


Figure 7. Spatial distribution and abundance (N/Km²) of *Aristeus antennatus* in the Greek Ionian Sea during September 2000 (exploratory survey), south part

Population structure, dynamics and fisheries of giant red shrimp *Aristaeomorpha foliacea* in Antalya Bay, Turkey 2012

by Deval M.C.

During a period of 12 months, between July 2010 and June 2011, from the stratum surveys (between 200 m and 800 m of depths) a total 16,228 specimens of *A. foliacea* were caught. The carapace length (CL) of males ranged from 12 to 48 mm with a mean of 33.8 mm, while that of females ranged from 13 to 61 mm, with a mean of 37.9 mm. The bathymetrical and temporal distribution of abundance (N/km^2) of *A. foliacea* showed high fluctuations within each survey and depth stratum. High values of abundance (N/km^2) and biomass (kg/km^2) were found in the 500–600 m and 600–700 m depth zones, indicating that these are the main zones for the distribution of giant red shrimp in the Antalya Bay (Figure 8). Examining the monthly length frequency distribution (LFD) analysis, for both sexes of *A. foliacea*, it was found that the males exhibited 2–3 year modes, while females showed more (3–4 year modes). The main reproductive period is suggested to be from June to September. Fluctuations of CPUE values for *A. foliacea* have been noted. The values are changing between 0–5 kg/h by stratum surveys. Maximum CPUE values were found in depths from 500 m to 700 m.

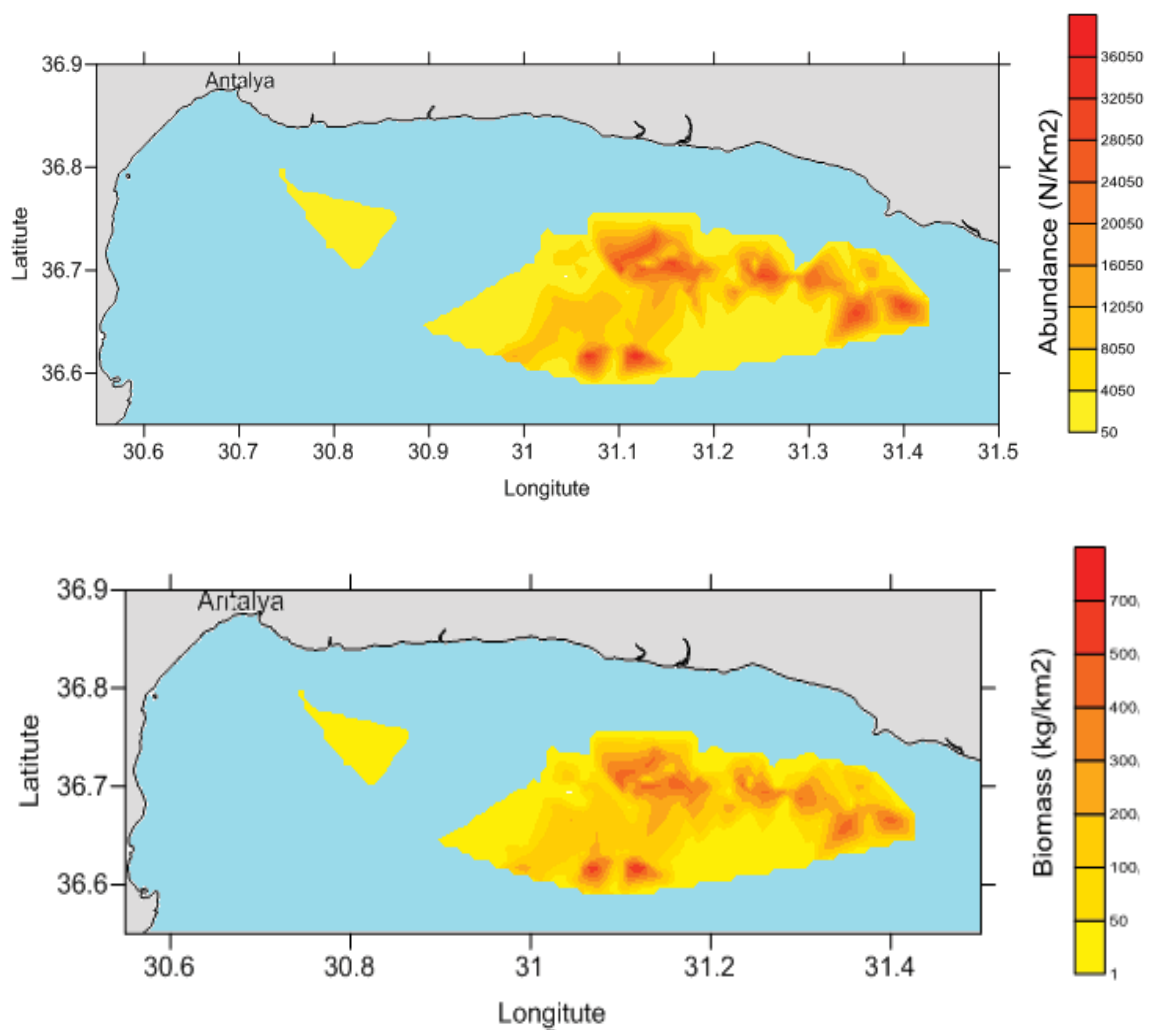


Figure 8. Abundance (N/Km^2) and biomass (Kg/Km^2) of *Aristaeomorpha foliacea* found between 500 and 700 m in the Antalya Bay.

Population structure, dynamics and fisheries of blackbelly rosefish *Helicolenus dactylopterus* in Antalya Bay

by Deval M. C, Kebapçioğđu T. and Güven O.



Figure 9. *Helicolenus dactylopterus*

Helicolenus dactylopterus (Figure 9) is distributed between 200 and 799 m depth range and it is extensively present between 300 and 499 m (Figure 10). Individual mean sizes change from 7.6 to 25.4 cm along with depth increase from 200 to 700 m. Female individuals compose 61% of the total, while males compose 38.8% of the total. Length-weight relationship computations show that the species has allometric growth ($TW = 0.0115 * TL^{3.11}$). Sperm transfer takes place from July to November, while spawning occurs from December to February. The first reproductive length (\bar{L}_{50}) is 17.3 for females and 21.8 for males. Catch length L_{50} is 7.4 cm for a PA44mm diamond mesh commercial codend. The longest individuals examined for age determination were 33.6 cm for females and 34.2 cm for males. The oldest ages identified was 19 (32.1 cm) for females and 21 (31.4 cm) for males. New recruitments are included to population between December and May. Von Bertalanffy growth parameters were determined as L_{∞} : 32.5 cm, K: 0.108 year⁻¹ ve t_0 : -1.549 year. The rate of natural mortality (M), total mortality (Z) and fishing mortality (F) were estimated at 0.28 year⁻¹, 0.46 year⁻¹ and 0.18 year⁻¹ respectively.

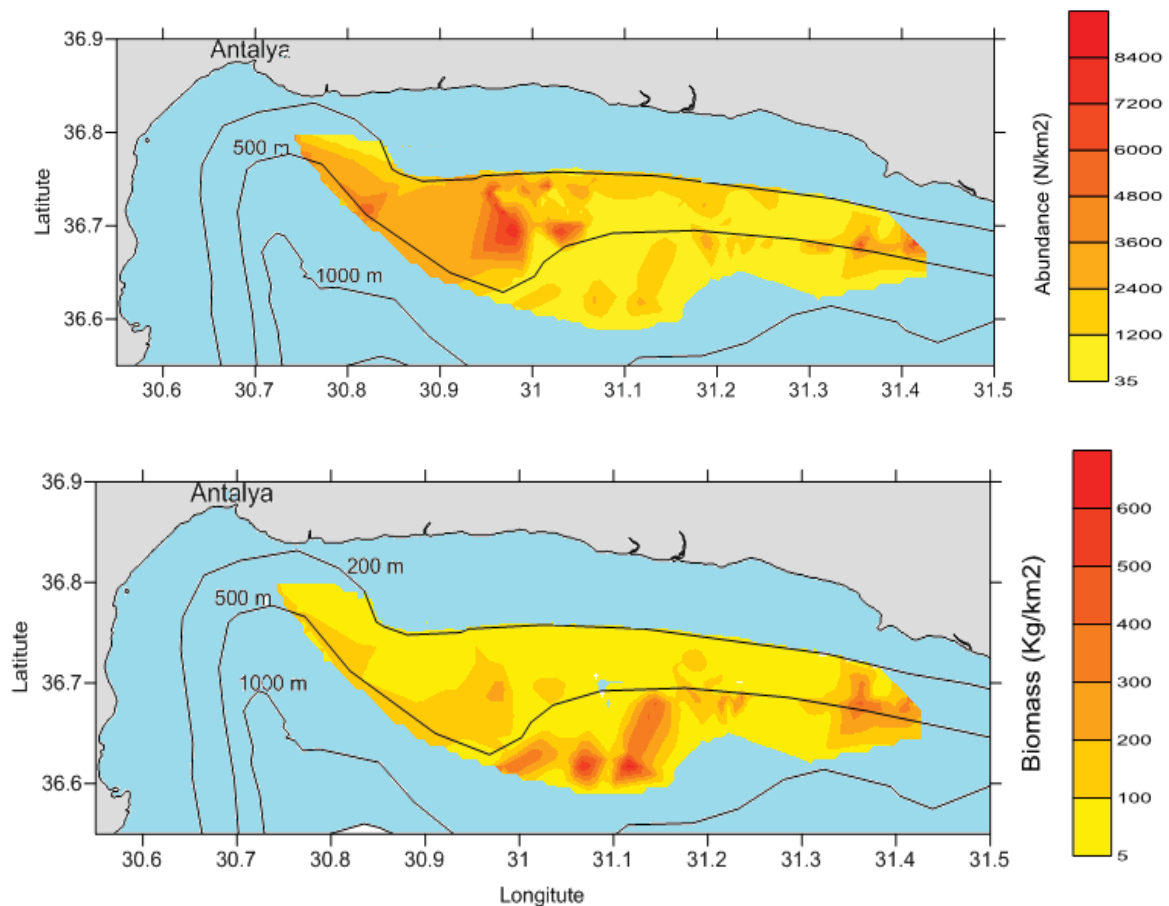


Figure 10. Abundance (N/Km²) and biomass (Kg/Km²) of *Helicolenus dactylopterus* in the Antalya Bay.

The Italian distant fisheries in the Central – Eastern Mediterranean. The case of Mazara del Vallo deep sea trawling

by Vitale S., Fiorentino F., Garofalo G., Gancitano V., Giusto B. and Sinacori G

In the Central-Eastern Mediterranean the deep water Crustacean Trawl Fishery (CTF) is the main form of deep-sea fishery that takes place on the lower continental shelf and the upper continental slope down to a depth of ca. 800 m. Not much is known about the biology or the impacts of fishing on several deep sea resources. The “Working Group on deep water biological resources” organized in the framework of the EastMed project gave the important opportunity to highlight the main Italian distant fisheries in the Central-Eastern Mediterranean. The presentation focused on the current activity of the commercial trawl fishery from Mazara del Vallo, which is located in the South Eastern Sicily and is one of the most important fishing harbours in the Mediterranean basin. The Mazara del Vallo CTF has been increasing since the 1960s targeting the Giant red shrimp *Aristaeomorpha foliacea* (Risso 1827). From the central to eastern side of the basin a number of fishing grounds with different levels of trawling pressure can be found. The progressive decrease in the catch rate of deep water shrimp (Figure 11) and the absence of deep trawling in the Eastern Mediterranean have driven some boats to fish around Crete and Cyprus and off the Turkish coast since 2004. Comparing the catch rates from fishing grounds with different exploitation history in the Central-Eastern Mediterranean, the

highest value was observed around the Maltese Islands and in the fishing grounds of the Eastern Mediterranean which have been being exploited since 2004 (Figure 12).

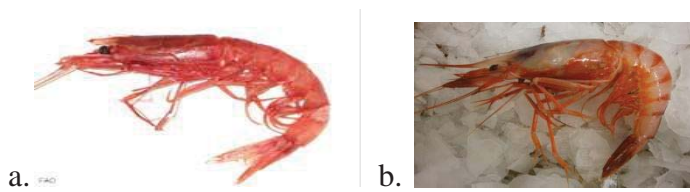
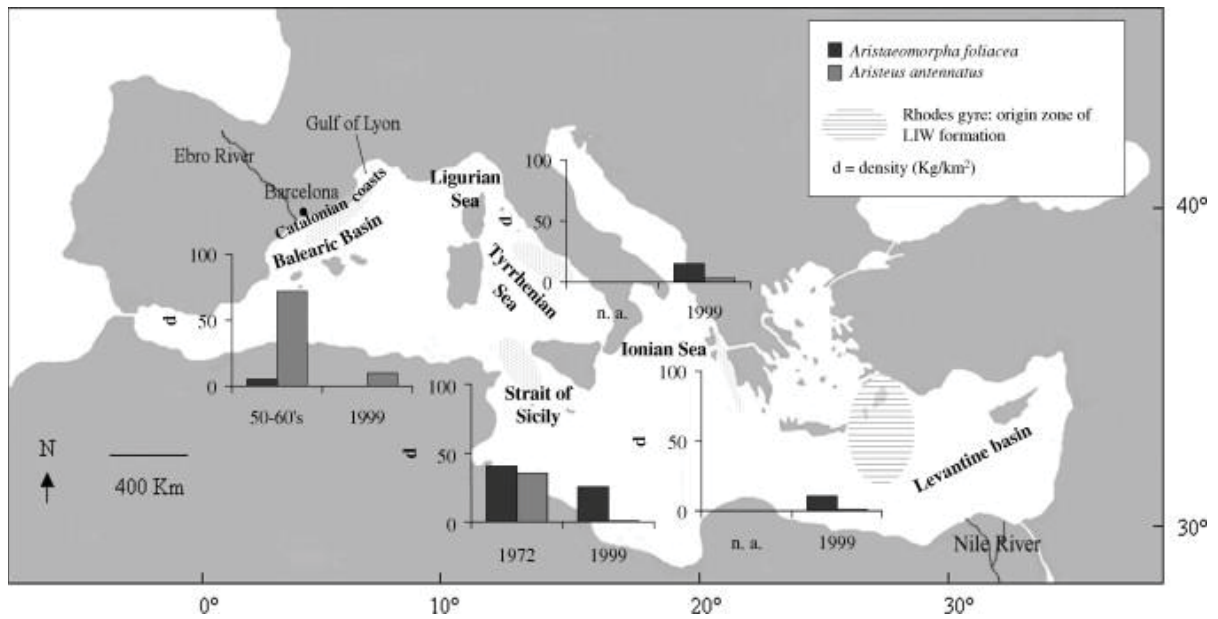


Figure 11. Geographical distribution and abundance of *Aristeus antennatus* (a) and *Aristaeomorpha foliacea* (b) in the Mediterranean Sea.

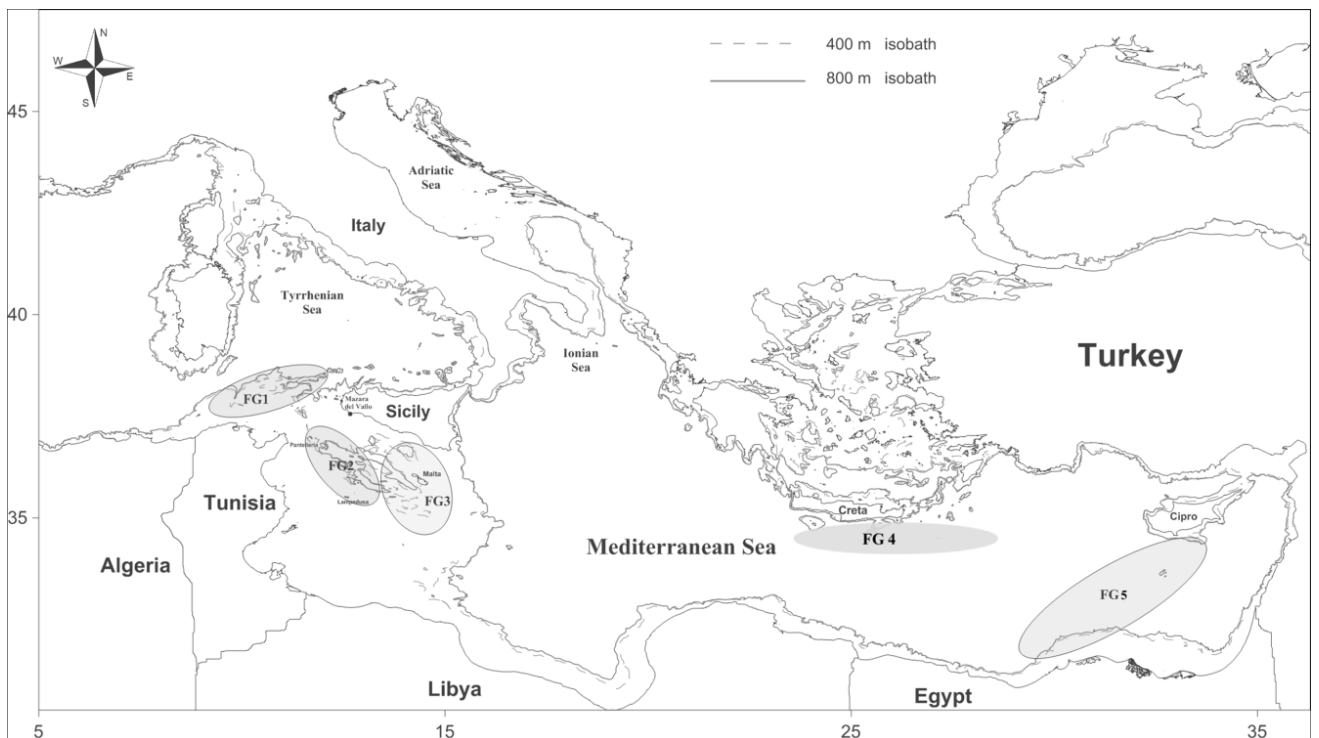


Figure 12. Five macro-fishing-grounds progressively exploited by trawler fleet of Mazara del Vallo

Moreover, comparison of the investigated length-frequency distribution of Silver roughy, *Hoplostethus mediterraneus* (Cuvier 1829) (Figure 13), among fishing grounds with different exploitation level in the Central-Eastern Mediterranean, indicates that deep water trawling may induce longevity-overfishing. Finally the results of the stock assessment of Giant red shrimp in GSAs 15 (Maltese Islands) and 16 (South of Sicily) highlighted that this resource is overfished since the current fishing mortality ($F_c=0.90$) is higher than both F_{max} and $F_{0.1}$. Considering the high consistency of results throughout the methods used, $F_{max} = 0.70$ was proposed as a Limit Reference Point (LRP), whereas $F_{0.1}=0.40$ as a Target reference point (TRP).



Figure 13. *Hoplostethus mediterraneus*

Studies in the deep waters in Egypt

by Lotfy M.

In 2010 the Egyptian fishing fleet consisted of about 3092 engine vessels and about 1541 sailboats. About 1128 vessels use a trawler net, 239 vessels use a purse seine, 1199 use a long line and about 526 use trammel nets (Figure 14).

Egypt has 10 ports in the Mediterranean Sea. In this area various species of shrimps are caught (e.g. *Metapenaeopsis stridulans*, *Trachypenaeus curvirostris*, *Metapenaeus stebbing*). In the Egyptian fleet catch red shrimps are being caught occasionally (Figure 15), however there is no data available on landings. The total catch of shrimps is 10,563t and it represents 13% of the total catch. The Egyptian vessels are not equipped to fish below the 200 m in deep waters. Egypt is expecting to benefit through the assistance of the EastMed project to fish in deep waters.

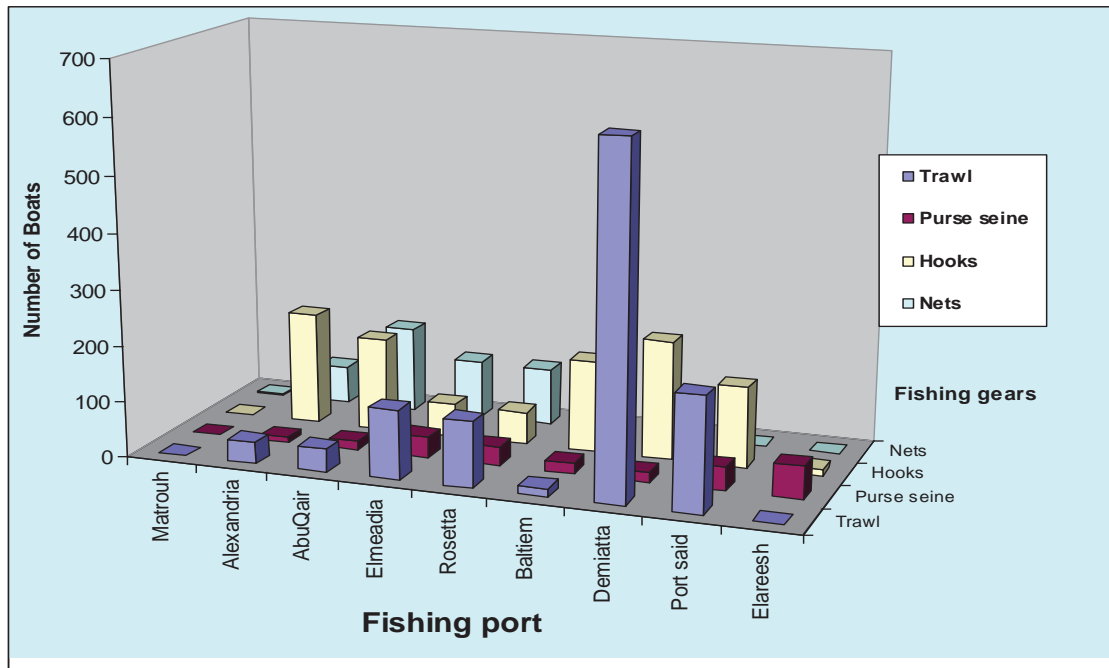


Figure 14. Distribution of fishing boats on the Mediterranean coast of Egypt

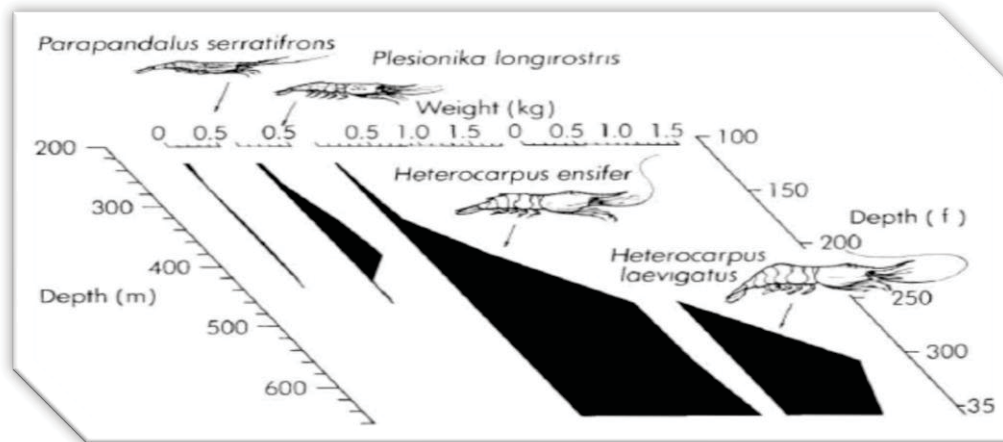


Figure 15. The depth distribution of the four most abundant deepwater shrimps in the Egyptian waters

Discussion

A discussion started about the existence of *Aristaeomorpha foliacea* in various regions of Greek waters. As it was mentioned by the Greek scientists, although a small sample of *Aristaeomorpha foliacea* is reported, red shrimps are abundant in the Ionian and the Cretan Sea, as opposed to the Aegean Sea. Juveniles inhabit lower depths than the adults. This information comes from the routine MEDITS survey conducted in Greek waters down to 800 m. The Greek delegation also mentioned that Greece needs a more extensive

sampling program, focusing on deep waters. A monitoring process is absolutely necessary process for the evaluation of the stocks.

A study was mentioned (Dimech *et al.*, 2012) which showed the positive effects of fishing on the production of red shrimps and that grooming the bottom by fishing activities seems to increase the yields. The Greek scientists added that the reproduction period of *Aristaeomorpha foliacea* is during June and July, when MEDITS takes place. The Italian scientists commented that there are various rates of growth in different areas, depending on climatic conditions. The Turkish scientist finally mentioned that in the South of Turkey *Aristaeomorpha foliacea* is abundant.

Data coming from the Greek projects (Anon., 2001) carried out before the Italian fishery started, gave the opportunity to consider the total mortality as equal to the natural one in the absence of the Greek fishery (Papaconstantinou, Kapiris, 2001, 2003). That value was indeed used by Greek and Italian scientists when working later on the surveys data from the area (EU RED project; AAVV 2008).

It was mentioned that the abundance of red shrimps in the Northern Ionian Sea showed increase in the last years, which is possibly related to the increase of the temperature in 2008, leading to the increase of the recruitment. A general discussion was raised regarding the number of stocks in the Ionian; however, it seems that only one stock exists. This was also supported by the genetic analysis which clearly showed the existence of one stock in the area isolated from the rest of the Mediterranean (Fernández *et al.*, 2011a, b; Cannas *et al.*, 2011)

With respect to Turkey and the selectivity studies (Deval *et al.*, 2009; Deval *et al.*, 2010; Deval, 2012 - unpublished data) done on red shrimps, it was mentioned that almost similar length frequencies were observed by the use of five types of net (PE40S, PA44DM, PA44S, PA50DM and PA50T90) and the study showed that mesh type does not influence the commercial catch of red shrimps, which is also indicative of the high abundance in the region. It was noted that the observed L_{50} values by the use of commercial (44DM) and four other codends showed that L_{50} values of meshes are less than first maturation sizes of *A. foliacea* and *A. antennatus*. According to the Turkish scientist, the number of vessels operating in Antalya Bay is about 20 although the local ones number up to 6. However no data regarding the catches have been registered yet in region. Finally the Turkish scientist mentioned that the fishing operations are taking place within 2 miles from the coast and limitations on minimum mesh size and closed period also exist but there is not a minimum landing size for any shrimp species.

With respect to Egypt it was clarified that the shrimp species are not caught deeper than 200 m depth. This is due to the fact that the Egyptian trawl fleet is not well equipped to fish below 200 m. The continental shelf of the Nile delta is very extensive and can extend up to 40 nautical miles in certain areas. Fishers restrict their trawling activity within this depth zone. The EastMed project has noticed however, the presence of *Aristeus antennatus* in the fish market of Ras el Bar port in the Damietta region, which means that some red shrimps are being caught and landed but not registered. This seems to be a general problem in the EastMed region. Fishers have mentioned that the red shrimps are caught in the deeper part of the Eastern Delta Region, close to the Gaza Strip and that fishers fish at about 500 m in depth but this fishing activity is not common and it is only done occasionally.

5. Presentation of data on the distribution and biology of the main species targeted with other fishing gears (e.g. shrimp traps for *Plesionika* spp)

Fishing trials on the deep shelf and upper slope of South Lebanon

by Colloca F. and presented by Ardizzone G.

Within the framework of the project “Assistance to the artisanal fishery in the port of Naqoura” financed by the Italian Cooperation, the Lebanese National Council for Scientific Research (CNRS) has carried out a series of activities aiming at establishing a pilot testing unit for the use of new fishing techniques in Lebanon. The main project’s objective was to evaluate the potential for an expansion of the fishing areas of the Lebanese artisanal fleet towards deeper depths. In this respect some fishing trials using gillnets and traps have been conducted in South Lebanon from the period March-May 2012 (Figure 16). The FAO sub-regional project EastMed has provided technical assistance to the CNRS for developing the activities foreseen by the project and enhancing the capability of the CNRS staff to collect and analyse fisheries data (Colloca F., Lelli S., 2012).

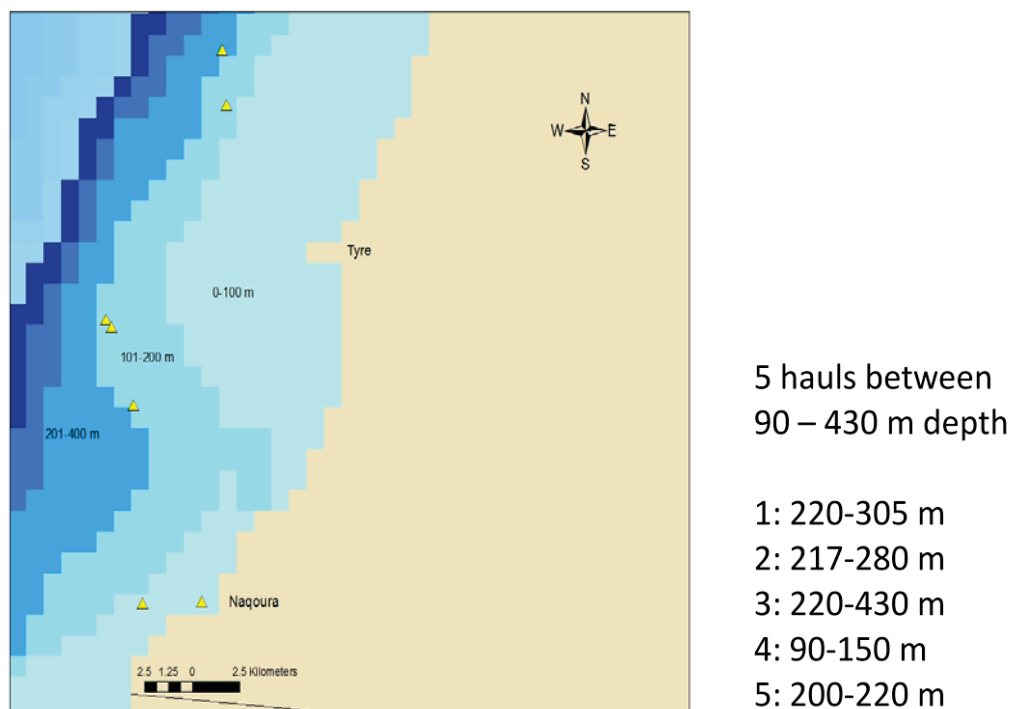


Figure 16. Study area during the fishing trials in South Lebanon

A total of 5 offshore hauls using both monofilament gillnets (Figure 17) designed to target hake and Spanish traps to catch the shrimp *Plesionika edwardsii* (Figure 18) were performed in May 2012 onboard a commercial fishing vessel from Tyre. The vessel was a classical Lebanese fishing boat of 10 m LFT, 1.3 GT and 60 Hp, equipped with a mechanical winch to retrieve the nets on board and with three fishermen as crew. The

hauls have been carried out between 90 and 430 m depth (Table 1). Both the gill nets and traps were left to fish overnight with a soaking time of 10-12 hours.

Table 1. Gillnets and traps hauls carried out in South Lebanon

date	DEPTH		HAUL		LAT initial	LON final
	initial (m)	final (m)	initial	final		
17/05/2012	220	305	04:10	08:10	33.2437	35.0965
22/05/2012	205	220	17:30	07:55	33.2409	35.0992
23/05/2012	320	380	17:30	06:00	33.3303	35.1536
30/05/2012	95	115	17:30	06:00	33.1485	35.0659
31/05/2012	200	250	17:30	06:00	33.2601	35.1012

A total of 29 species were caught on the 5 gillnet hauls carried out between 17 and 31 May 2012. Commercial species made up the 64% in weight of the total catch. The most abundant species was hake (53%) with highly variable CPUE (366-6706 kg/km net) followed by the demersal shark *Centrophorus granulosus*.

The highest CPUEs of hake have been obtained in the hauls carried out between Tyre and Naqoura between 200 and 300 m depth, corresponding to the shallower part of the upper slope. The size composition ranged between 24 and 57 cm TL with a higher occurrence of mature specimens. For the other commercial species, such as *Helycolenus dactylopterus* and *Dentex macrophtalmus*, few specimens were caught. No lessepsian species were caught on fishing grounds deeper than 200 m. Cephalopods occurred in the catch with only two specimens of *Illex coindetii*.



Figure 17. Gillnets for hake

The traps for shrimps had a mean CPUE of 210-310 g/trap of *Plesionika edwardsii* that were in the same range of the CPUE obtained in other traps surveys carried out in the past in the Western Mediterranean. The composition of the catch showed large differences according to the depth: the high abundance of high value large ovigerous females was observed between 200 and 300 m depth. On the deeper depths (400-420 m) the catch was almost composed by males and immature females, while the smallest immature specimens were caught in the haul carried out between 100 and 150 m depth. The results obtained can be considered as preliminary given the low number of hauls carried out. A longer survey with an appropriate number of hauls positioned according to a spatio-temporal

stratified sampling design would be necessary to collect the data necessary to identify the fishing periods and areas to exploit hake and *Plesionika* shrimps offshore the South Lebanese coasts.

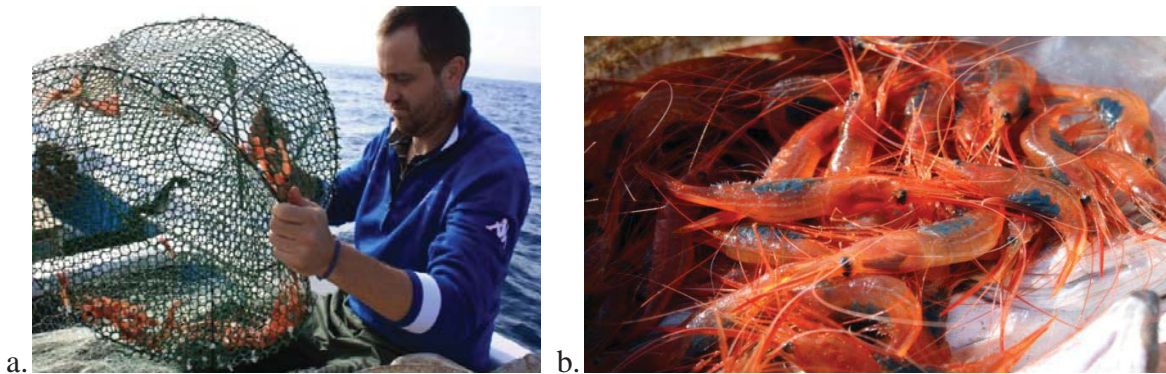


Figure 18. Spanish traps (a) for *Plesionika edwardsii* (b)

Nevertheless, the hauls carried out offshore the coasts of South Lebanon clearly showed the occurrence of potentially exploitable resources on the upper slope. In particular, the hake catch obtained in two hauls was in the range of the catch of gillnet fisheries observed in other Mediterranean areas (e.g. South Italy-Tyrrhenian Sea). This result is encouraging considering that the fishing trials have been conducted in May at the end of the traditional fishing period for hake (December-April), when the highest CPUE can be obtained. It is also important to remark how the future offshore expansion of the fishing grounds of the Lebanese artisanal fisheries is currently strongly constrained by the structural characteristics of the fleet. Most of the boats are less than 10 m in length and without appropriate engine power and winches to exploit offshore stocks. A modernization of a part of the fleet would be necessary to achieve the objective of a better distribution of the fishing effort in Lebanese waters.

Discussion

Some of the participants asked why the study in Lebanon was being undertaken. It was clarified that the aim was to investigate whether it was possible to exploit the deep sea resources. If the resources are available one could diverge part of the fleet to fish in the deeper waters. Concerns were shown if a new fishery opens in deep waters, taking into account the vulnerability of the deep water resources. However it was pointed out that in Lebanon trawling is forbidden altogether, the fleet is all artisanal and the deep waters are not exploited with the existing vessels. Hence this kind of studies could give an opportunity to the existing fishers to start thinking of exploiting the new resources and diversify their fishing activity. To this line the EastMed project is working in Lebanon to improve the small scale fishing vessels by developing new modern artisanal fishing vessels which could exploit the deeper waters. It was highlighted that in Lebanon the existed fishing vessels operate mostly within the 3 nautical miles. The next step of this study would be to do a survey in the entire Lebanese coast using nets and/or pots, and this would give information on the spatial distribution of the resources. In a very cost-effective way, a simple survey with artisanal gears could provide a lot of information in an area

which is relatively unknown. Trawl surveys will be kept out of the picture due to both financial burden, and political sensitivity of using trawl gears in the area.

Regarding the hake fishery in deep waters, it was mentioned that in the North of Greece and the Ionian Sea there is a fishery using gill nets for hake which is however seasonal, lasts for only 3 months but is very profitable. Similar fisheries also exist in Italy.

6. Identification of shared stocks on the continental slope in the Eastern Mediterranean

The issue of the existence of shared stocks in the deep waters was discussed in length. The participants pointed out that the lack of catch data which could show the exploitation pattern by country are missing. Even in the Ionian Sea where biology information on deep water resources is available (e.g. Kapiris *et al.*, 2010; Kapiris & Thessalou-Legaki, 2001, 2011, Sarda *et al.*, 2004; D'Onghia *et al.*, 2005), one cannot as such justify the shared stocks. The participants agreed on the use of a questionnaire which could collect information and could give some light on this issue. The development of the questionnaire will further be discussed under the workplan.

7. Determination of the problems in the collection of catch, effort and biological data & 8. Solutions and methodologies on how the problems in data collection could be solved

A discussion started on the Italian fleet which fishes in international waters close to the Greek territorial waters. According to some of the participants the Italian fleet, which operates in the Aegean Sea should be declaring the catch with the Greek authorities, when the catch is landed for export. This is the case for the fleets which operate around the island of Crete. The Italian participant mentioned that the fleets operate there continuously without returning to Italy. The crew is changed every month or two, the vessels land their catch in the islands and then export them to Italy. According to the Italian scientists the fleet which operates in the Aegean consists of 6 trawlers, while another 3 vessels fish around Cyprus. With respect to the catch from the Ionian Sea (GSA 20), this is not registered in Greece but in Italy, since the vessels leave from Italian ports, spend some time fishing (up to 1 month at sea) and then return to their country's port. The problem is that the catch is landed and recorded as catch originating from the Italian GSA (GSA 19). In this case the catch GSA is different from the landed GSA and hence the catch data cannot be correctly attributed to the geographical location. It was also highlighted that for European countries, and according to the EC Data Collection Framework, it is the countries' obligation to collect fisheries data (catch, effort and biological) from foreign vessels which are landing in the respective country.

The participants asked if only 10 trawlers fish in the Eastern Ionian Sea, since more vessels seem to fish in the area. To this comment, it was clarified that indeed much more vessels target red shrimps, but only 10 are equipped and able to fish for long period outside Italian waters. Some of the participants remarked that no data is registered for this GSA, the lack of which does not allow the assessment of the stocks.

The problem of mixed catches from different GSAs was raised. Catch from one GSA would be stored and landed together with the catch from another GSA and in this respect it would be difficult to allocate the catch to the correct GSA. An ideal solution would be to have the Vessel Monitoring System (VMS) data, which provide very useful information on the spatial distribution of the fleet. However there is a general problem in obtaining this kind of data due to administrative and confidentiality issues. Another approach could be to obtain those data from the log book. It was mentioned however that not all the fishermen fill it properly making the use of the log books uncertain. Additionally, the current threshold limit of 15 kg per species leads in some cases such as the red shrimps, which have low weights, to underestimations.

The Italian participant highlighted the problem of the ageing of red shrimps. He pointed out that ageing needs validation, which in USA is done by the radiometric method. He commented that this method gives more accurate results for deep water species. Finally it was generally acknowledged that the catch and biological data could be collected only when the fishing pattern in the region would be known, which will certainly contribute to the allocation of the catch to the correct GSA.

9. Development of a workplan within the framework of the EastMed project on which actions are required in order to improve the management of the deep water resources.

At the start of the development of the work plan a discussion was devoted to the definition of deep-water resources. It was mentioned that at the moment this term is absent from the GFCM glossary and in ICES the deep-water zone refers to those resources found below the 400 m depth. The participants commented that it would be better to define it according to the targeted species e.g. for *Nephrops norvegicus*: 200-500 m, for *Plesionika sp*: 300-600, for red shrimps; 500-800 m. Some others supported to take into account the multispecies context of the fisheries and to consider a range for instance between 200 and 500 m where deep sea fisheries in the Mediterranean takes place. However in general in the Mediterranean it is understood that deep waters refer mainly to the red shrimp fishery between 500-800 m. Since there was no conclusion, the WG agreed to postpone the discussion to another WG where more information would have been collected.

Another discussion was devoted to whether it is important to collect data on *P. bogaraveo*. This species seems to be caught in high numbers by the recreational fishery and that the stock was in a risky condition, since fishers have generally noted a considerable decline in the catches around 2000 (Petrakis et al., 2001; Mytilineou and Machias, 2007). The status of the E. Ionian stock is currently studied by HCMR in the framework of DEEPFISHMAN project (Mytilineou, unpublished data). Given that the species is highly vulnerable, the group agreed that there was a need to develop a program of work to assess and manage the species. The project's coordinator mentioned that the same species is found in the CopeMed region and it is assessed annually in the project's WGs. In this respect a possible collaboration with the CopeMed for the exchange of information could be made.

The participants then started a discussion on which would be the future actions regarding the study of the deep water resources. To this line, it was proposed that a Working Group

between Greece and Italy could be established in order to study and manage the deep water resources in the Ionian Sea by studying the red shrimp as a first step. However some other participants commented that the rest of the EastMed also deserves attention. In the Ionian Sea there is the MEDITS time series, while some other projects have also been conducted as was shown by the presentations. On the contrary, nothing is relatively known in the other areas of the Eastern Mediterranean. If the aim is to undertake stock assessment the MEDITS data could be used which could give a picture of the status of the stocks, exploring as well long time series. At this point the Working Group was informed that Greece did not conduct MEDITS since 2008 due to administrative problems which did not allow the country to conform with the Data Collection Framework (DCF). In general, MEDITS data are only available for EU countries and for the rest of the countries the WG has to find an alternative solution. Maybe MEDITS could be used for areas in which data exist and at the same time collect data using a questionnaire survey for the other areas.

Once the Data Collection framework re-starts in Greece, Greece and Italy can also collaborate together in the Ionian Sea within the framework of the European Commission, such as the Scientific and Technical Economic Committee on Fisheries, Working Sub-Group on the Mediterranean (STECF-SGMED). For the time being within the framework of the EastMed project, the WG can work for the Ionian Sea but also for the other areas of the Eastern Mediterranean.

Assessment is required for the areas that have available data on deep water fishing. At the same time data could be collected where information is lacking. So work could be done both in the Ionian Sea and in the other areas. Analysis can start from the Ionian Sea because there's a lot of information. Regarding the data collection in other areas it was mentioned that the EastMed funds are limited. Data analysis in the Ionian Sea could be conducted using the existing data, and at the same time funding could be sought from other sources. However the collection of basic information in other areas, which are practically unknown, should also be one of the project's tasks. This will also serve to develop local deep-water fisheries in new regions, to give some light on the problem of management of the deep water resources in the EastMed region and flag this issue to countries outside the region, which may wish to fish in the Eastern Mediterranean. In this respect collaboration with the other FAO sub-regional projects could be sought, for investigating whether countries outside the project have vessels fishing in the Eastern Mediterranean.

In order to solve the problem of the lack of catch and effort data, it was proposed to draw up a kind of questionnaire which would be common for all the countries. The questionnaire could be very simple in order to obtain the basic data on catch, effort, price and geographical location of the catch. It was also highlighted that such a questionnaire would give information on the existence of shared stocks, since up to date this information is lacking. In this respect it is worth noting that in the frame of the project "Study of the feasibility of the development of deep shrimp fishery in the Ionian Sea (Greece) and at depths lower than 500 m using innovative bio-economic methods and cost/benefit analysis" (responsible; Dr. Kapiris K.) an important questionnaire has already been completed by the trawler fishermen of the E. Ionian Sea for the fishery and economical data of both red shrimps in the above area (Anonymous, 2008). This work could offer valuable help to the present workplan. This questionnaire could be the first study in which all the countries would participate together to provide information on the deep water fleets in the Eastern Mediterranean. Eventually, the questionnaire could be extended to other

FAO Mediterranean sub-Regional projects, so that information on countries outside the EastMed area, which are fishing in the Eastern Mediterranean, could also be gathered.

The Greek scientists highlighted that the red shrimp fishery in the Ionian and on the edge of the Aegean Sea, should be of major concern. In other areas of the Eastern Mediterranean except of the lack in fisheries data, there is no analogous fishing activity. Any questionnaire completed for the other areas will contain information without relying on real records. Instead, the activity of the Italian fleet, which fishes an almost virgin stock in the whole area of Eastern Mediterranean Sea, is completely unreported or if reported is attributed to the catch in Italian waters. Taking into consideration that unique red shrimp population exists in the whole Mediterranean (Fernandez *et al.*, 2011), the exploited stocks should be managed through a multiannual plan by an International management body, which in the case of the Mediterranean is the GFCM, where EastMed contributes scientifically.

As mentioned above the stock of red shrimp is fished mainly by Italian vessels and to a lesser extend from other countries fleets. The fishing grounds where the Italian fleet is operating are along the coasts of Greece, Cyprus, Turkey, Lebanon and Egypt. If the aim is to promote an international management for a shared stock, we need information mainly by the Italian fishermen or the Italian authorities, who are the main actors in this fishery. The Italians have the obligation to declare the area where the fishing vessels are working, to cover with sufficient biological samples these landings and to transmit the information to the competent European authority. The quantities landed from the Italian fleet in other countries must be monitored from those third countries even if they are not directly involved in the fishery.

The group agreed to conduct the questionnaire and after that a decision would be taken on the issue of shared stocks and how to proceed on data collection and analysis. The group then worked to produce a questionnaire (Annex IV), which would be distributed to every country through the focal point so that data could be gathered. The target was to start the survey in January 2013, and collect data for the previous years that is 2012.

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Annex II Agenda

Sub-regional Working Group on deep-water biological resources in the Eastern Mediterranean (GFCM GSAs 19-20 and 22-28)

Draft Agenda and Time Schedule

Athens, Greece 12 – 15 June 2012

The meeting will be held from 9:30 - 18.00 every day

Coffee breaks can be held at 11:30 and 16:15

Lunch break can be held from 13.30-15.00

Tuesday 12 June 2012

1. Opening of the meeting and designation of the chairperson
 - i. Welcome of the participants and presentation of the ToR of the WG
 - ii. Introduction of the participants
 - iii. Designation of the chairperson
 - iv. Adoption of the agenda

2. Presentations on descriptions of the fishing fleets (e.g. trawlers, vessels using shrimp traps) which target deep water demersal resources on the continental slope (500 – 800 m) in the Eastern Mediterranean, including the management actions currently in force.
 - i. “Deep water fisheries and resources and management actions related in the eastern Mediterranean with particular emphasis in Eastern Ionian in the eastern Ionian Sea and management actions related” by Mytilineou Ch, & A. Anastasopoulou, K. Kapiris & S. Kavadas

3. Compilation of a list of studies and surveys on deep water demersal resources in the Eastern Mediterranean.
 - i. “Scientific projects carried out in the deep waters of the E. Ionian Sea by the Hellenic Centre of Marine Research (HCMR)” by Kapiris K., Mytilineou Ch., and Anastasopoulou A.
 - ii. “Experimental fishing using fish traps in south east Aegean Sea” by A. Kallianiotis
 - iii. “A compilation of projects carried out in Ionian Seas and dealing with deep sea resources” by Maria Teresa Spedicato.

4. Presentation of data on the distribution and biology of the main species targeted by the trawl fishery (e.g. *Aristaeomorpha foliacea*, *Aristeus antennatus*), in the Eastern Mediterranean.
 - i. “Distribution and biology of the most important species in the deep waters of the E. Ionian Sea, mainly for *Aristaeomorpha foliacea* and *Aristeus antennatus*” by Kapiris K., Mytilineou Ch., and Anastasopoulou A.
 - ii. “Population structure, dynamics and fisheries of giant red shrimp *Aristaeomorpha foliacea* and *Aristeus antennatus* in Antalya Bay, 2012” by Deval M., C.

- iii. “Population structure, dynamics and fisheries of blackbelly rosefish *Helicolenus dactylopterus* in Antalya Bay, 2012” by Deval M.,C; Kebapçioğđu T., and Güven O.
- iv. “Studies in the deep water in Egypt” by Marwa Lofty
- v. “The Italian distant fisheries in the Central – Eastern Mediterranean. The case of Mazara del Vallo deep sea trawling” by Sergio Vitale

Wednesday 13 June 2012

5. Presentation of data on the distribution and biology of the main species targetted with other fishing gears (e.g. shrimp traps for *Plesionika* spp).
 - i. “Fishing trials on the deep shelf and upper slope of South Lebanon” by Francesco Colloca and presented by Gianni Ardizzone
6. Identification of the shared stocks on the continental slope in the Eastern Mediterranean.
7. Determination of the problems in the collection of catch, effort and biological data.
8. Solutions and methodologies on how the problems in data collection could be solved.
9. Development of a workplan within the framework of the EastMed project on which actions are required in order to improve the management of the deep water resources.
10. Any other matters

Thursday 14 June 2012

11. Adoption of the report

Annex III Terms of Reference

Sub-regional working group on deep-water biological resources in the Eastern Mediterranean.

Terms of reference

1. To describe the fishing fleets (e.g. trawlers, shrimp traps) which target deep water demersal resources on the continental slope (500 – 800 m) in the Eastern Mediterranean, including the management actions currently in force.
2. To compile a list of studies and surveys on deep water demersal resources in the Eastern Mediterranean.
3. To present any data on the distribution and biology of the main species targeted by the trawl fishery (e.g. *Aristaeomorpha foliacea*, *Aristeus antennatus*), in the Eastern Mediterranean.
4. To present any data on the distribution and biology of the main species targeted with other fishing gears (e.g. shrimp traps for *Plesionika* spp).
5. To identify the shared stocks on the continental slope in the Eastern Mediterranean.
6. To determine the problems in the collection of catch, effort and biological data.
7. To provide solutions and methodologies on how the problems in data collection could be solved.
8. To provide a workplan within the framework of the EastMed project on which actions are required in order to improve the management of the deep water resources.

Annex IV Questionnaire

Confidential - Information gathered for statistical purposes only

Yearly questionnaire on the catch and effort data for deep water (500-800 m) fisheries

Year	Depth	Vessel Reference	Landing Ports	Ports of Departure
2012	<input style="width: 40px; height: 15px;" type="text"/>	<input style="width: 120px; height: 15px;" type="text"/>	<input style="width: 100px; height: 25px;" type="text"/>	<input style="width: 120px; height: 25px;" type="text"/>

Mark with an X the area (GSA) fished

— FAO Statistical Divisions (red) — GFCM Geographical Sub-Areas (black)

01 - Northern Alboran Sea	07 - Gulf of Lions	13 - Gulf of Hammamet	19 - Western Ionian Sea	25 - Cyprus Island
02 - Alboran Island	08 - Corsica Island	14 - Gulf of Gabes	20 - Eastern Ionian Sea	26 - South Levant
03 - Southern Alboran Sea	09 - Ligurian and North Tyrrhenian Sea	15 - Malta Island	21 - Southern Ionian Sea	27 - Levant
04 - Algeria	10 - South and Central Tyrrhenian Sea	16 - South of Sicily	22 - Aegean Sea	28 - Marmara Sea
05 - Balearic Island	11.1 - Sardinia (west) 11.2 - Sardinia (east)	17 - Northern Adriatic	23 - Crete Island	29 - Black Sea
06 - Northern Spain	12 - Northern Tunisia	18 - Southern Adriatic Sea	24 - North Levant	30 - Azov Sea

Gear Used

1 Trawl	<input type="checkbox"/>	3 Gill net	<input type="checkbox"/>	5 Bottom longline	<input type="checkbox"/>
2 Pots or Traps	<input type="checkbox"/>	4 Trammel net	<input type="checkbox"/>	6 Other _____	<input type="checkbox"/>

mesh size

reference of the national regulation

Area (GSA)	Species	Gear Ref.	Size category (S, M, L)	Weight (t)	Price

No. of days fished	Area (GSA)	Av No of hauls per day	Gear Ref.

Av Km of Trammel net used per fishing trip

Av No of hooks per trip	Av No of Pots or Traps per trip

Beneficiary countries

Countries with waters included in the GFCM
Geographical Sub-Areas (GSAs) 19-20 and 22-28

Donors

Greece

- Ministry of Foreign Affairs
- Ministry of Rural Development and Food

Italy

- Ministry of Agriculture Food and Forestry Policies

European Community

- Directorate General of Maritime Affairs and Fisheries (DG-MARE)



Hellenic Ministry of
Foreign Affairs

Hellenic Ministry of Rural
Development and Food



ITALIAN MINISTRY OF AGRICULTURE, FOOD
AND FORESTRY POLICIES



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