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Regional cooperation in the Mediterranean fisheries

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SUMMARY – During the last decade, regional cooperation for fisheries research and management gained a significant momentum in the Mediterranean scenario. The FAO Mediterranean projects played a major role to foster regional cooperation and the establishment of scientific networks. The paper outlines cooperation initiatives supported by the FAO and activities for the development of sustainable fisheries in the Mediterranean. Particular reference is made to the relations between the Mediterranean projects and the General Fisheries Commission for the Mediterranean, and to the support provided for the implementation of the Code of Conduct for Responsible Fisheries and the Ecosystem Approach to Fisheries.

Keywords: Mediterranean Sea, code of conduct for responsible fisheries, ecosystem approach to fisheries, General Fisheries Commission for the Mediterranean.

RESUME *– "Coopération régionale en matière de pêches méditerranéennes". Au cours de la dernière décennie, la coopération régionale pour la recherche halieutique et la gestion des pêches a gagné du terrain en Méditerranée. Les projets de la FAO en Méditerranée ont joué un rôle majeur dans la promotion de la coopération régionale et la création de réseaux scientifiques. L'article donne un aperçu des initiatives soutenues par la FAO et des activités pour le développement de pêcheries durables en Méditerranée. Il y est question, en particulier, de la relation entre les projets méditerranéens et la Commission Générale des Pêches pour la Méditerranée, ainsi que du soutien apporté à la mise en œuvre du Code de Conduite pour une Pêche Responsable et à l'Approche Ecosystémique des Pêches.*

Mots-clés : *Mer Méditerranée, code de conduite pour une pêche responsable, approche ecosystémique des pêches, Commission Générale des Pêches pour la Méditerranée.*

Regional scientific cooperation for the promotion of fishery research and management in the Mediterranean

The United Nations Convention on the Law of the Sea (UNCLOS, 1982) requires States to cooperate on a global and, as appropriate, on a regional basis in the protection and preservation of the marine environment, taking into account the characteristic regional features (Articles 161, 118, 119, and 197). This implies cooperation in marine scientific research, and promotion of joint fishery research activities in support of responsible and effective fisheries management. Such cooperation can occur through inclusion of bilateral and multilateral agreements, so as "to create favourable conditions for the conduct of marine scientific research in the marine environment and to integrate the efforts of scientists in studying the essence of phenomena and processes occurring in the marine environment and the interrelations between them" (Article 243). Article 123 emphasizes the requirement for coastal States of enclosed or semi-enclosed[1] seas to cooperate on issues such as exploration and exploitation of the sea's living resources, the protection and conservation of the sea, and marine scientific research.

The United Nations Conference on Environment and Development (UNCED, Rio de Janeiro, 3-14

[1]Art. 122 (UNCLOS, 1982) defines enclosed or semi enclosed seas as follows: "...are understood to be a gulf, maritime basin or sea surrounded by two or more States and linked to another sea or the ocean via narrow straits of exit, or entirely or mostly made up of territorial seas and exclusive economic zones of two or more coastal States".

June 1992) underlined the regional dimension in context of Chapter 17 of Agenda 21 on the "Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources". The Conference emphasized the need to enhance regional cooperation and coordination for the development, protection, and sustainable use of the marine environment and its resources.

Agenda 21 under Chapter 17 provides principles and guidelines for building up coastal and ocean management in accordance with the sustainable development principles. Chapter 17 contemplates seven action areas to pursue and support coastal and ocean management. Among others, Paragraphs 17.8a and 17.17 are particularly relevant when scientific cooperation is concerned. Paragraph 17.8a specifically refers to the development of Mediterranean data bank(s), advising that states "develop and maintain databases for assessment and management of coastal areas and all seas and their resources". Moreover, Paragraph 17.17, dealing with capacity building and research states that regional as well as international organisations are required to give full co-operation to coastal states to implement their capacity-building. The following points are particularly relevant to the Mediterranean scenario (Vallega, 1995): (i) ensuring capacity-building at the local level; (ii) co-ordinating sectoral programmes while building capacity; (iii) developing scientific and technological means and research; (iv) supporting "centres of excellence" in integrated coastal and marine resource management; and (v) supporting pilot demonstration programmes and projects in integrated coastal and marine management.

In recent years, with reference to the high seas and international waters, international fishery instruments, such as the Code of Conduct for Responsible Fisheries (FAO, 1995), have further developed the concept of the necessary character of international cooperation in its use and management. This seems to substantiate the concept that "an undertaking to cooperate is also an undertaking to act" (Pinto, 1987 in Payoyo, 1994). Significant progress and advancement in the knowledge of ocean dynamics and processes which take place over relatively large spatial and temporal scales have been possible because of the joint effort of scientists committed to common tasks and sharing the same objectives (Fine, 2002). Governments increasingly recognize the benefits of cooperation and the necessity of tackling ocean problems, such as fishery research and management, from local to global dimensions. Holland and Bernal (2002) reported that the most outstanding example of such a trend was the monitoring and forecasting of the El Niño phenomenon in the Pacific. Countries in the region support the international cooperative scientific initiatives because of the collective benefit they produce.

Worldwide one of the main trends today is the regionalization and internationalization of scientific research activities (Chang *et al*., 1997). This is also justified by the need to make more efficient and cost-effective use of very expensive equipment and scientific facilities. A good example and model is the agreement signed in 1996 by the United Kingdom (National Environmental Research Council), France (French Research Institute for the Exploration of the Sea), and by Germany (German Ministry of Education and Research) for scientific cooperation which included a research vessel sharing scheme (Summerhayes, 2002).

The evolution from technical assistance to partnership relies on essential criteria and conditions. Partnership projects fostering capacity building in fisheries sciences should:

(i) Be scientifically appealing, and multidisciplinary including social sciences.

(ii) Be relevant to the development of the recipient country/ies in the framework of its development strategy.

(iii) Include capacity strengthening, particularly by on-the-job training (i.e. training should be finalized to support the project implementation).

(iv) Use participatory processes for project planning and implementation.

(v) Involve financial and in-kind contribution from all partners and ensured over the necessary time span.

(vi) Ensure access and exchange of data for joint analyses and for potential publications.

Experience gained in promoting and developing international partnerships and cooperation initiatives allows highlighting some simple, nonetheless crucial facts that are based on experience:

(i) Marine and fishery sciences capacity building is a long term process.

(ii) National institutional involvement is an essential condition.

(iii) Projects should target limited, attainable objectives.

(iv) The most effective tools for partnership are those in which scientists, technicians, and users work closely together in executing project activities.

Most international cooperative programmes require action at the regional level through provision of coordinating entities, regional or sub-regional data centres, and some common research facilities. Most of the effort is, however, undertaken by the countries participating in such joint initiatives. Usually, each country accepts a specific share, geographically, in the investigations. Financial support can make a substantial contribution to such joint programmes when provided through regional/sub-regional technical cooperation projects. This is also particularly relevant when cooperation initiatives have been conceived for the purpose of strengthening the participation from less developed countries in such a way that their national scientific and institutional capabilities in fisheries research and management are permanently enhanced.

All Mediterranean coastal States face local issues and problems which require marine scientific research for their solution. However, they also have to cope with problems that can only be resolved by investigations on a wider geographical scale. Over the years, a pattern of international cooperative programmes has emerged, and procedures for planning and implementing these have been worked out by several of the coastal countries. Cooperative programmes are mutually beneficial to the parties concerned, in so far as they provide an excellent opportunity for interaction and for strengthening of national scientific capacity in various disciplines of marine sciences including fishery sciences. It may be seen as inevitable that, in the semi-enclosed Mediterranean Sea basin, intergovernmental arrangements will eventually become a basis for rational management. The process, however, is neither straightforward nor granted and it would require appropriate conditions to be established and operational tools to be available. Although all the Mediterranean coastal countries are members of the General Fisheries Commission for the Mediterranean (GFCM), which provides advice on fishery management in the Mediterranean Sea, a need for even closer cooperation for fisheries research and management remains.

The Mediterranean coastal area is subject to great demographic pressures. As an example, the population around the Mediterranean, which in 1950 was fixed at about 212 million, had reached 332 million by 1980 (Suárez de Vivero and Rodríguez Mateos, 2002). In 2000 the total population of the Mediterranean reached 428 million, In 2001, one forecast (Attané and Courbage, 2001; Benoit and Comeau, 2005) indicated that, by year 2025, the population would reach 523 million.

A distinctive feature of the Mediterranean Sea is its jurisdictional status characterized by the absence of declared Economic Exclusive Zones, EEZ, (with the exception of Egypt, Cyprus and Morocco whose claimed EEZs' limits are not specified) or fishing zones (except for Algeria, Malta, Tunisia, Libya and Lebanon). To this diversity of jurisdictional situations the existence of two historical bays should be added, the Gulf of Taranto (Italy) and the Gulf of Sirte in Libya. Most coastal states have established a 12-mile territorial sea. Consequently, Mediterranean waters are simply divided into territorial waters 12 miles wide and international, off-shore waters. The final result is that the waters of high-seas have gone from being dominant to being setback in the Mediterranean basin (Suárez de Vivero, 2007). The presence of such jurisdictional complexity necessarily requires a correspondingly high level of cooperation between the countries concerned with the development and implementation of the sustainable management of the fishery resources occurring in the Mediterranean large marine ecosystem.

The structure, organization and performance of the national fishery sectors around the Mediterranean Sea region are significantly different as appraised within the GFCM and its Scientific Advisory Committee (SAC) framework and as researched and assessed by the FAO regional projects. At the regional scale the fishing industry reflects the regional socio-economic set up and two large

groups: the European Union (EU) member countries (seven nations) and the Mediterranean countries non-EU members (fifteen nations). The total landing share of these two main groups, according to the available nominal data, changed from 62% and 38%, as made up, respectively, by the EU and non-EU countries in 1995, to the currently reached (2005) equal contribution to the total Mediterranean marine capture fishery production.[2,3]

The development of modern cooperation among the coastal countries of the Mediterranean Sea can be framed within three main phases (Vallega, 1995): (i) the preparation of cooperation (mid-1940s to mid-1970s); (ii) the take-off of co-operation (1976 to 1991); and (iii) the maturity of co-operation (post-1991). During the last decade, several endeavours have been undertaken in the Mediterranean that specifically address fisheries research and management. Sub-regional networks have been established through sub-regional data collection schemes and research programmes, addressing jointly identified priorities. The on-going Mediterranean cooperation for fishery research and management promoted by the FAO regional projects supports the process for which the recipient and donor countries change their approach to capacity building programmes into one of true partnership.

Through the establishment of the CopeMed Project in 1996 a new mechanism was created to foster scientific cooperation in sub-regional fishery research and management in the Mediterranean. This mechanism proved to be very viable, but requires increased financial support on an interregional basis. The CopeMed and AdriaMed Projects and the ensuing MedSudMed, MedFisis and EastMed Projects supported by the respective concerned donors emphasized, from the start, regional activities through concerted action, with the participation of the countries involved, international organization (the EC) and the relevant regional fisheries organization (the GFCM).

Projects like those the Fisheries and Aquaculture Department of the FAO operate in the Mediterranean also provide tools for the improvement of scientific communication within established networks, resulting in joint field activities, data analysis, and publications. In this respect, the FAO/GFCM Mediterranean projects have brought new light on the perception and interpretation of multilateral regional and sub-regional cooperation for fisheries research and management. The projects facilitated the broadening of intra-regional contacts which promote closer cooperation among Mediterranean scientists and countries on a regular basis.

The challenge of common interest fisheries in a shared ecosystem

The Mediterranean Sea is a comparatively small sea bordered by a relatively high number of countries. The Mediterranean Sea ecosystem's goods and services, including the fishery resources, are shared by twenty-two coastal countries and territories. Addressing future ecological issues and challenges of the Mediterranean Sea region, calls for an ecosystem-oriented approach that includes cooperation among all the countries concerned.

At present, many of the main fishery stocks of the Mediterranean are not formally defined or regarded as shared stocks, although the definition of common trans-boundary stocks, or common interest stocks, is often used. In general, the lack of sound bio-ecological evidence substantiating the existence of separate stocks or sub-populations makes it advisable to adhere to the precautionary approach regarding the fishery stocks as belonging to panmictic populations occurring throughout large areas and being shared by the fisheries of the coastal countries concerned.

The management of shared fishery resources remains one of the great challenges to achieving long-term sustainable fisheries. The management of shared fish stocks –a major, worldwide, resources management issue– owes its origin to the UN Conference on the Law of the SEA (1973-1982), the UN Convention on the Law of the Sea (1982) to which the Conference gave rise, and the resultant EEZ regime. The Norway-FAO Expert Consultation on the Management of Shared Fish Stocks (Bergen, Norway, 7-10 October 2002; FAO, 2002) concluded that non-cooperative management of shared fisheries resources carries with it the threat of overexploitation. Problems of implementation and enforcement are far more complex for shared fisheries than those encountered

[2] FAO Fisheries and Aquaculture Information and Statistics Service, 2007. Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series. Food and Agriculture Organization of the United Nations. Available at: http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp.
[3] Japan and Portugal data not included.

with non-shared fisheries. In line with the GFCM acceptance of the Ecosystem Approach to Fisheries (EAF; FAO, 2003; García *et al*., 2003), shared stock fisheries management should proceed on an ecosystem basis rather than on a single stock basis. Consequently, the GFCM and its member countries could be expected to adapt themselves increasingly to deal with the ecosystem issues.

Two levels of cooperation were identified by Gulland (1980) between or among states sharing fishery resources: the primary level through which cooperation in scientific research is established, and the secondary level developing cooperation in active coordinated management programmes. Cooperation in scientific research will be promoted and eventually achieved through the following major steps (FAO, 2002): (i) setting priorities for research; (ii) coordinating data collection and management; (iii) standardizing analyses and assessments; (iv) ensuring the availability of adequate equipment and human capacity; and (v) capability to deal with data-poor situations.

Particularly in the case of shared stocks, fishery management and development will heavily rely on cooperative scientific efforts to better understand the linkages between the varying biophysical conditions, the stock dynamics, and the geographic distribution of target species. In addition, changes in relevant social, economic and political conditions should be routinely tracked and openly communicated among the cooperating parties.

Worldwide, there is a general agreement that the fisheries management paradigm needs to be significantly broadened to match the definitions and principles of sustainable development and the welfare of humans as well as that of the ecosystem (García *et al*., 2000). In general, the contribution of science to support sustainable development processes will have to be based on the integration of different disciplines. Consequently, in recent years, commitments to a wider approach to fishery management have become numerous (e.g., implementation of the FAO Code of Conduct for Responsible Fishery, and of the Ecosystem Approach to Fisheries) and increasing attention has been directed to the analysis of both the biological and socio-economic aspects of the fisheries management measures (Hilborn, 2007).

Data and information required for fisheries management covers the broad spectrum of social, economic and ecological dimensions and, given the large data requirements this entails, priority setting is an important part of research coordination. If done properly, this will provide the most important information at the lowest possible cost. The setting of priorities should involve relevant stakeholders, including the beneficiaries of the research. Data collection schemes in shared-stock situations should be based on a common framework, something that is accepted and widely promoted by all the regional projects conducted by the FAO Fisheries and Aquaculture Department in the Mediterranean: standard operating and data collection procedures elaborated with the support of the projects are concrete examples of such an approach to the standardized protocols and collection of basic data relevant for fishery management. Data sharing exercises can also be supported through the establishment of common databases. Further, common assessments of stocks and fleets, as well as the broader social, economic and ecological aspects, are highly desirable and should be actively pursued.

The adherence of GFCM to the EAF will determine the need for a more integrated approach to the analyses and assessments that incorporate various types of data, disciplines and decision support tools. In this view, indicators can be considered valuable tools and a link between objectives and action in management (Degnbol, 2005). Many indicators have been proposed for use in assessing impacts of fishing both at the ecological and at the socio-economic level (Fulton *et al*., 2005; Ceriola *et al*., in press). They support the decision-making process in the following ways: (i) describing the pressures affecting the ecosystem, the state of the fisheries and the response of managers; (ii) tracking the progress towards meeting management objectives; and (iii) communicating the trends, occurring in complex impacts and management processes, to a non-specialist audience (Jennings, 2005). To evaluate the state of fisheries through time, the indicator values are usually compared to appropriate reference points, which should be associated to either a critical or an optimal state, where the former identifies a limit to be avoided (limit reference points) and the latter is a target to be attained by the system (target reference points) (Caddy and Mahon, 1995).

The need and rationale behind concerted regional activities and initiatives should be common to all the coastal countries concerned. Particular consideration should be given to address those issues that are of national relevance and at the same time are common to the whole region. This should

contribute to the optimization of the available financial resources. Current experiences worldwide indicate cooperation in scientific research as the precursor to cooperation in active management. Eventually, every country would be better off with cooperation than without it (i.e., a cooperative solution is better than a non-cooperative one); the outcome of cooperation should be perceived as fair and equitable. The role and function of Regional Fisheries Management Organizations such as the GFCM are essential to facilitate and reinforce regional collaboration. They are the primary way to achieve cooperation between and among fishing nations that is essential for the conservation and effective management of international fisheries (Lodge *et al*., 2007).

The FAO fishery projects in the Mediterranean

The Mediterranean fisheries are extremely diverse, targeting a great number of species and having an extensive scope of fishing gear and methods. Catches are highly multi-specific. Fishing in the Mediterranean is a major economic activity in terms of jobs, revenues and food supply. Fishing products are an important component of the Mediterranean diet, and fishery has been one of the pillars of the Mediterranean civilization and culture. The 60 marine and fisheries research centres in the Mediterranean countries that participate in the FAO CopeMed, AdriaMed and MedSudMed Projects constitutes a great intellectual reservoir and a major opportunity for implementing collaboration within the FAO framework. This network will further develop and expand through the establishment of the EastMed Project.

The CopeMed Project (Advice, Technical Support and Establishment of Cooperation Networks to Facilitate Coordination to Support Fisheries Management in the Western and Central Mediterranean) was established in 1996 to strengthen scientific collaboration among Western and Central Mediterranean countries involved in the management of fisheries in this area. Morocco, Algeria, France, Italy, Libya, Malta, Morocco, Spain and Tunisia participated in the first phase (1996-2005) of the Project. The main objective of the Project was to widen scientific knowledge and regional cooperation for the sustainable management of the Mediterranean fisheries. It was financed by Spain through the AECI (Agencia Española de Cooperación Internacional). Within the frame of international cooperation, CopeMed reinforced the capacities of the Southern Mediterranean countries, encouraged the collaboration between the participating states and supported their contribution to the scientific activities promoted by the regional fisheries management bodies (GFCM and ICCAT).

The Project generated a common scientific strength in the western Mediterranean region facilitating the participatory approach in the preparation of the activities, their implementation and the evaluation of results. The CopeMed Project has developed in the sub-region a sound scientific collaboration. This approach has much contributed to the subsequent development in the Mediterranean basin of other projects of similar characteristics and that today continue the collaborative scientific activities in the Mediterranean.

During the first phase, the Project helped to improve the knowledge of the state of marine resources and helped to standardize common methodologies related to bio-economic data collection and processing in the western and central Mediterranean. The Project encouraged an exchange of fish-related information among participating countries, which has improved the level of collaboration between the scientists of participating countries and has created the basis of a sub-regional cooperation network in this part of the Mediterranean. This helped strengthen the institutional capacity of the southern Mediterranean countries for coordinated and cooperative fisheries research and management in line with the indications set by the Code of Conduct for Responsible Fisheries.

The second phase of the CopeMed Project (Coordination to Support Fisheries Management in the Western and Central Mediterranean) is expected to start in 2008, and it will be funded by Spain through the General Secretariat of Marine Fisheries and by the Directorate-General for Fisheries and Maritime Affairs of the European Commission. The Project will build on the achievements of the first phase of the Project while strengthening the established framework of international cooperation, which fosters sub-regional approaches in fisheries research and management. The Project aims to maintain the sustainability of marine fisheries in the central and western Mediterranean Sea, taking into consideration environmental, biological, economic and social issues, and aims to promote scientific cooperation among the coastal nations through coordinated scientific investigations and data-gathering as well as through joint multidisciplinary analyses. CopeMed will support national and

regional fisheries management processes and will take advantage of the scientific multidisciplinary knowledge that was developed during the first phase. Re-qualifying the artisanal fisheries sector in the Mediterranean, particularly in the fragile coastal zones, is essential to the livelihood of the coastal fishing communities. CopeMed through the AECI financial support will develop pilot activities to assist the artisanal fisheries sector.

The Adriatic Sea is one of the largest areas of the Mediterranean with shared fisheries resources. The AdriaMed Project (Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea) was designed to promote scientific cooperation among the Adriatic countries (Albania, Croatia, Italy, Montenegro and Slovenia) and to improve the management of fishing activities in compliance with the Code of Conduct for Responsible Fisheries. The Project was established in 1999 with the financial support of Italy through the Ministry of Agriculture, Food and Forestry Policies, and since 2007 also with the financial contribution of the Directorate-General for Fisheries and Maritime Affairs of the European Commission. The main goals of the Project are to develop common basic knowledge and support regional fishery management through improved scientific coordination among the fishery institutions. One major challenge is to establish a permanent collaborating network among the fishery institutions of the Adriatic.

AdriaMed strengthened the collaboration on fisheries research and management of shared demersal and small pelagic fisheries resources. The Project also implemented fisheries monitoring systems, and developed standardized methodologies applied to scientific research and harmonized data collection processes that have been used by the participating countries.

The Project has promoted scientific and technical cooperation in the Adriatic sub-region and established a basis for cooperative management on shared multi-species fisheries in the area through a series of actions and activities including: (i) establishing regional monitoring and research programmes on the status of demersal and small pelagic resources including studies on socio-economic aspects of the related fisheries; (ii) improving the capacity of national scientific institutions and fishery management bodies; (iii) establishing technical and scientific regional networks which have contributed *inter alia* to the appraisal of main shared demersal and small-pelagic stocks in the Adriatic Sea, the identification of nursery areas and of bio-economic indicators for fisheries management; and (iv) disseminating scientific information more widely in the area by creating an on-line information centre on fisheries related information.

The Straits of Sicily is one of the most important fishing areas of the Mediterranean Sea, where significant fleets operate with high fish production. Yet, the available knowledge on fishery resources and their ecosystems in the region is often scarce. The MedSudMed Project (Assessment and Monitoring of the Fishery Resources and the Ecosystems in the Straits of Sicily) was created to strengthen the national and regional research capacities and to promote scientific cooperation in the southern part of the central Mediterranean (Italy, Libya, Malta and Tunisia) for the assessment and monitoring of fishery resources. The Project implementation started in 2001 funded by Italy through the Ministry of Agriculture, Food and Forestry Policies. The Project's main objective is to improve knowledge on fishery resources and their ecosystems –as a contribution to the development of responsible fisheries management– by supporting research activities related to the interactions between demersal and small pelagic fishery resources and biotic and abiotic environmental factors.

MedSudMed's most important achievement is the establishment of a sub-regional system for monitoring fisheries resources that involves the research institutions of the participating countries. The Project has undertaken the extensive work of standardizing methodologies and protocols in the context of the research activities. The Project has successfully produced baseline scientific information on fishery resources relevant to fisheries management.

MedSudMed has promoted scientific and technical cooperation in the central Mediterranean and created a basis for cooperative fisheries research in the area through a series of actions, such as: developing and implementing standardized methodologies and monitoring programmes for small pelagic fish and demersal fisheries resources; increasing knowledge on the spatial distribution of fish stocks, in particular for target species that are of common interest for the four participating countries, and including the main oceanographic patterns characterizing the Project area with the intention of correlating it with the spatial distribution of the different life phases of fishery resources; to provide an opportunity to develop an exchange platform for sharing information and joint data management and processing at the regional scale.

The MedFisis Project (Fishery Statistics and Information System in the Mediterranean) was created in 2004, funded by the Directorate-General for Fisheries and Maritime Affairs of the European Commission and by the FAO, to promote and establish a region-wide compatible and integrated fishery statistical system, with an emphasis on the fishing fleet register and catch assessment surveys, which are fundamental to fishery management information systems. The system is based on the national fishery statistics systems, but has been enhanced and standardized in line with the requirements of FAO and the GFCM to meet both national and regional requirements and to ensure that the information necessary for tracking sustainability indicators is collected and compiled in a reliable and timely manner.

MedFisis provides specific assistance to non-European Union countries to develop their fishery statistics systems while ensuring regional compatibility. The database to accommodate and manage the national fishing vessel register is now available to the GFCM members. The new version of the catch and effort database software is being designed to be fully compatible with the fishing fleet database. Technical assistance provided to the GFCM and to its subsidiary bodies has gradually increased. The Project produced a web-based tool for on-line visualisation of the capture fisheries landing data and the preliminary analysis of the priority species landings series of the FAO and GFCM public database. MedFisis has developed training modules on species identification, gear and vessel classification and catch and effort survey. The Project provides technical support for the analysis of fishery dependent data, and communicates the results to the Scientific Advisory Committee of the GFCM as appropriate.

The EastMed Project (Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean) was designed to improve management at national and regional levels in order to achieve sustainability in the fisheries of the eastern Mediterranean and, through this, to support national economies and protect the livelihoods of those involved in the fisheries sector. The Project is expected to be established in 2008 with the financial contribution of Greece, Italy and the European Commission. EastMed will support and improve the capacity of national fishery departments and scientific institutions to increase their information base for fisheries management. The Project will also assist participating countries in developing and implementing fisheries management policies through a multidisciplinary approach, taking into account biological, environmental, socio-economic and institutional factors. A multidisciplinary advisory group (Country Participative Working Group) will be promoted in each country to support the national fishery directorate and the activities related to the sustainable development of the fishery sector. The EastMed Project is consistent with the Code of Conduct for Responsible Fisheries and the associated technical guidelines and International Plans of Action, and it draws heavily on the principles and standards embodied in these instruments. It is likely that the Project will increase the capability of the participating countries to be more active in fisheries management and, consequently, enable them to increase their level of participation in and their support for the GFCM.

The preparatory phase leading to the formulation of the EastMed Project was made possible through the Italian contribution to the "EastMed Project Formulation and Preparatory Phase". The initial core of the sub-regional technical network has been established around the eastern Mediterranean and the information flow has increased, allowing for the preliminary identification of the main national and regional priorities. Some of the national fisheries departments have initiated preliminary technical work, and a first set of technical contributions have been given to the subsidiary bodies of the Scientific Advisory Committee of the GFCM.

The projects and the General Fisheries Commission for the Mediterranean

The Agreement for the establishment of the General Fisheries Commission for the Mediterranean (GFCM), under the provisions of Article XIV of the FAO constitution, was approved by the FAO Conference in 1949 and entered into force in 1952. Amendments to this Agreement were approved during the last forty years, the last one being in 1997 (GFCM, 1997). The latter amendments were related to the change in name of GFCM previously "General Fisheries Council for the Mediterranean" and to new obligations for the Contracting Parties including their contributions to an autonomous budget for the functioning of the Commission. These new obligations came into force on 29 April 2004. The Commission much benefits by the support of the FAO technical cooperation projects at sub-regional and regional level which enhance, in particular, scientific cooperation and capacity building in participating countries in line with GFCM priorities and strategies.

Since its inception, the scientific cooperation represented the focus of the activities of the GFCM giving to the Commission the possibility to deal with a wide range of issues referred to all the different aspects of fisheries including, the state of fishery resources, the taxonomy and biology of the exploited species, the fishing technology, the development of aquaculture, the fish market, the food processing, fishery statistics, the environmental issues, institutional and management aspects and the socio-economic subjects.

The scientific cooperation among the Mediterranean countries and the work carried out so far by the GFCM has drawn the attention to the environmental and the socio-economic peculiarities of the fisheries in the whole Mediterranean area, which is based predominantly on artisan and small scale fisheries. These peculiarities are naturally underlined by the presence of an extensive shelf area, the presence of a fisheries population regulated by the local physical and oceanographic processes and features, biocenosis, unit stocks areas and species refugia (Caddy, 1998) highlighting the sub-regional dimension of the Mediterranean fisheries.

The numerous "Technical Consultations on Fisheries Management" held between 1979 and 1996 related to the Balearic and Gulf of Lions, the Adriatic and the Ionian Seas, and the Central and Eastern Mediterranean, stressed the geographical peculiarity of the GFCM area confirming the significance of the sub-regional scientific knowledge for the Mediterranean. Furthermore the Technical Consultations represented not only a momentum for the discussions on the research methodologies to be applied, the identification of common problems and the research results but also an opportunity of cooperation among the scientists coming from the different institutions in this region.

For aquaculture in the Mediterranean, the regional cooperation was more evident after the establishment of the FAO regional Projects Medrap (Mediterranean Regional Aquaculture Projects I and II from 1985 to 1995). These projects, among others, in 1992 established four Mediterranean networks: TECAM (Technology of Aquaculture in the Mediterranean), SELAM (Socio-Economic and Legal Aspects of Aquaculture in the Mediterranean), EAM (Environment and Aquaculture in the Mediterranean) and SIPAM (Information System for the Promotion of Aquaculture in the Mediterranean). In support of the work done by its Committee on Aquaculture, the GFCM has recently organised an expert consultation for the reestablishment of EAM (FAO, 2006), and a programme for the revitalisation of the SIPAM was launched in 2006**.**

For the capture fisheries, the cooperation between the FAO regional projects and the GFCM began with the institution of the CopeMed Project in 1996 and the AdriaMed Project in 1999. The Projects' activities on statistics, biological and socio-economic aspects of fisheries, in their respective geographical areas of intervention gave new support to the scientific knowledge and cooperation in the Mediterranean. Subsequently, the Scientific Advisory Committee and its four Sub-Committees and Working Groups on different subjects gave further evidence of this cooperation.

Despite the fact that every project has its own mandate and scope in its areas of competence and that each workplan reflects the sub-regional scientific technical needs, the cooperation among the countries independently of the origin's sub-region and the contribution to the work of the GFCM and its subsidiary bodies represent a common factor to all these projects.

The regional projects, not only provided a technical support at the regional level, but have also contributed to the establishment of a cooperative framework among the GFCM countries. Since the first SAC meeting, the projects' work plans are discussed and the relevance of their contribution to the work carried out by GFCM is pointed out during every meeting of the Commission. The regional projects such as MEDRAP for aquaculture, AdriaMed, CopeMed, MedSudMed and MedFisis, have played (or are playing) a central role in the development of a new culture of fishery management in the region (Cataudella, 2002). The regional cooperation supported by the projects network has allowed the formulation of scientific recommendations and the definition of scientific criteria for the development of a better integrated fisheries management system in the Mediterranean. The role of the FAO regional projects, as an essential component in the Mediterranean contest, was clearly highlighted during the Venice Ministerial Conference for the Sustainable Development of Mediterranean Fisheries (November 2003).

Contribution and support to the Code of Conduct for Responsible Fisheries and to the Ecosystem Approach to Fisheries

The Code of Conduct for Responsible Fisheries (henceforth referred to as the "Code") was adopted during the 28th Session of the FAO Conference (FAO, October 1995) and provided the essential framework for the management of fisheries resources in a sustainable manner. Since its adoption, the Code became a guideline for national, international, and for governmental and non-governmental fisheries organisations to ensure sustainable management of the fisheries resources.

Furthermore, the adoption of the Code has increased the awareness that fishing activities should be regulated with appropriate knowledge and giving proper consideration to the areas in which the fisheries stocks are shared. In this respect, the Code clearly and unequivocally addresses issues regarding shared stocks, with emphasis given to the development of cooperation among states as an essential and unavoidable requirement for the responsible exploitation of fishery resources.

One of the first follow-ups to the adoption of the Code, and in consideration of a request made during the 22nd Session of the Committee on Fisheries (1997) regarding the provision of assistance for the achievement of the Code objectives in the Mediterranean area, the Italian Government requested and funded a specific project for a Consultation on the Application of the Article 9 (Aquaculture Development) of the Code in the Mediterranean Region. This Consultation was conceived as a test to start providing assistance to member countries in implementing the Code, within the context of specific sub-sectors and geographic regions (FAO, 1999).

AdriaMed since the first meeting of its Coordination Committee focused its attention on activities addressed to issues on shared fisheries resources and that considered the Art. 7.1.3[4] of the Code as the base ground for the development of scientific cooperation in the Adriatic Sea.

All FAO regional projects in the Mediterranean address issues and activities with particular attention to the different principles, goals and elements for action as indicated by the Code and through the implementation of cooperation programmes. The projects have contributed in establishing a clear framework referred to the same Code in the Mediterranean.

For instance, the FAO projects have designed, developed and set-up different fishery information systems to enable national institutions to collect, store and analyse the multidisciplinary data required for fisheries monitoring at national and regional level (Art. 12.18); contributed in establishing a by-country inventory of ports/fishing vessels and a regional inventory of available historical data series (Art. 7.4.4); translated and gave easy access to information on current fishery management measures adopted in the different costal countries (Art. 7.7.1); improved the knowledge on commercial landing composition and dynamics and the relation with the exploitation pattern and fishing capacity (Art. 7.6.4); strengthened the regional scientific cooperation through the organization of expert working groups on the identification and definition of priority issues for fisheries research at regional level (Art. 12.12); provided and facilitated the access within countries to the international scientific information and ensured the circulation of scientific literature published in the different regions (Art. 7.3.4); reviewed and assessed the status of small scale and artisanal fisheries in different areas in the project countries (Art. 12.12); involved the different stakeholders in the discussions at subregional level. The regional projects have also strongly contributed to the dissemination of the Code in the countries involved such as in the case of AdriaMed that translated the Code into Albanian and Croatian languages.

According to the FAO (2003): *"the purpose of an Ecosystem Approach to Fisheries (EAF) is to plan, develop and manage fisheries in a manner that addresses the multiplicity of societal needs and desires, without jeopardizing the options for future generations to benefit from a full range of goods and services provided by marine ecosystems"*. The EAF is defined as: *"An ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and*

[4]"For transboundary fish stocks, straddling fish stocks, highly migratory fish stocks and high seas fish stocks, where these are exploited by two or more States, the States concerned, including the relevant coastal States in the case of straddling and highly migratory stocks, should cooperate to ensure effective conservation and management of the resources"

uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries".

The broad principles and approach for effective and responsible fisheries management are contained in the FAO Code of Conduct for Responsible Fisheries, many of which relate to an Ecosystem Approach to Fisheries (EAF). EAF is, in effect, a means of implementing many of the provisions of the Code of Conduct.

The principles pertaining to EAF are not new. They are already included in a number of international agreements and conference documents, including the 1972 World Conference on Human Environment; the 1982 United Nations Convention on the Law of the Sea Convention (UNCLOS); the 1992 United Nations Conference on Environment and Development (UNCED) and its Agenda 21; the 1992 Convention on Biological Diversity; the 1995 United Nations Fish Stocks Agreement; the 1995 FAO Code of Conduct for Responsible Fisheries; the 2001 Reykjavik Declaration; and the 2002 World Summit on Sustainable Development (WSSD). However, although the principles are not new, there has been little prior practical experience in implementing them (FAO, 2003).

The main principles and concepts included within an EAF are:

(i) Fisheries should be managed to limit their impact on the ecosystem to the extent possible.

(ii) Ecological relationships between harvested, dependent and associated species should be maintained.

(iii) Management measures should be compatible across the entire distribution of the resource (across jurisdictions and management plans).

(iv) The precautionary approach should be applied because the knowledge on ecosystems is incomplete.

(v) Governance should ensure both human and ecosystem well-being and equity.

Making EAF operational, i.e. moving from theory to practice, requires to go ahead step by step: (i) identifying broad objectives and considering the relevance to the selected fishery (or area); (ii) the objectives must further break down into smaller priority issues and sub-issues that can be addressed by management measures; (iii) the objectives are setting in operational objectives developing indicators and reference points; (iv) it is also important to develop a series of decision rules on how the management measures should be applied; and (v) all the operational measures need a monitoring programme. The fisheries management process within the EAF applied to Mediterranean fisheries will require increased participation, including most of the stakeholders. Traditionally the fisheries management has been an exclusive administrator task with not always sufficient transparency. Within the EAF this participative process is one of the key issues for implementing it in a selected fishery or region.

To implement the ecosystem approach it should be accepted by the stakeholders that the ecosystems have limits (and fishery resources are not unlimited) that, when exceeded, can result in major or irreversibly changes for target or non target species. The EAF implementation will entail the recognition of the wider economic, social and cultural benefits that can be derived from fisheries resources and the ecosystems in which they occur. An effective ecosystem approach will depend on better institutional coordination. In many countries fisheries and marine environment issues are under the umbrella of different ministries or administrations with different objectives, budgets and conservation philosophy. To advance in the implementation will require clarification of the roles and responsibilities, improving the coordination mechanisms and integrating across government and other users and more accountability across all stakeholder groups.

For the implementation of the EAF relevant regional objectives need to be identified considering the different Mediterranean stakeholders' interests (tourism, coastal development, agriculture, etc.), different policies and instruments (the Integrated Management of the Coastal Zone, for example) and the ecosystem and fisheries resources sustainability. Increase the capacity building on biology, ecosystem, economy, sociology and other disciplines for the EAF must be an important concern for

fisheries managers, as well as redefine the existing management structures and process (at national and regional level) to incorporate EAF. The capacity building at national and international level and leadership at regional level need to be considered.

The FAO regional projects have been supporting important actions to incorporate the sustainability of the resources, incorporating new stakeholders in the management process through the organisation of fora and by improving the scientific capacities of many countries participating in the projects by organising courses and on-the-job training. The FAO projects through their implementation have been strengthening some important Mediterranean fisheries and their management through the EAF. It should be noted here that for example the MedSudMed Project has important objectives related with the ecosystem approach for fisheries management in the south Sicily region.

When scientific cooperation works: Successes and achievements

The history of cooperation for fisheries research and management in the Mediterranean during the last decades can be marked as before and after the establishment of the last generation of FAO regional fishery projects. The AdriaMed, CopeMed, MedFisis, MedSudMed, and soon ArtFiMed (Sustainable Development of Mediterranean Small Scale Fisheries: Morocco and Tunisia) and EastMed Projects have made possible the regional scientific cooperation in fisheries to gain momentum in the Mediterranean scenario. Besides the inspired initiative of a small number of donors, some geo-political changes which took place around the Mediterranean in the 1990s and the process of renovation of the GFCM in late 1990s and early 2000s have certainly fostered the increase of scientific cooperation in support of fisheries management.

It is certainly impossible in a short manner to synthesize the main successes and achievements when considering the nine years of activity and production of the first phase of the CopeMed Project. All the relevant and detailed information is available from the Project website. The main achievements of the Project include the set up of a series of research programs on: artisanal fisheries, gears selectivity, socio-economic indicators, sampling schemes, tuna and swordfish, dolphin fish, Geographic Information Systems, Marine Protected Areas as a management tool, growth studies among others. Other important aspects initiated at the very beginning by CopeMed were the facilities of the Project for the south countries scientist to participate in the SAC and subsidiary bodies meeting with national information and data that permitted the stocks evaluations in some case for the first time. The issue of the much overlooked small-scale artisanal fishery is here selected as an example of cooperative effort and outcome within the CopeMed framework. When the Project started there was only partial and very scarce information related with the artisanal fisheries in some countries but not in others. At the end of the Project the data base on the artisanal fleets and activities in many of the countries has been created and this constitutes an essential source of information for the concerned fisheries administration to reinforce the national activities directed, and to improve the human, social and economic aspects of the artisanal fisheries by reducing the poverty and facilitating the instruments for the sustainable livelihood of the metier. This artisanal programme that started as a scientific activity has moved to constitute a set of operational and practical results useful not only for the fisheries researchers but also for the national fisheries administrations and the GFCM. The main results have been produced in an easy format, the CD-ROM and the artisanal fisheries book (Griffiths *et al*., 2007) easily available at the FAO Web page. Moreover a Virtual Library was built with the purpose of favouring a wider dissemination of the scientific papers which have not been previously published.

The evolution of scientific cooperation in the Adriatic Sea was also made possible thanks to the implementation of the AdriaMed Project, which paid particular attention to the networking aspects of the statistical, biological and socio-economic components of the fisheries sector. Throughout the years of its implementation, AdriaMed has set the basis for the cooperation in the area through: (i) the strengthening of national research institutions collaboration; (ii) the organization and successful implementation of regional research programmes; (iii) the establishment of scientific networks; (iv) the training of national staff; (v) support to the national fishery statistics programmes; (vi) the identification of operational units; and (vii) the creation of databases.

An open-access Information Centre was created to gather information available in the area, on research institutions and scientists; on ports and fish markets, links to websites of interest to the fisheries sector in the region, including documents published by the Project. The AdriaMed Web pages

are frequently visited by worldwide users and more than 40,000 documents were downloaded only during the period 2001-2006. Eleven scientific institutions in the Adriatic Sea now have a common information system (ATrIS) for the storage and analysis of data collected during the scientific surveys at sea; the digital cartography of the Adriatic Sea, assembled in the framework of the Project activities, is now available for all the research institutions. Through the Project activities, e.g. the implementation of the research programme "Identification of Population Units in Adriatic Sea Shared Stocks by Genetic Structure Analysis", it was also possible to improve the scientific knowledge on the Adriatic fisheries resources (demersal and small pelagic). In particular this programme represented the first case of a multi-species analysis of the population's genetic structure on a comprehensive pool of internationally-relevant shared stocks. On shared stocks, the Project organized the first ever acoustic survey event covering the entire northern Adriatic Sea thus highlighting the need of a comprehensive coverage of the occurrence area of the surveyed stocks as a basic requirement for the resource appraisal. In this regard, the Project established a permanent coordinated team for the acoustic survey in the Adriatic area. Moreover, between 2001 and 2005 the Project established a regional monitoring system for the assessment of small pelagic fish biomass and related fishery exploitation patterns in the Adriatic Sea. Since 2001 joint bottom trawl surveys were designed and carried out by the countries of the eastern Adriatic in cooperation with the western Adriatic counterpart.

Furthermore, the Project worked on the issue of operational units, their definition and area identification in the Adriatic Sea, and their application to the management of the region's shared resources. A critical review on the scientific knowledge on main Adriatic shared demersal stocks was produced and numerous technical documents were prepared. Many of the scientific results achieved and summarized above have also been used as technical support for the GFCM SAC activities.

The most important achievement of the MedSudMed Project was the establishment of a consistent scientific cooperation in fisheries science in the project area. The counterpart institutions in the Project countries are fully involved in the Project activities by availing their staff, premises and technical equipment. The Project constantly encourages and develops a "regional attitude" to face and solve common problems. For the first time in the areas concerned, scientists from the participating countries and from different fisheries research institutions have met together, discussed and agreed on methodologies to be applied, offering scientific data collected from different surveys (trawl, acoustic, ichtyoplankton surveys) for inclusion in common databases, joint data analysis and discussions of the results. Moreover, for the first time in the area, Italian, Libyan, Maltese and Tunisian researchers carried out surveys at sea on the same research vessel and to provide on-the-job training sessions. A substantial increase in the scientific knowledge was attained through the results of the scientific work carried out with the standardization of methodologies and protocols as a prerequisite for any other activity. As another proof of scientific cooperation, many of the scientific results analysed jointly were presented in international fora.

Lastly, within the framework of the EastMed preparatory phase and in cooperation with MedFisis and MedSudMed, and the FAO Species Identification Programme, scientists from nine southern and eastern Mediterranean countries are working together to compile the first Arabic-English Field Guide for the Identification of Fisheries Species of the Eastern and Southern Mediterranean.

The logical development of the cooperation experiences developed by the FAO/GFCM regional projects will be the consolidation and further development of the achievements and results reached and, particularly, the establishment of a cooperation network encompassing the whole Mediterranean basin. Such a network would dramatically strengthen the GFCM and would ensure a highly cost-effective service to the community of Mediterranean coastal countries to conserve and manage their fisheries.

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