

# Sustainable Sustainable Fisheries

in the Mediterranean

# Fisheries

# Mediterranean



**Regional Activity Centre for Cleaner Production (CP/RAC)**  
Mediterranean Action Plan



**Regional Activity Centre  
for Cleaner Production**



**UNEP**



**STOCKHOLM  
CONVENTION**



**Generalitat de Catalunya  
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## **1 Introduction**

### **1.1 The Mediterranean condition**

The Mediterranean Sea touches three continents and 22 countries with a coastline of 46,000 kilometres. Its average depth is of 1,500m with a maximum depth of 5,267m at Calypso Deep in the Ionian Sea. A shallow submarine ridge at the Strait of *Sicily*, between the island of *Sicily* and the coast of *Tunisia* divides the sea in two main sub-regions, the Western Mediterranean (about 0.85 million km<sup>2</sup>) and the Eastern Mediterranean (about 1.65 million km<sup>2</sup>) (New World Encyclopedia 2007). An estimate of more than 8500 species of macroscopic marine organisms, with a high rate of endemism, is thought to inhabit the Mediterranean Sea, corresponding to between **4% to 18% of the world marine species**. This is considerable as the Mediterranean Sea is only 0.82% surface area and 0.32% volume of the world ocean (Bianchi & Morri 2000). Its primary production is of 406 mgC m<sup>-2</sup> day<sup>-1</sup> (SeaAroundUs2009). Compared with the Atlantic, the Mediterranean marine communities have many different species with generally smaller individuals (Mediterranean nanism) and having a shorter life cycle (EEA/Zenetos *et al.* 2002). Sharp seasonality with temperature conditions that differ by more than 15°C between the two extremes allows the coexistence in space but not in time, of a tropical and temperate biota. The Mediterranean is a miniature but dynamic ocean where things happen faster than in the world ocean, and as such may be useful in allowing us to see what might happen in the future on a wider scale, both in space and time (Boero 2007).

Apart from its unique natural characteristics, the **Mediterranean Sea is used extensively for transportation** and is involved in 20% of the global oil shipping with 370 Million tonnes of oil being transported through the Mediterranean each year (MAP/REMPEC 1996). This enclosed sea suffers 17% of global marine oil pollution (UNESCWA 1991). The United Nations Environment Programme (UNEP) has reported that apart from the million tons of sewage, mineral oil, mercury, lead and phosphates dumped into the Mediterranean Sea each year, there is also the problem of increasing marine debris. A study of the seabed around the coasts of Spain, France and Italy, back in 1994 had already reported an average of 1,935 items per square kilometre. Plastic debris accounted for 76%, 94% of which were plastic bags (UNEP 2005b).

The **coastal population around the Mediterranean have doubled** in the last 40 years and is estimated to reach over 600 million in 2050 (World Bank Report 2005). As the Mediterranean region also offers an important contribution to world tourism (UNEP 2005a) and tourism arrival is expected to rise to 350 million in 2025, doubling the population along the coast during summer, there will be increased demand for space, water and natural resources (including marine resources), with increased stress on coastal ecosystems (World Bank Report 2006). At the same time only a relatively small portion of the Mediterranean Sea is fully protected (Greenpeace 2006b; Abdulla, *et al.* 2009) thus limiting the necessary

conservation when measured against the goal of reducing the rate of biodiversity loss by 2010, especially for the countries in the southern and eastern parts of the Mediterranean Sea (World Bank Report 2006). Due to these characteristics, conditions and requirements, the countries of the Mediterranean basin face a variety of shared environmental problems that are transboundary in nature. The cumulative uncontrolled coastal development, population expansion and increasing coastal tourism, unregulated and unsustainable fishing, and pollution are the greatest threats to the marine and coastal ecosystems.

The 2005 Transboundary Diagnostic Analysis (TDA) for the Mediterranean Sea identifies the following as some of the **major transboundary environmental concerns for the Mediterranean basin:**

- “1.) **Decline of biodiversity** due to over-fishing, conversion and degradation of critical habitats, introduction of alien species, pollution in the form of excess nutrients, toxic waste, including oil, solid waste and litter, and use of non-selective fishery gears;
- 2) **Decline in fisheries** due to over-fishing, use of harmful fishing practice, loss of shallow-water habitats for some life stages of critical fisheries, adverse water quality from rivers, coastal aquifers, sewage discharges, dredging, and non-point discharges;
- 3) **Decline in seawater quality** due to inadequate sewage treatment, lack of best practices in agriculture use of fertilizers and pesticides, inadequate controls on atmospheric emissions of heavy metals and persistent organic pollutants from European industrial sources, inadequate source controls and discharge control for industries along the sea, and increases in shipping traffic across the Mediterranean with consequent increase in accidental and purposeful discharge of harmful pollutants;
- 4) **Human health risks** due to ingestion of infected or contaminated seafood, ingestion of water while swimming, contact with contaminated seafood products, and contact with seawater contaminated with pathogens or viral agents” (UNEP/MAP/MED POL, 2005 pp 3).

The general idea that the sea is limitless and bountiful may have arisen from the notion that in spite of the intensive human use experienced for more than two thousand years, the Mediterranean Sea is still considered a global biodiversity hotspot, listed in the top 15 marine hotspots by Conservation International (CI) and figuring prominently in the WWF Global 200 list (WWF Report 2002). However **limitations and declines in fish stocks and marine resources are recently increasing in scientific reports and assessments as this report overviews.** The speed and effectiveness of the understanding and use of various scientific knowledge in sustainable fisheries management for effective sustainable consumption and production still need tuning so as to reach the targets required.

The challenge required in diverse research, management and governance in the fisheries sector is rather evident when one considers the 1,200 different aquatic animal species of commercial interest are found in

Mediterranean waters (FAO news 2005a). More than 600 fish species have been recorded in the Mediterranean Sea, including 81 cartilaginous fish, such as sharks, and 532 bony fish, and the numbers are increasing as new species enter and inhabit this sea. As a result, an extremely wide range of gear is used to catch various marine species: trawls, seines, harpoons, gillnets, lines, hooks, pots and traps - frequently very similar equipment that was being used hundreds of years ago. However fishing on the Mediterranean is slowly changing from small-scale fishers to a new-generation of larger commercial enterprises (FAO news 2005b).

## **1.2 The meaning and need for sustainable fishing**

### *Sustainable development*

Any challenging target requiring the involvement of various players or actors, cannot be reached without clearly understanding the meaning, actions required and reasons for these targets. The concept of sustainable development, simply defined by the 1987 'Brundtland Commission' of the UN as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" has inspired various pioneers in business, government and civil society to work toward the sustainable goal. The idea of Sustainable Consumption and Production which found early expression in concepts like 'eco-efficiency' (promoted by the World Business Council for Sustainable Development), 'cleaner production' (adopted by the United Nations Environment Programme), and 'Factor-4 production' (introduced by von Weizsäcker *et al.* 1997) also assisted in the ideas and implementations required. However, Sustainable Consumption and Production was clarified further by businesses, governments and NGOs at the 1992 Rio de Janeiro Earth Summit and the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg (Sabapathy 2007).

### *Sustainable Consumption and Production (SCP)*

Defining SCP, the *United Nations World Summit on Sustainable Development* indicated that there would be the need: "To promote social and economic development within the carrying capacity of ecosystems by addressing and, where appropriate, de-linking economic growth and environmental degradation through improving efficiency and sustainability in the use of resources and production processes and reducing resource degradation, pollution and waste." (UN 2004 (WSSD-POI Chapter 3)).

"At a European level, the Lisbon Strategy, also referred to as the *Lisbon Agenda*, was adopted at the European Summit of Lisbon, in March 2000. The Strategy aims at making the European Union the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs, greater social cohesion, and respect for the environment by 2010. At the time the Strategy had two dimensions: an economic and a social one. The environmental dimension was added to the Lisbon Agenda at the European Council of Göteborg in June 2001 through the adoption of the Sustainable Development Strategy (SDS). Both Strategies were asserted to be complementary and

mutually reinforcing. From that moment on, the Lisbon Agenda was to be guided by the sustainable development approach” (WECF 2006 pp1). However little progress, on the ambitious targets set in this agenda, was reported by EurActiv news (EurActiv 2007).

#### *Life cycle assessment*

Toward changing this state of affairs drivers that enable and encourage individual business action on Sustainable Consumption and Production have been put forward and among these we find: Savings and efficiencies; Costs and penalties; Markets and competition (Sabapathy 2007). The need to assess human production to make it sustainable requires an understanding and planning of the whole processes involved. Such *Life cycle assessment* is used to help understand the environmental impacts of goods and services through all stages of a life cycle. It seeks to identify what raw materials are used; what other products and processes are needed for manufacture; how the product or service is used; how it is disposed of; and whether the associated transport or storage costs are environmentally significant?

#### *Innovation*

Innovations in support of sustainable economies are creating the sixth major wave of industrial inventions since the start of the Industrial Revolution (Lovins, 2008). “From the steam engine in the first wave to biotechnology and information networks in the fifth, surges of innovation have accelerated the rates at which natural capital could be converted to human-made capital, thereby ushering in new eras of material prosperity throughout the industrial era. The sixth wave, which taps green chemistry, biomimicry, industrial ecology, and other sustainability innovations, offers the promise of breakthroughs in using natural wealth efficiently, wisely, and equitably. And because it takes advantage of social and institutional innovations as well - not just technological ones - this new wave provides leadership roles for consumers and non-governmental groups, businesses, and governments” (Hawken, Lovins, and Lovins, 1999 pp15-16).

#### *Ecosystems value*

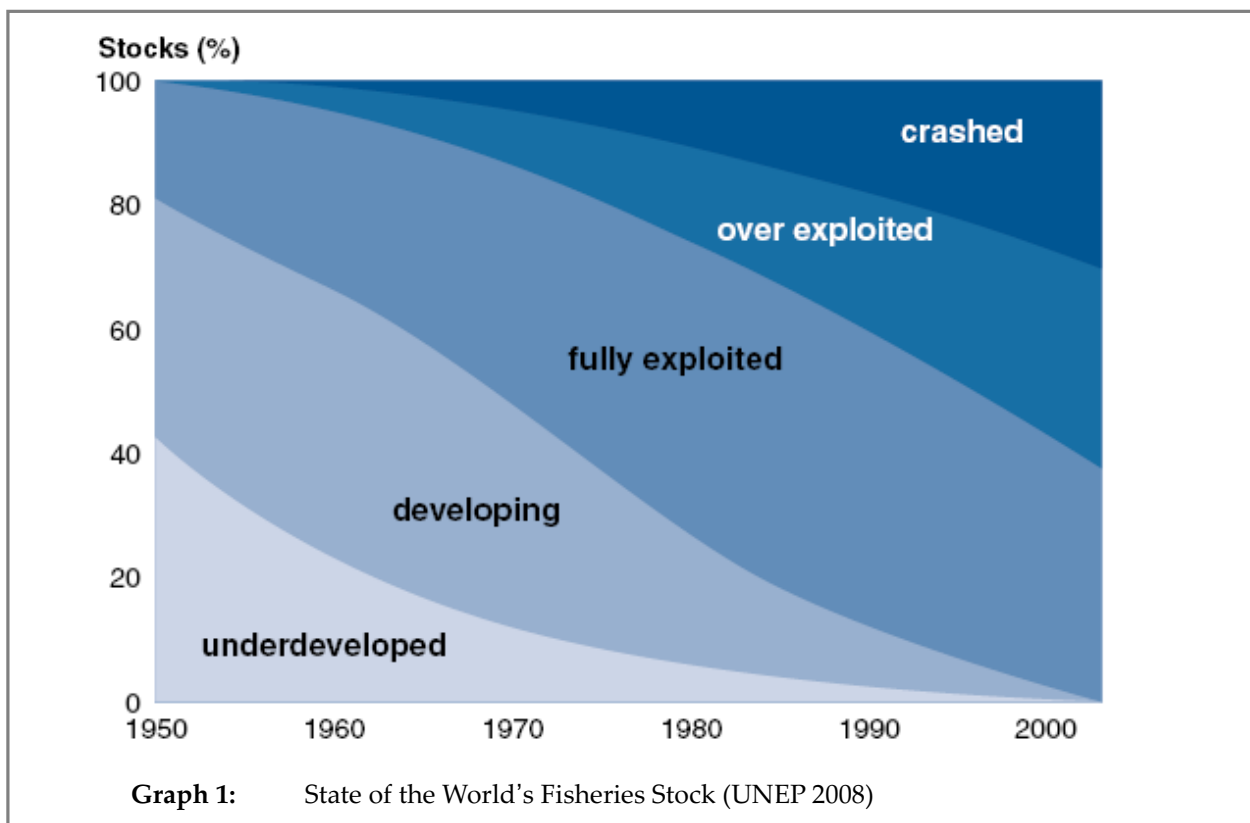
As part of these innovations there is the need to account for nature’s contributions. “Nature is a ready storehouse of the raw materials of civilization—food, fiber, fuel, minerals—and the collective annual value of these goods is in the trillions. But the global ecosystem also provides many services that are the indispensable substrate of economies, including air and water purification, mitigation of droughts and floods, soil generation and soil fertility renewal, waste detoxification and breakdown, pollination, seed dispersal, nutrient cycling and movement, pest control, biodiversity maintenance, shoreline erosion protection, protection from solar ultraviolet rays, partial climate stabilization, and moderation of weather extremes” (Daily *et al* 1997; Gardner & Prugh 2008 pp 12).

“Far from being free, the value of ecosystem services is sobering. For instance, honeybees’ work as



pollinators is worth up to \$19 billion a year in the United States alone. Farmers around the world spend \$30–40 billion annually on pesticides to control crop pests, but the pests' natural enemies eliminate at least as large a share of the pest population—in fact, perhaps far more—and without them, expenditures on chemicals would be far higher” (Johnson 2008; Gardner & Prugh 2008 pp. 13).

Equally, various marine species and ecosystems have increasingly offered vital services and goods to humanity for thousands of years. “Thirty years ago, the fishing industry and Government fisheries policy focused mainly on harvesting fish as food for the country. The Government’s main interest was in boosting fishing activity, because stocks were generally buoyant and there was limited understanding of, or concern about, the environmental impact of the fisheries sector. The fishing industry had a high political profile and received widespread public support as a provider of food in difficult and often dangerous conditions. But fishing was opportunistic and paid little attention to consumer demand. This approach in European Union (EU) waters, coupled with unresponsive management and other factors, led to the over-exploitation and depletion of many commercial fish stocks. This in turn has had high economic, social and environmental costs” (Defra 2007 pp. 5).



*Towards Innovative fisheries management?*

“Business as usual, is a continued decline in global fish wealth” (World Bank/FAO 2008 pp x). According to the State of the World 2008 report, “all currently fished marine species could collapse by 2050 and the number of oxygen-depleted dead zones in the world’s oceans has increased from 149 to 200

in the past few years, threatening fish stocks” (Gardner & Prugh 2008 pp. 3). To reach sustainable consumption and production of marine resources needs a better understanding and internalisation of knowledge and precautions in fisheries and aquaculture management. Marine “ecosystems are complex and dynamic natural units that produce goods and services beyond those of benefit to fisheries. Because fisheries have a direct impact on the ecosystem, which is also impacted by other human activities, they need to be managed in an ecosystem context. The meaning of the terms “*ecosystem management*”, “*ecosystem-based management*”, “*ecosystem approach to fisheries*” (EAF), *etc.*, are still not universally defined and progressively evolving. The FAO Code of Conduct for Responsible Fisheries is particularly important in this respect and contains provisions for practically all aspects of the approach. One major difficulty in defining EAF lies precisely in turning the available concepts and principles into operational objectives from which an EAF management plan would more easily be developed. Experience in EAF implementation is still limited but some issues are already apparent, e.g. in added complexity, insufficient capacity, slow implementation, need for a pragmatic approach, *etc.*” (Garcia, *et al.*, 2003 FAO pp. iv).

#### *The ecosystem approach for fisheries*

However more recently the discussion on EAF (ecosystem approach to fisheries) has moved from definitions and principles to an international call for its implementation. “The EAF concept has reached a point of general acceptance by those involved in fisheries and their management and the global political drive is there. However, many countries and regions are still grappling with understanding and interpreting the concept of application within their own context. There is an urgent need for proactive and comprehensive implementation of EAF if declines in fisheries productivity and biodiversity of the Mediterranean are to be halted and reversed where necessary. Given the high seas nature of many of the Mediterranean fisheries and the traditions of regional cooperation through international bodies (e.g. GFCM, ICCAT and the European Commission), the Mediterranean countries would benefit from developing an overall framework for the implementation of EAF. This framework would define what the application of the EAF entail for the GFCM, across biological, ecological, economic, social and governance dimension and provide a guiding process to be followed and adapted to the particularities at the sub-regional, national and local levels” (Cochrane & Young 2008 pp.83). However unless all countries around the Mediterranean and exploiting the Mediterranean's resources are closely involved and participative in the planning, management, research and awareness efforts involved to safeguard Mediterranean marine resources, biodiversity and sea water quality, it may be hard to achieve the necessary goals.

In some countries, such as in the UK, “Fishermen are working with scientists to reduce the environmental impact, and improve the sustainability, of fishing. Processors are putting in place more robust traceability mechanisms; consumers are increasingly demanding sustainability - caught fish; and retailers are taking steps to ensure that their purchasing policies are sustainable. We now recognise the economic and social

value of recreational fishing and the potential for conflict for access to a shared resource. These changes are encouraging, but across the EU we are still catching too many fish of some species, and the greatest negative impact on the marine environment as a whole is caused by unsustainable fishing. More needs to be done to secure a sustainable future for fisheries businesses, recreation and for the health of our seas and oceans" (Defra 2007 pp. 5). Similar considerations are required in various countries around the Mediterranean.

#### *Global frameworks of action and strategies*

For sustainable development to be a "global objective that aims to respond to the needs of current generations without compromising the abilities of future generations to meet their own needs and for The *Millennium Development Goals*, approved by 189 countries in September 2000, and the *Johannesburg Plan of Implementation*, adopted in 2002 by the *World Summit on Sustainable Development (WSSD)*" to be effective, emphasis needs to be placed on "the urgent needs for greater commitment to reduce inequalities and assist in the development of poor countries". There is also emphasis on the "need to change unsustainable production and consumption patterns, as confirmed by the Global *Marrakech process*, to protect and manage natural resources sustainably for economic and social development, to safeguard health and integrate the objective of sustainable development more effectively into the process of globalization. The WSSD also calls for regional and national strategies in recognizing that sustainable development cannot be achieved in isolation and that international prescriptions have to be adapted to local circumstances and to the conditions of the eco-region" (UNEP/MAP pp. 1).

The **Mediterranean Strategy for Sustainable Development (MSSD)** developed the framework which allowed the adoption of international commitments to regional conditions and guided toward national sustainable development strategies while allowing for dynamic partnership between countries at different levels of development. However, there is a latent but growing awareness throughout the Mediterranean that current development trends are unsustainable. "Mediterranean people are becoming increasingly aware that it is just not possible to keep using resources, building up coastal areas and developing industries, especially tourism, without an adequate integrated planning framework, a reduction of North-South disparities and the necessary policy reforms. Though the Mediterranean partners have already made much progress in this respect through the Barcelona Convention and the MCSD and the Strategy offers an excellent opportunity for these partners to make progress, based on genuine partnership and co-development, there may be the fear that due to the diversity of economic, social, cultural and future outlooks of different Mediterranean countries unified efforts and actions may be very difficult to achieve" (UNEP/MAP 2005 pp.1).

### **1.3 Background to codes, recommendations and legislations to protect marine resources.**

In November of 1967, Malta's Ambassador to the United Nations, Arvid Pardo, asked the nations of the world to “look around them and open their eyes to a looming conflict that could devastate the oceans, the lifeline of man's very survival”. In a speech to the United Nations General Assembly, he spoke of the super-Power rivalry that was spreading to the oceans, of the pollution that was poisoning the seas, of the conflicting legal claims and their implications for a stable order and of the rich potential that lay on the seabed (UNCLOS website; UN, 1967).

#### *Need for new approaches*

“The United Nations Convention on the Law of the Sea (UNCLOS) was adopted in 1982. However by the late 1980s it became clear that global marine fisheries development was running at a pace which resources were unlikely to be able to sustain. Development and exploitation was often rapid and uncontrolled, fuelled by strong and growing world demand for fisheries products. Unregulated fisheries targeting high seas and straddling fish stocks exacerbated this situation. The need for new approaches to fisheries development, planning and management rapidly became apparent – approaches that would embrace principles of conservation, environmental responsibility and sustainability” (Hosch, G. - FAO, 2009 pp.1).

#### *FAO Code of Conduct for Responsible Fisheries (CCRF)*

“Based on these concerns, the nineteenth session of the Committee on Fisheries (COFI) (1991) called for the development of concepts which would lead to responsible and sustainable fisheries. The FAO Code of Conduct for Responsible Fisheries (the Code) finds its origins in this call. A number of other fora then quickly endorsed the idea of developing a Code, including the 1992 Cancún International Conference on Responsible Fishing and the 1992 United Nations Conference on Environment and Development (UNCED). At the same time, two major international fisheries instruments were being developed. These were the 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the Compliance Agreement), and the 1995 United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the Fish Stocks Agreement). On the basis of these developments, the FAO Governing Bodies recommended the formulation of a *Global Code of Conduct for Responsible Fisheries* which would be consistent with these instruments, and which would establish principles and standards applicable to the conservation, management and development of all fisheries in a non-mandatory manner. The Code was adopted by the FAO Conference in October 1995” (FAO 1995; Hosch, G. - FAO, 2009 pp.1).

The 1995 FAO Code of Conduct for Responsible Fisheries and the technical guidelines developed in support of its implementation (such as those on the precautionary approach) provide further examples of international support for improved fisheries management (FAO 1995). In addition, Agenda 21 of the UN Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil (UN 1993) and the 1992 Convention on Biological Diversity (CBD 1993) gave political support to the goals of improved fisheries management as well as to the conservation and sustainable use of marine biodiversity. In specific support of protecting endangered species world-wide, the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was also set up. The latter already offering protection to marine turtles and cetaceans, while there are increasing calls for the considerations urgently required for the protection of some endangered fish species like the Bluefin tuna (Greenpeace news, 2009; WWF news, 2009; IUCN news, 2008).

The Code of Conduct for Responsible Fisheries (CCRF) was developed to address the management of all aspects of capture fisheries and aquaculture, fish processing and trade, including environmental issues and fishing on the high seas. The 1993 FAO Compliance Agreement (the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas), which addresses fishing on the high seas, is an integral part of the CCRF (FAO Report 2003 pp. 209).

“The application of the precautionary approach is a fundamental concept in the CCRF. It requires cautious aquatic resource management when information is uncertain, unreliable or inadequate, and should lead to reduced risks to the ecosystem. The precautionary approach has been enshrined in several other international initiatives, including the UN Convention on Biological Diversity and the UN Fish Stocks Agreement (i.e. the Agreement for the Implementation of the Provisions of the United Nations Convention of the Law of the Sea, relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks)” (FAO Report 2003, pp. 209).

Identifiable **requirements toward the protection of marine and coastal marine resources** include:

- “1) The need to **halt the loss of marine and coastal biodiversity by 2010** in EU Member States and reduce it substantially in other countries, in accordance with international and European commitments;
- 2) Ensure the **development of fishing in the Mediterranean towards an ecosystem approach** and restore the stocks as far as possible by 2015, in accordance with the commitment of the Johannesburg World Summit on Sustainable Development;
- 3) Promote **sustainable aquaculture techniques** that minimize their impact on the environment and conflicts with other users of the coast.”

*Mediterranean Strategy for Sustainable Development (MSSD)*

The MSSD should allow for these important needs to be promoted in the region through coordinated actions listed by UNEP/MAP (2005 pp. 22-23) as follows:

- a) "Encourage fishing and aquaculture practices that are compatible with the protection of biodiversity and the sustainable management of marine resources. Strengthen implementation of commitments undertaken within the framework of the Code of Conduct for Responsible Fisheries (FAO, 1995), the General Fisheries Commission for the Mediterranean (GFCM), the International Commission for the Conservation of Atlantic Tunas, the declaration of the Ministerial Conference on the Sustainable Development of Fisheries in the Mediterranean (Venice, November 2003) and the Common Fisheries Policy of the European Union.
- b) "Actively implement the programme of work on protected areas adopted by the Convention on Biological Diversity, taking into account the agreed timetable and objectives."
- c) "Identify the Mediterranean sites in which the sustainable management of biodiversity would be advanced by the creation of marine and coastal protected areas, including in particular pelagic and deep habitats, within and beyond zones of national jurisdiction, on a scientific basis and in accordance with the Law of the Sea."
- d) "Increase the number of protected areas throughout the Mediterranean significantly, to cover at least 10% of coastal and marine habitats with forms of protection that meet the criteria of the IUCN."
- e) "Promote a representative network of protected marine and coastal areas that makes up an ecologically representative regional system, and increase their protection by adding them, when necessary, to the SPAMI list."
- f) "Promote the creation of new types of protected spaces (public-private-local community partnerships; partnerships with owners of coastline property; mobilization of local NGOs), and invite the managers of protected areas to play a more active role in promoting local sustainable development."
- g) "Strengthen cooperation between MAP and the GFCM and, at the local and national levels, cooperation between fisheries operators and the managers of protected areas."
- h) "Strengthen institutional and human capacity for management of the interactions between human activities and marine and coastal biodiversity."
- i) "Strengthen the synergies between international organizations and networks (such as the Barcelona Convention, IUCN, MedWET, the Bern Convention, the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area UNEP/CMS/ACCOBAMS, the Natura 2000 Network and the EU Marine Strategy)".



**Photo 1:** Trawler followed by sea birds

*European framework of action*

In the European Union a legal framework for fisheries management in the Mediterranean which entered into force in 2006 (Council Regulation (EC) No 1967/2006), as “the Mediterranean Regulation”, provides the EU and its Member States with a basic set of tools to enable them to enhance the sustainability of their fisheries activities. “For example it allows for better selectivity by trawl nets both by improving the rigging of the trawler and by changing the shape and dimension of mesh size. It controls fishing effort by limiting the maximum dimension of fishing gears and it embeds environmental concerns into the CFP by ensuring the protection of coastal areas through limited access for active gears. More over, it protects sensitive habitats from mobile fishing gears and sets a basis for establishing marine protected areas” (Borg 2008).

The **EU Common Fisheries Policy** (CFP) was reformed in 2002 to facilitate the achievement of sustainable fisheries even in the Mediterranean. With the publication on 11 April 2008 of DG Mare's Communication on ‘*The role of the Common fisheries Policy (CFP) in implementing an ecosystem approach to the marine environment*’ (COM(2008) 187 final & SEC(2008) 449), the Commission took a step forward in addressing the long-awaited commitment of the CFP Regulation to ‘*aim at a progressive implementation of an ecosystem-based approach to fisheries management*’. “So far, the ecosystem-approach initiatives undertaken by the Commission have too often been reactive to particular issues, and as such have been *ad hoc* and piecemeal rather than forming the coherent and overall operational strategy so urgently needed” (WWF/Birdlife 2008). In July 16th 2008, the European Commission launched the Sustainable Consumption and Production package, which includes a legislative proposal and an Action Plan for sustainable development (COM(2008) 397 final - {SEC(2008) 2110} {SEC(2008) 2111}). The EU

Commissioner for fisheries and maritime affairs stresses on the need to have a more effective GFCM in providing scientific knowledge for best levels of exploitation of marine resources in the Mediterranean while ensuring effective harmonisation of fisheries rules and reducing fishing capacity (Borg 2008).

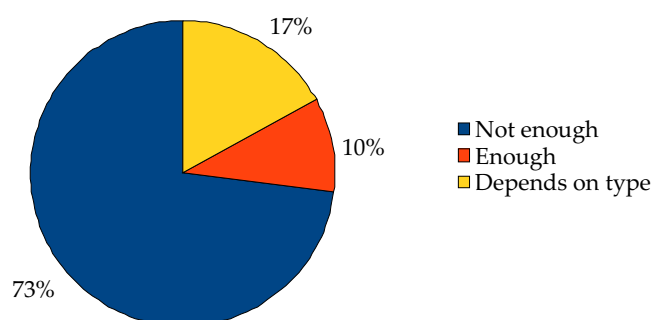
But as considerations for reducing the fishing capacity is stressed in Europe and the Mediterranean, many subsidies in the fisheries sector are pernicious as they foster overcapacity and over-exploitation of fish stocks. By reducing the cost of harvesting, for example, through fuel subsidies or grants for new fishing vessels, subsidies enable fishing to continue at previously uneconomic levels. Subsidies effectively counter the economic incentive to cease fishing when it is un-profitable (Oceana 2007b; World Bank/FAO 2008; Knigge 2008). “Common fisheries sector subsidies include grants, concessional credit and insurance, tax exemptions, fuel price support (or fuel tax exemption), direct payments to industry, such as vessel buyback schemes, fish price support, and public financing of fisheries access agreements. In addition to the extensive catalogue of public support, subsidies have variously been considered to include government fisheries extension and scientific research services. Policy changes, such as relaxation of environmental regulations governing fisheries or special work permits for migrant fish workers (crew) can also reduce costs in the sector and such distortions also have been regarded as a form of subsidy. The reduced costs restore profitability and create perverse incentives for continued fishing in the face of declining catches. The result is over fishing, fleet overcapitalization, reduced economic efficiency of the sector, and resource rent dissipation” (Schrank 2003; World Bank/FAO 2008 pp.18).

#### **1.4 *The need to look into the current actual situation in Mediterranean Fisheries from various workers in this field: fisheries questionnaire study for Mediterranean Countries.***

As increasing regulations, agreements, conventions, communications and legislations pile up toward addressing the need for actions, at both national and regional levels, toward sustainable fisheries management, how are Mediterranean countries currently dealing with this urgent issue? As part of this report, replies to a questionnaire sent out to a wide selection of operators, researchers and workers in the field of fisheries in the Mediterranean are considered so as to obtain an idea of the direction in which Mediterranean consumption and production is going. A copy of the full questionnaire is available in Annex 2 of this report.



**Q2 Do you feel enough information is collected by your Country and Mediterranean Countries on the catch statistics of fisheries to assist with suitable management of marine resources?**



**Pie Chart 1:** Illustrating replies to question 2 on the adequacy of information collected on fisheries catch data and statistics in their country.

Among the contributions to the fisheries questionnaire (Annex 2, question 2), 73% indicated that not enough fisheries information was being collected and made available for accurate assessment of the fisheries status and statistics in the Mediterranean. 17% indicated discrepancies between information or data collected for different types of gear. While 10% indicated that enough fisheries data was being collected in their country. The critical situation was particularly felt among research, fishermen and NGO entities that were not connected to governmental institutions. The reasons given for this failure to obtain and access accurate information on fisheries and their real impact on and use of marine resources included: the lack of expertise in species identification, funds for adequate man power for accurate data recording and enforcement; differences in the way data is collected for different fishing method and species; lack of vigilance on offshore fishing activities; lack of widespread scientific research which would allow rigorous focus on accurate data collection; improvements required in regional regulatory bodies which have been found to poorly manage fisheries where research indicated the need for such management and action; poor data on by-catch and impacts on the marine environment; lack of data on some artisanal fishing activities which end up not landing catches at fisheries centers where data could be collected prior to the sale of their catch; differences between EU and Non-EU countries in the rigour of data collection and management may increase the pressure among EU fishermen as any possible responsible fishing from their part may be jeopardized by non EU countries' fishermen, thus defeating their present caution for future fishing benefits. In brief, Mediterranean countries currently face serious difficulties in improving their data collection, fisheries assessment, research and management to allow for sustainable and ecosystem-based fishing, in a unified and responsible manner through out the region. This is a prerequisite for fishermen in the region to gain trust in management entities and fallow

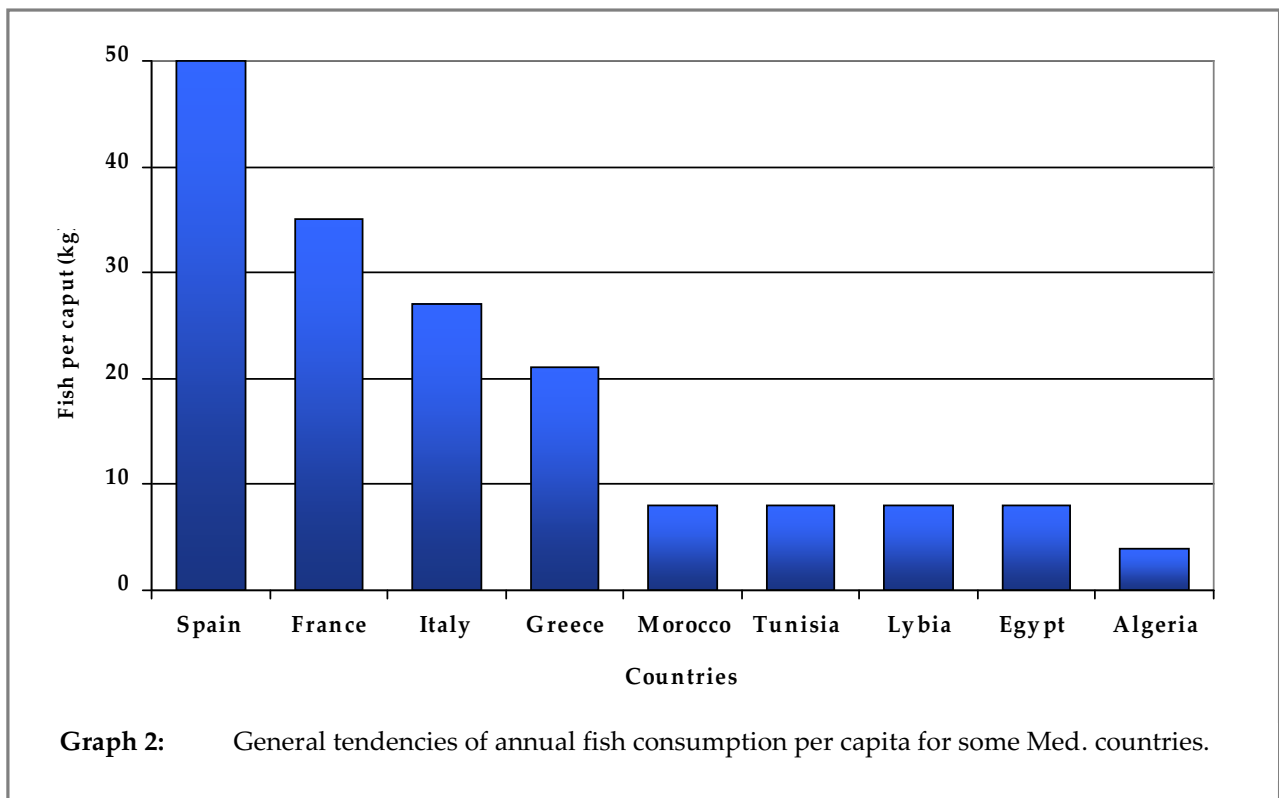
Mediterranean fishermen toward actions that would have effective influence on the protection of future stocks of marine organisms and a healthy biodiversity in this sea. So greater data accuracy and research but also law enforcement and unified regulations across the region, were the main issues brought up in reply to question 2.

## 2 Is Mediterranean seafood consumption sustainable?

### 2.1 Seafood consumption trends in the Mediterranean population

The Mediterranean countries are **top consumers and deficit producers of fishery and aquaculture products** (Paquette and Lem 2008). Demand for fishery products consists of two components: direct consumption of fish as food and fish used for animal feeding. Increasingly, fishery resources are also in demand as a source of leisure activities (FAO Report 2003 pp. 199). Globally, fish provide about 16% of animal proteins consumed and are a valuable source of minerals and essential fatty acids (FAO Report 2002).

“The Mediterranean countries are mainly responsible for the enormous deficit in the trade balance of the European Union for fishery and aquaculture products, Italy holding first place with a deficit reaching almost 2.5 billion euros, followed by France and Spain, each with a deficit of 2 billion Euros. The five largest Mediterranean countries of the EU (France, Greece, Italy, Portugal and Spain) account for 38% of the total population of Europe, but make up approximately 53% of consumption. These high figures refer particularly to shellfish and crustacean consumption since the five Mediterranean countries account for 72% of the total European consumption of these species, in comparison to 47% for finfish. There is however a wide disparity in the levels of consumption per caput with nearly 50 kilos in Spain, followed by 35 kilos in France, 27 kilos in Italy and 21 kilos in Greece” (Paquette and Lem 2008 pp. 43), “the annual consumption per capita in Morocco, Tunisia, Libya and Egypt is around 8 kg and much less in Algeria” (Ciheam/Oliver 2002a).



“The **globalization of trade markets has changed consumer habits and the Mediterranean market** for fishery products is not an exception. In fact, the Mediterranean market for fishery products is probably one of the regions in the world where this change is most evident and important Mediterranean fish markets are increasingly dependent on imports, making their equilibrium increasingly more fragile and endangering the interests of the Mediterranean fishery sector due to the inexorable advance of the liberal trading system. At present, in the Mediterranean region there is a growing dependence on imported fishery products (processed fish products and specially prepared meals), which may now represent between 50 and 80% of total fish consumption in some European countries” (Ciheam/Oliver 2002a pp. 179).

## **2.2 The traditional Mediterranean diet**

The term “traditional Mediterranean diet” refers to dietary patterns in regions around the Mediterranean sea in the 1950s and early 1960s. Characteristic features of this diet include: Abundant plant foods (grain products, vegetables, fruits, herbs, garlic, nuts and seeds) rich in carbohydrate, fibre, minerals and vitamins; Olive oil as the principle source of fat (rich in unsaturated fatty acids); High ratio of dietary unsaturated to saturated fatty acids; Low to moderate consumption of poultry and dairy products; Low consumption of red meat; Moderate consumption of fish. In addition, observational studies have shown that eating at least one portion of fish per week is associated with a significant reduction in the risk of cardiovascular events. Modest oily fish consumption is associated with protection from coronary heart disease (Sanders 1991). More frequent consumption of fish, however, did not provide additional benefits and the ‘very long chain polyunsaturated fatty acid’ contents of the consumed fish could not fully explain the observed benefits (Albert, *et al.*, 1998; Ascherio *et al.*, 1995; Daviglius, *et al.*, 1997; Gillum, *et al.*, 1996; Kromhout, *et al.* 1985; Kromhout, *et al.* 1995; Shekelle, *et al.*, 1985; Unilever Health Institute, 2002).

### *Risks and benefits associated with fish consumption*

Healthy eating, triggered by various food crises (e.g. BSE and dioxin) is another determinant of the positive trend of seafood consumption in Europe (Failler 2007). This does not exclude seafood to contain different types of toxic substances (SACN, 2004) and a changing Mediterranean diet influenced by the globalisation of fast foods (Alexandratos 2006). “Oily fish, such as mackerel, herring and sardines, can be a valuable source of omega-3 fats, which are believed to have important benefits for heart health and mental development. However, there is clearly a problem with promoting increased consumption of fish for human health when fish are so under threat. More and more organisations are now promoting sustainable fishing, to ensure that health benefits of fish consumption can be enjoyed by future generations. There are some health problems associated with increasing the amount of oily fish we eat. The same fatty tissues in fish that provide valuable omega-3 fats also tend to have high levels of pollutants such as mercury and synthetic chemicals called PCBs (polychlorinated biphenyls). PCBs

accumulate in the body and can damage the development of fetuses; for this reason, pregnant women are advised to limit the amount of fish they eat and avoid certain types of oily fish altogether” (Sustainweb & Sustain reports 2008; 2009).

A more holistic approach is needed in order to give advice on balancing the risks and benefits of consuming fishery products. The existing focus on links between seafood and contaminants on one side, and between seafood consumption and health on the other, is making it increasingly relevant to provide advice to governments on how to handle such issues. In this context, “FAO and the World Health Organization are preparing an expert consultation on the risks and benefits of consuming seafood. The first phase would focus specifically on the impact of methylmercury exposure on women of childbearing age and the future development of their children with respect to neural and cardiovascular development as well as the benefits of fish and its components. The confounding effects, if any, of dioxin and dioxin-like PCBs will also be considered, as dioxin intake is highly correlated with the intake of fatty fish, which are also significant sources of the beneficial omega-3 fatty acids” (FAO Report 2009 pp 174).

#### *Cultural issues*

In the midst of food choices that Mediterranean and non Mediterranean people are taking in the light of increasing awareness of health issues and sustainability needs, it is relevant to consider the cultural issues that come to impinge on food choices and habits which may be more difficult to change. The following passage called “*Insatiable Europe*” from *National Geographic* (2007) – Saving the Sea's Bounty: Special Report, illustrates eloquently how tragic it may be to see years of traditions and heritage risking to be lost due to lack of foresight and action taken in time.

“A swordfish is brought ashore in Vigo, Spain, one of the world's busiest seafood ports, handling about 675, 000tons of fish a year. Lower stocks of commercial species such as Atlantic cod and hake have caused a steady decline over the past five years for Spain's fleets, which receive the EU's heaviest subsidies. Yet Spain's and Europe's appetite for fish keeps growing. The EU is the world's largest market, taking in 40% of all imported fish with a large chunk coming from developing countries. Spaniards consume a hundred pounds of seafood a year per person, nearly double the European average and exceeded only by Lithuanians and Portuguese. In northern Spain, the fishing family of Maria Jose Novoa Villarejo enjoys mussels and other seafood. Whether her children will choose to make their living through fishing is for the first time an open question” (National Geographic 2007 pp. 61).

### **2.3 Culture and tourism: demand on marine resources**

#### *Tourism and seafood*

As cultural identities are perpetuated and tourism increases in the Mediterranean region, seafood appreciation and use as part of the tastes sought out by locals and visitors to Mediterranean countries

may increase the demand for marine resources. Whether these will continue to depend on local fresh resources or imported products is to be considered. However in any case responsible issues of sustainable consumption issues in the Mediterranean come into play in the decisions taken by Mediterranean consumers, importers and exporter.

“Consumption per capita represents the total apparent consumption divided by the number of inhabitants of a country. Consumption can be within the home or outside, mainly through catering. The consumption per capita is an indicator of the overall consumption, but it does not reflect internal changes in fish consumption. Compared to the consumption in 1998, the trends for the period 2005-2030 will be as follow for the Mediterranean countries of the EUR-28 countries: *Increasing in France, Greece, Italy, Slovenia, Malta; while Decreasing in Spain*” (Failler 2007-FAO pp. xx).

“Net supply of fish represents what is left from the addition of the production and the imports less the exports. From 1989 to 2030 the apparent consumption of fish by the EUR-28, or net supply of fish, will move from 9.3 Mt to 12.2 Mt, the net supply of fish commodities for human consumption at the EUR-28 level will show three tendencies: 1) Cured and fresh/chilled fish will remain more or less stable; 2) Crustaceans, molluscs and other prepared aquatic products, filleted and prepared/preserved fish, molluscs, crustaceans and cephalopods will increase; 3) Frozen fish will decrease” (Failler 2007-FAO pp. xxii).

Regarding groups of species, the overall tendency will be an increase of all major groups of species. Demersal species will be utilised further, in terms of volume, since they enter into the composition of ready to eat dishes and fish fillets that are subject to an important augmentation. The increase of the net supply will be possible because of: 1) the rise of imports from third countries (mainly from Asia, Africa and South America); and 2) the increase of the aquaculture production in some countries (Norway, UK, Greece, Spain) (Failler 2007-FAO pp xxiii).

#### *Fishing as leisure activity*

Apart from the culinary demand for marine resources, there is also the fishing activity linked to leisure activities demands. Two types of users are increasingly using fisheries for leisure activities: active users such as recreational and sports fishers, and so-called non-consumptive and passive users such as tourists, sport divers and individuals who want to enjoy the environmental values of pristine marine environments (including fisheries). “In many parts of the world, the number of stakeholders who want to use fisheries for leisure purposes exceeds the number of commercial fishers. Because all stakeholders, commercial or otherwise, have valid claims for access to living aquatic resources and have a stake in influencing the use of world fisheries, the emergence of this group is an important development. Because of their numbers and the fact that they are increasingly well represented and organized, these stakeholders in affluent developed economies have a growing influence on how fisheries can be used,

including the use of fisheries for food production” (FAO Report 2003 pp. 201).

## **2.4 Economic and non-economic reasons for changes in fish consumption in the Mediterranean**

Technology has enabled humans to haul in more fish than the oceans can replace, so fish populations, such as Bluefin tuna, groupers and cod, are plummeting. As catches decline by about 1% annually, the Ocean Conservancy warns that we are “spending the principle” of our marine resources rather than living off the interest (Klesius 2002).

Similarly Daly (2008 pp. 40) indicated that “The economy is a subsystem of the finite biosphere that supports it. When the economy's expansion encroaches too much on the surrounding biosphere we begin to sacrifice natural capital (animals, plants, minerals and fossil fuels) that is worth more than the man-made capital added by 'growth'.”

### *Need to change consumption and production patterns*

“Foreign trade during the 1990s was characterized by strong growth in exports, together with more moderate growth in imports as intra-regional trade continued to increase. In the future, it is likely that increased consumption, linked with declining national resources, will lead to Europe’s growing dependence on foreign suppliers. Since EUR-28 production will not be sufficient to cover the needs of the 500 million inhabitants in 2030, imports of raw material and commodities will help to fill the gap between EUR-28 production (less exports) and EUR-28 consumer demand” (Failler 2007-FAO pp xxvii). This would however impinge on global natural resources that are concurrently facing sustainability problems so that looking outside of Europe and the Mediterranean to fill in the gaps that are increasing locally may not be the long-term solution.

“If replicated worldwide, current patterns of Western consumption and production would, it is estimated, need at least three planets’ worth of resources. So we need urgently to harness ingenuity, technological innovation and behaviour change in ways that will enable us to make the transition to meeting our economic and social goals within the capacity of our planet. For business this means making a shift to deliver new products and services with lower environmental impacts across their life cycle. It’s also about making it easy for customers and consumers to make more sustainable choices.

**Changing our ingrained patterns of consumption and production to be more sustainable will require us to:**

- challenge and revolutionize prevailing business models that externalize social and environmental costs
- pass on the debt of negative impacts to future generations.

There are three fundamental challenges to current consumption and production systems: energy, resource depletion and ecosystem degradation” (Sabapathy 2007 pp. 5).

*Globalization and food security*

“The expansion of international markets can be considered as useful but also problematic. For many communities, especially in developing countries, fish play a very important role in food security and constitute an important part of the diet. However, if fish producers or processors take advantage of access to distant markets for their fish in order to receive a higher net income, the local availability of fish may be reduced. Thus, increased trade can provide a mechanism for economic development, but local communities also need to change to accommodate it” (FAO Report 2003 pp. 208). In Mediterranean countries where local fish had no export opportunity prices remained low until highly profitable export alternatives were found. E.g. when fishermen of Bluefin tuna (photo 2) in Mediterranean countries found profitable export of this fish to Japan, the price of this fish increased in local markets.



**Photo 2:** Bluefin tuna caught in the Mediterranean for export to Japan

*Need to act along the global supply chain*

Retailers’ relationships with their customers are just as crucial for Sustainable Consumption and Production as for any other area of business. Some companies treat sustainability as a premium product, charging more and targeting only the more affluent of their consumer base. Also relevant and required is the interaction between government and industry with different penalties, bans and incentives introduced at different times which also shows the complexity of the process and the collaboration



needed to generate successful regulatory approaches to Sustainable Consumption and Production (Sabapathy 2007 pp. 14). Engaging consumers in sustainable behaviour is more difficult, but recent research shows that the overwhelming response of individuals asked to be more 'sustainable' is 'I will if you will' (SDC/NCC, 2006; Sabapathy 2007).

*Sustainable fisheries in the international agenda*

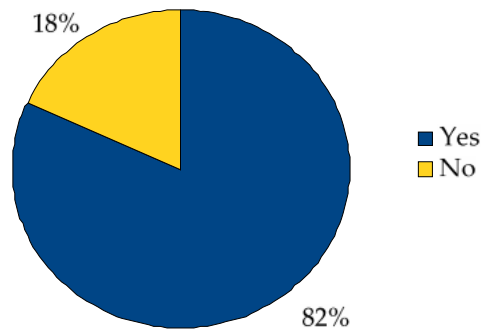
Activities, such as, the **Seafood Summit in Barcelona 2008**, organized by the Seafood Choices Alliance, allow for increased discussion and consideration of the various issues related to global sustainable seafood. The Seafood Choices Alliance is the international association working to advance markets for sustainable seafood (Seafood Choices Alliance 2007).

As stated in the **World Summit for Sustainable Plan of Implementation** (WSSD PoI), sound science and ecosystem approach are fundamental underpinnings of sustainable fisheries (Articles 30, 36). However, the principal drivers of the over-exploitation in marine capture fisheries and the causes of the dissipation of the resource rents and loss of potential economic benefits are the perverse economic incentives embedded in the fabric of fisheries harvesting regimes, reflecting a failure of fisheries governance. As such there are those that state that "Sustainable fisheries are primarily a governance issue and the application of the fishery science without addressing the political economy of fisheries is unlikely to rebuild marine fish wealth. Restoration of marine fish wealth and rebuilding the flow of net benefits implies fisheries governance reforms with an increased emphasis on the economic and social processes, informed by, rather than centred on, biological considerations and recognizing solutions and opportunities provided in the broader economy outside the fisheries sector" World Bank/FAO 2008 pp. 39).

Regardless of whether the initial propulsive force is exerted by the consumers' choices; fisheries/producers' governance; national and regional economic needs; businesses' publicity; NGOs' awareness campaigns; researchers' recommendations; regulators' policies; in the end all these forces need to be in place with suitable strategies that can bring effective results.

## 2.5 Focus on some current issues related to fish consumption in the Mediterranean: input from questionnaire (question numbers 7 &8)

Q 7. Is seafood highly valued in your country? How can you tell this? Is there any report or assessment of this in your Country?



**Pie chart 2:** Illustrating the 'yes' and 'no' replies to question 7, on whether seafood is appreciated and valued in one's country.

As shown in the pie chart 2, 82% of the respondents replied that seafood is valued in their country, in most cases due to their culture and traditions linked to particular seafood. Interestingly due to diversity of cultures and seafood recipes around the Mediterranean, the value given to particular species may be different in different countries. Consumption of seafood also varies across the Mediterranean. In fact even the IUCN reply indicated that the value given to seafood depends a lot on each country / culture. Countries like Spain, Italy have a very strong seafood culture, other such as Algeria and Libya has almost none. Israel gave different measures of fish consumption per person per year for their country ranging between 0.3 and 10 kgs. The former measure being reported to have been derived from the Department of Fisheries and indicating the consumption of local seafood. In Lebanon the value of seafood is quite high, especially during the summer season. It may be prohibitive for a middle class family to eat fish at restaurants more than once/month. The only indicator/report about fish value is the data produced by the Lebanese Customs. These only cover imports though. As for national reports or assessments on the consumption patterns and trends, this seems to be an area that still needs to be developed in most Mediterranean countries.

### Q.7 extended replies:

In **Cyprus** although seafood consumption is still relatively low in Cyprus, it has an increasing appreciation among consumers and is highly valued in Cyprus.

In **Egypt** seafood is highly valued, especially in coastal areas with the spread of canning, filleting and

smoking processing industries, as well as the uprising fish import trade of seafood.

In **France** seafood is highly valued and there is a strong request from the consumers even though there are less and less marine resources available year after year due to a general lack of fisheries management or due to a lack of good actions of fisheries management in France. Such an assessment is difficult to get due to the complexity of the fishing network in France. The demand in France for seafood is generally substantial, especially for molluscs, crustaceans, and species of fish considered being of high quality. Per caput consumption is about 15 kg/year. For the French Mediterranean coasts, sea food consumption represented in 2005 more of 600 KT with 40% of fresh products (SECODIP-SOFRES).

According to **Friend of the Sea**, Mediterranean countries generally have a high per capita consumption. In price terms there's a market standardization and also differences in tastes between different countries (eg: cod in the north, mussels and small pelagic in the Mediterranean).

In **Greece** the per capita fish consumption in Greece is almost 25 Kg per annum (according to FAO data) and of these 2.1 kg are aquaculture products (seabream and seabass). This amount is considered to be high for European standards and the mean prices in the Greek seafood market are constantly increasing.

According to **Greenpeace**, the Mediterranean seafood market is very fragmented and quite different from one coastal country to the other. The most speaking market issue relates to the plunder of Bluefin tuna in the Mediterranean waters: It is estimated that 80 to 90% of the catch is directed to the Asian and Japanese market in particular.

In **Israel**, Freshly fished fauna (approx. 3% of the seafood consumption in the country) is highly valued in Israel and most locally caught species are more expensive than imported fish (66% of consumption) and aquaculture fish (30%). Nevertheless, the prices vary considerably both seasonally and annually. A small number of species are considered traditionally as being of high quality and are thus expensive, while many others which are highly prized in other Mediterranean countries receive very low prices or are border line to not being of any commercial value. Per capita consumption of fish in Israel is estimated to be approximately 10 kg of fish (product weight) per person. Israel imported and produced 72,000 tons in 2007. While valued as a food, fish are still behind chicken and meat as a protein source. More specifically the annual consumption from local marine fishery is however only 0.3-0.5 kg per capita (data from the statistical report of the Department of Fisheries).

In **Italy**, Fish food is greatly appreciated and forms the basis of Italian food in many regions. It forms part of Italy's history, official website and publications of IREPA (whose aim is to spread the outcomes of the National observatory on the productive structure on seafish in reports, papers and miscellaneous documents) and ISMEA (economic observatory of the alimentary agricultural market) also indicate the importance of seafood in Italy. Official available data are furnished by the MiPAF (Italian Ministry for the

Alimentary and Forestry Politics: [www.politicheagricole.it/default.html](http://www.politicheagricole.it/default.html)). Some species are very valuable from an economic point of view; others are valuable from a protein or a cultural point of view. There are several movements taking care of this issue (Slow Food, the Slow Fish Fair, the sustainable fish consumption campaign of the Fondazione Acquario di Genova Onlus). Seafood is particularly important in some communities and in some poorer areas (mainly in South Italy) where there is a strong tradition in seafood use.

According to **IUCN-Med**, it depends a lot on each country/culture. Countries like Spain, Italy have a very strong seafood culture, other such as Algeria and Libya has almost none.

In **Lebanon** seafood is considered valuable.

In **Morocco** seafood, especially demersal species, has a high value.

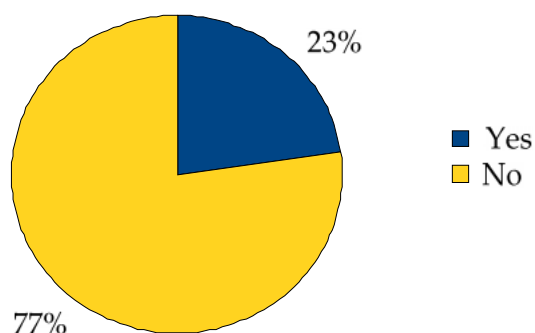
In **Montenegro** fish consumption is amongst the lowest in Europe (around 2 to 4 kg per capita).

In **Malta** seafood is valued depending on the species and not seafood in general. For example as Maltese do not value swordfish like the Italians, Maltese fishermen usually export this fish to Italy. But it is expensive for the Maltese Fishermen to export the swordfish to EU countries, such as Italy, where the prices and profits are more convenient. In Malta there is a tradition of typical dishes made up of fish which depend on fresh marine resources and thus specific marine resources are valued by the Maltese, however there is trend for fish food prices to be going up and this is discouraging some consumers. There is a need for research in this area and strategies to improve local awareness of the importance of seafood and its conservation management.

In **Spain**, **Oceana** indicated that seafood is highly valued in Spain. As the major fishing nation in the European Union as well as one of the main fish importers, the Spanish population has a high fish consumption habit and seafood is highly appreciated by the consumer for its quality. The main consumption formats are fresh, frozen and canned seafood. Fresh seafood being the most preferred Spanish option. Taking into account the relevance of fish consumption and fishing sector in Spain a wide number of studies have been published. As reference source for this document, the FROM can be quoted. FROM is an organism depending from the Spanish Fisheries Ministry in charge of the regulation and management of fisheries market and aquaculture (Estudio de los hábitos de Consumo 2007: [http://from.mapa.es/docs/estudios/113\\_HabitosConsumo2007.ppt#356,26,Diapositiva 26](http://from.mapa.es/docs/estudios/113_HabitosConsumo2007.ppt#356,26,Diapositiva%2026)).

In **Turkey**, Seafood is highly valued because this region is a touristic region.

**Q8 Are local fisheries and the seafood market high in Economic Status/Income in your Country?**



**Pie chart 3.** Illustrating the % yes and % no replies to question 8, on whether seafood is economically important in one's country in the Mediterranean.

As illustrated in pie-chart 3, around 77% of respondents indicated that seafood market is not particularly high in economic status in their country. However variations on particular species may be found. e.g. Bluefin tuna (*Thunnus thynnus*) which is sold at high prices to the Japanese is considered of high economic value, so are red shrimps (*Aristeus antennatus*) in Spanish coastal regions. Fresh species that are in demand usually cost more. Overall however, it is recognized in various Mediterranean countries that seafood provides subsistence to coastal fishing communities and as such are considered as of social and economic importance to these communities and of cultural importance to the country.

**Q.8 extended replies:**

In **Croatia**, seafood production is not high in economic status.

In **Cyprus**, in economical terms fisheries has a low status in the National Gross Product. However, it is an important source of income for an important percentage of the population in the coastal areas.

In **Egypt**, fresh fishes, as well as, seafood products contribute high income in Egyptian local and foreign markets.

In **France**, the fish market of the city of Sète (Gulf of Lions, Hérault, France) is one of the major fish markets of the French Mediterranean coast. However, agriculture, forest and fishery contribute only 2.5 % of French PIB.

According to **the Friend of the Sea**, the seafood industry is not a rich market in most cases. Traders and distributors generally get a higher margin than producers.

In **Greece**, large scale fisheries and seafood market are much higher in economic status than, artisanal fisheries. Overall, the fishery sector in Greece is considered important even if its contribution in the

national revenue is not high (4.34% of the income from primary production and 0.36% gross national revenue). The explanation given by the Greek authorities for supporting the fisheries sector is the recognition of the social role of fishing for the small islands and isolated parts of the country.

According to **Greenpeace**, the economic value of seafood is variable from one country to the other one. Accurate and updated figures are scarce except for aquaculture.

In **Israel**, seafood is not high in economic status. It is very low on the priority list – about 1000 employees, a small fisheries department in which 95% of the funds are allocated to aquaculture, not to mention dwindling yields and a poor public image, all contribute to lessen the status of fisheries in Israel.

In **Italy**, seafood economic value depends on the value of the various marine resources and species. In the Mediterranean there are around 560 exploitable species and out of these only 60 are exploited commercially and only a few tens of these are really valued by the consumers and restaurants. So the values of catch can vary between 30 Euros per kilo for the more valued fish species and 3 to 4 Euros per kilo for the fish considered of low value such as sardines. As for the market value one could consult the ISMEA site. Seafood production represents only 2% of P.I.L. (Italian Economy).



**Photo 3:** Red shrimps at a fish monger

In **Lebanon**, seafood prices are quite high, especially during the summer season due to demand. It may be prohibitive for a middle class family to eat fish at restaurants more than once/month. The only indicator/report about fish value is the data produced by the Lebanese Customs. These only cover imports though.

In **Libya**, seafood is not high in Economic value, the only exception is Bluefin Tuna, and the quota for Libyan fisheries is about 1300 Tons.

In **Morocco**, seafood production is of high economic importance.

In **Montenegro**, seafood is not of high economic contribution; however fish prices are artificially high in Montenegro and are well above those in the EU.

In **Malta**, skates, sharks, eels, and mackerel (fish caught with the lampara net) are no longer of economic value locally, and thus many fishermen have stopped going for such fish. With the discovery of the dolphin fish (*Coryphaena hippurus*) in other EU countries, there was a surge of good export in 2007-8, but this was not so in 2008-9 for Maltese fishermen. This has increased the local price of this fish, similar to when Bluefin tuna started being exported to the Japanese market and thus its cost raised locally too. Though fishing is not an important economic sector in Malta, it is important for fishing communities which specialize on traditional local fishing activities. Some fish species such as the dolphin fish has been a typical local seasonal target fish species traditionally valued by Maltese but as this fish is being exploited by increasing number of countries in the Mediterranean and exported to EU countries greater care on its exploitation in the Mediterranean will be required.

In **Spain**, seafood is economically important mainly in coastal areas where there is a consumption culture for fresh species, such as red shrimp (*Aristeus antennatus*) in Mediterranean coast. Local Fresh Seafood prices are higher than frozen or imported ones, and rising due to the high fuel costs and declining fish stocks. General consumers usually choose the best quality-price option being this most of times import products. This fact is threatening the economic performance and viability of the coastal fish sector in Spain.

In **Turkey**, seafood is not generally considered of high economic input, but it also depends on the kind of fish and on whether the seafood is from aquaculture or caught fresh.

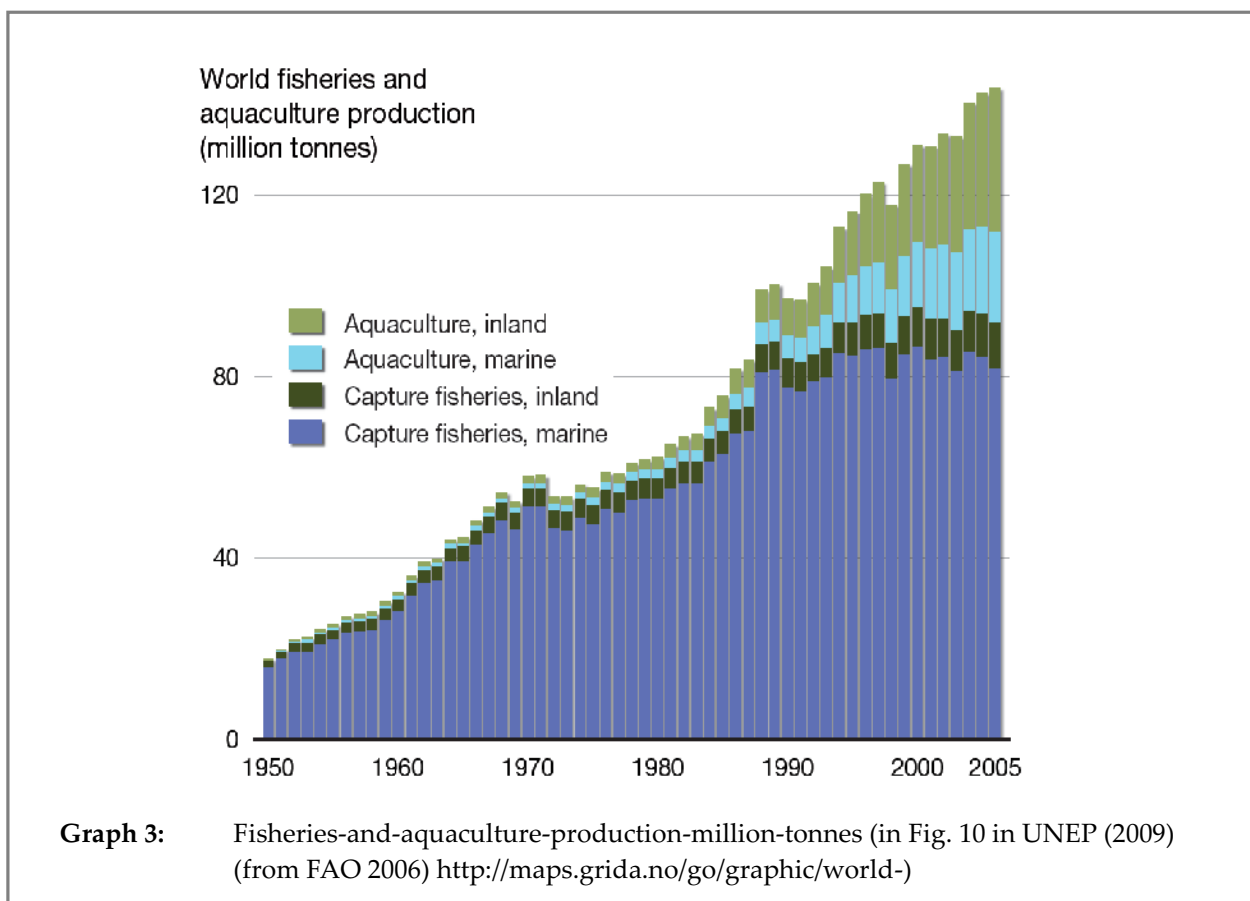


### 3. Is Mediterranean fisheries production sustainable?

#### 3.1 Statistics: trends and problems of accuracy in fisheries data

##### General trends

“In 2005, total world fisheries production had risen to 141.6 million tonnes (FAO 2006). Annual per capita food fish supply was estimated to stand at 16.6 kg – the highest ever recorded. **Aquaculture was now supplying over a third of world fish production**, and had virtually doubled total output from 15.8 million tonnes in 1993 (FAO 1995) to 47.8 million tonnes in 2005 (excluding aquatic plants). With world capture fisheries supply firmly level, this goes to underline the importance of aquaculture production and development in supplying the world with protein for human consumption. Europe produces 3.54 %. Long term trends show that per capita availability of food fish has almost doubled between 1950 and 2005, which in many senses is counterintuitive to the looming world fisheries crisis that many scientists are warning of. World trade in fisheries products is likely to have doubled between 1995 and 2008 (export value)” (Hosch, G. - FAO, 2009 pp. 16).





### *Seafood values*

“Aquaculture, freshwater and marine fisheries supply about 10% of world human calorie intake – but this is likely to decline or at best stabilize in the future, and might have already reached the maximum. At present, marine capture fisheries yield 110–130million tonnes of seafood annually. Of this, 70 million tonnes are directly consumed by humans, 30 million tonnes are discarded and 30 million tonnes converted to fishmeal” (UNEP 2009 pp. 23).

This phenomenon indicates that seafood as a global commodity has substantially gained in value, and that its importance to national economies and the global economy is rising. Some of the high-value species, combined with deteriorating stocks, have seen their values go through the roof. By way of an example, in the United Kingdom, cod used to cost 6£/kilo in 2003 – already substantially up from prices paid for cod in the late nineties. This price stood at 30£/kilo in 2008. Today, many European consumers complain that fish is becoming “unaffordable” (Hosch, G. - FAO, 2009 pp 16). Overall, production from wild capture fisheries was considered to be approaching its biologically sustainable limit for many fish species way back in 1990s. The bulk of further production increases were therefore thought to have to come from aquaculture. However, aquaculture is at present also constrained to the extent that it relies for feeding purposes on fishmeal and fish oil that come from capture fisheries. This constraint may be overcome when cost-effective substitutes for fishmeal and fish oil emerge. Beyond these constraints, future fish production increases will depend on further development of post-harvest utilization technologies, and on successful resolution of various negative externalities such as habitat destruction, by-catch and pollution from intensive aquaculture” (FAO Report 2003 pp. 202).

### *Mediterranean fisheries characteristics*

“The main feature of the Mediterranean fisheries is the **very high number of small vessels** and the **wide diversity of fishing techniques** used by artisanal (skipper-owner) fishermen. This is important from both a socio-economic and a management point of view, and rules and regulations need to take this into account. The artisanal vessels land their catches at many small and sometimes isolated ports and beaches. This not only creates problems with regards to enforcement and control, but also makes recording of catches and fishing effort very cumbersome. Fisheries statistics in the Mediterranean have been relatively poor for many years, particularly for the smaller vessels, and while the situation has improved in recent years, they are still largely incomplete. In addition to the small scale fisheries, there are also important fishing activities carried out by larger vessels (demersal and pelagic trawlers, long-liners, purse-seiners, etc.), which provide the larger markets with sea products. Corporate fisheries are limited to the tuna purse-seiners and the very recent activity of tuna farming” (Carpentieri & Biaggi 2006 pp.10).

*Over-exploitation Mediterranean marine resources*

From data made available by various states and compiled by regional entities, fishing in the Mediterranean has increased by about 48% since 1970 with high exploitation of both bottom-living (demersal) and big pelagic stocks, e.g. Bluefin tuna (*Thunnus thynnus*) and swordfish (*Xiphias gladius*). The overall increase in marine species caught until about a decade ago had suggested that the species involved could recruit enough young to allow abundance in subsequent years, despite intensive demersal fishing and a lack of quota control. However, short-term trends over the last fifteen years now reflect a general picture of **over-exploitation for most demersal and shellfish populations** (EEA Report, 2006). In fact during the last ten years or so, demersal resources catches have decreased by 20% while small pelagics as a whole do not show any particular trend, although the increase of round sardinella (*Sardinella aurita*) should be noted. According to recent assessments the most important demersal species: hake (*Merluccius merluccius*), red mullet (*Mullus barbatus*) and some valuable crustaceans appear to be over-exploited. Bluefin tuna (*Thunnus thynnus*) fishing and farming are now the most conflicting activities in the Mediterranean fisheries (Leonart 2008).



**Photo 4:** Rays of various species placed together and poorly distinguished in Fisheries data and catch statistics.

Immature fish may account for as much as 50 to 70% of the swordfish caught in the Mediterranean (ICCAT 2005). While the Bluefin tuna population fished in the Mediterranean during its spawning season has been estimated to have suffered a 80% decline in the last 20 years (Greenpeace 2006a). Various species of sharks and rays have declined or disappeared in the Mediterranean in the last 50 years e.g. Gual (1999) for gulf of Lions in trawl surveys between 1957 and 1995; Dalli (2004), Dalli & Vella (2006), and Dalli & Vella (*in prep.*) for the central Mediterranean region around the Maltese Islands.

Results of research work carried out in the North African Mediterranean region also show that most of the marine resources are either fully exploited or already at an advanced stage of over-exploitation (Berraho 2008).

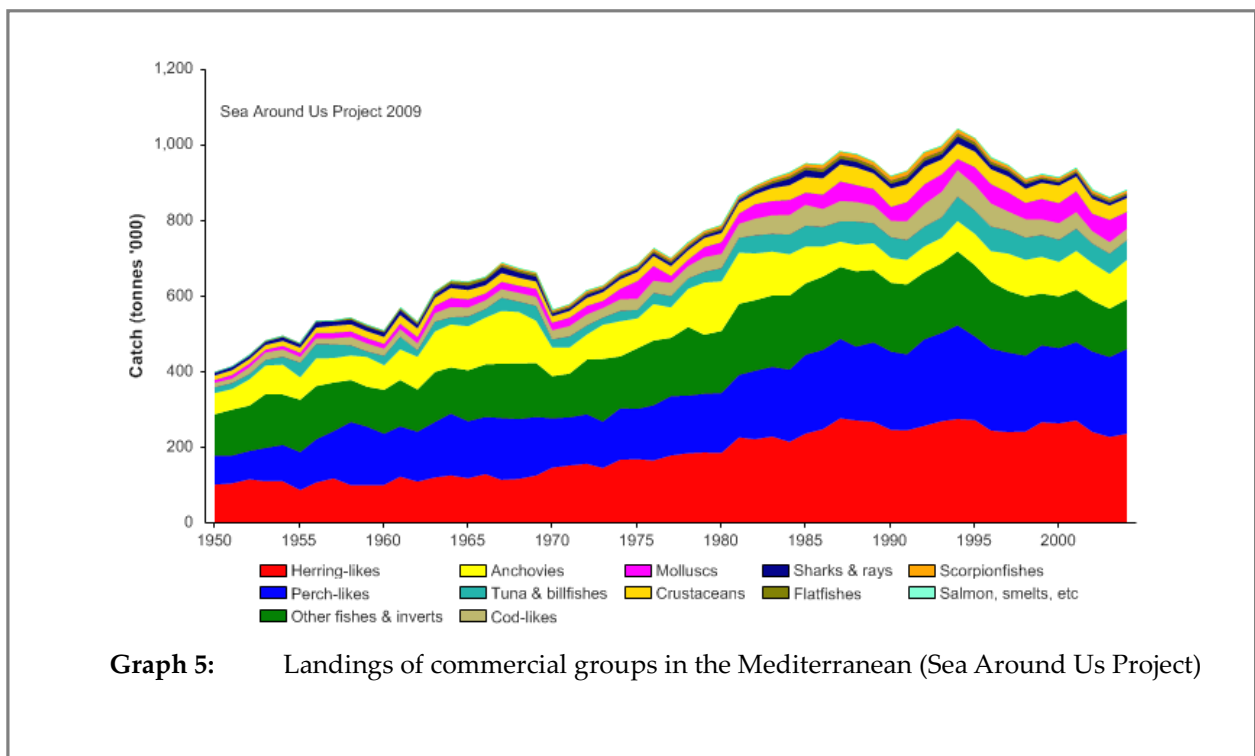
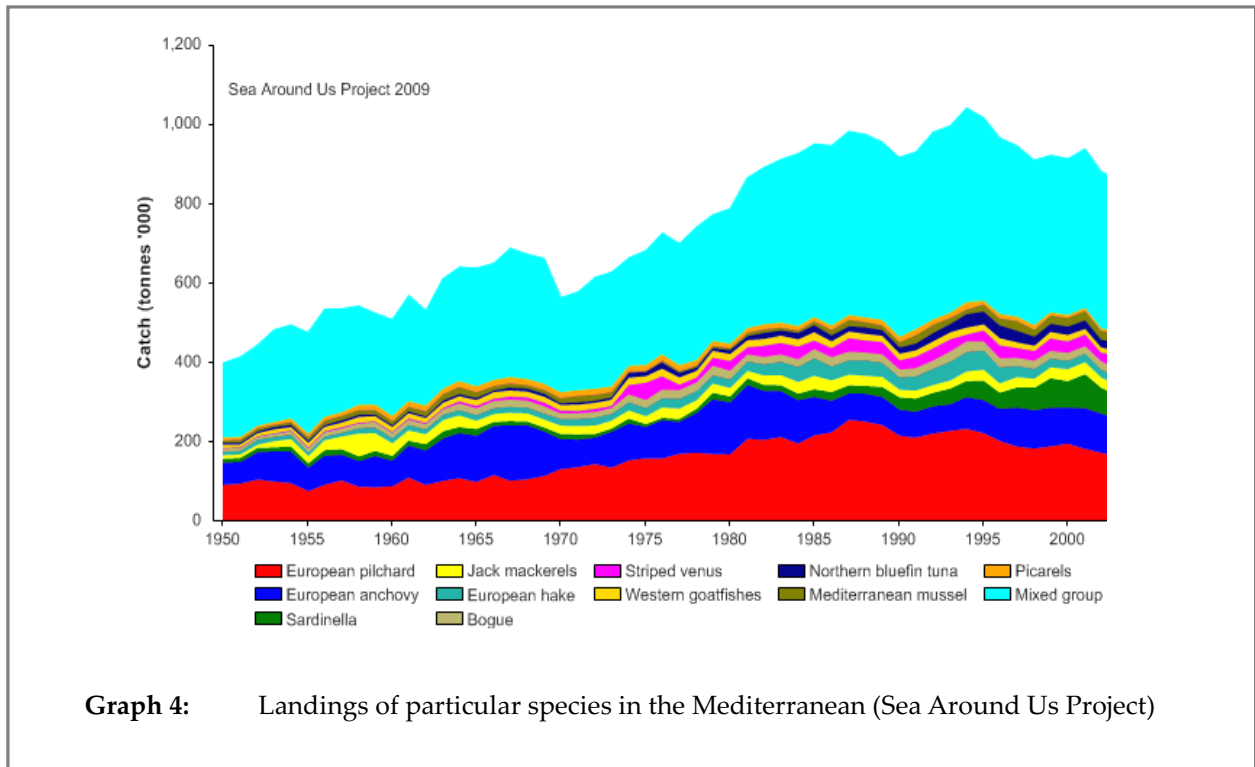


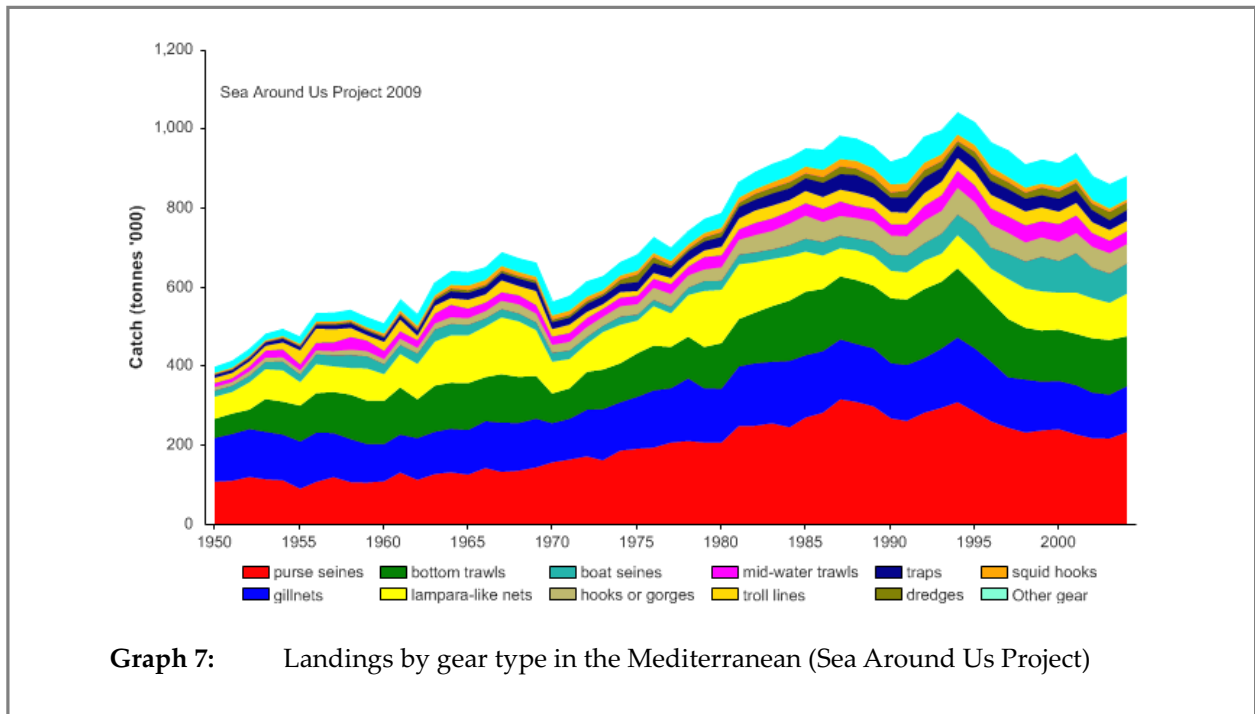
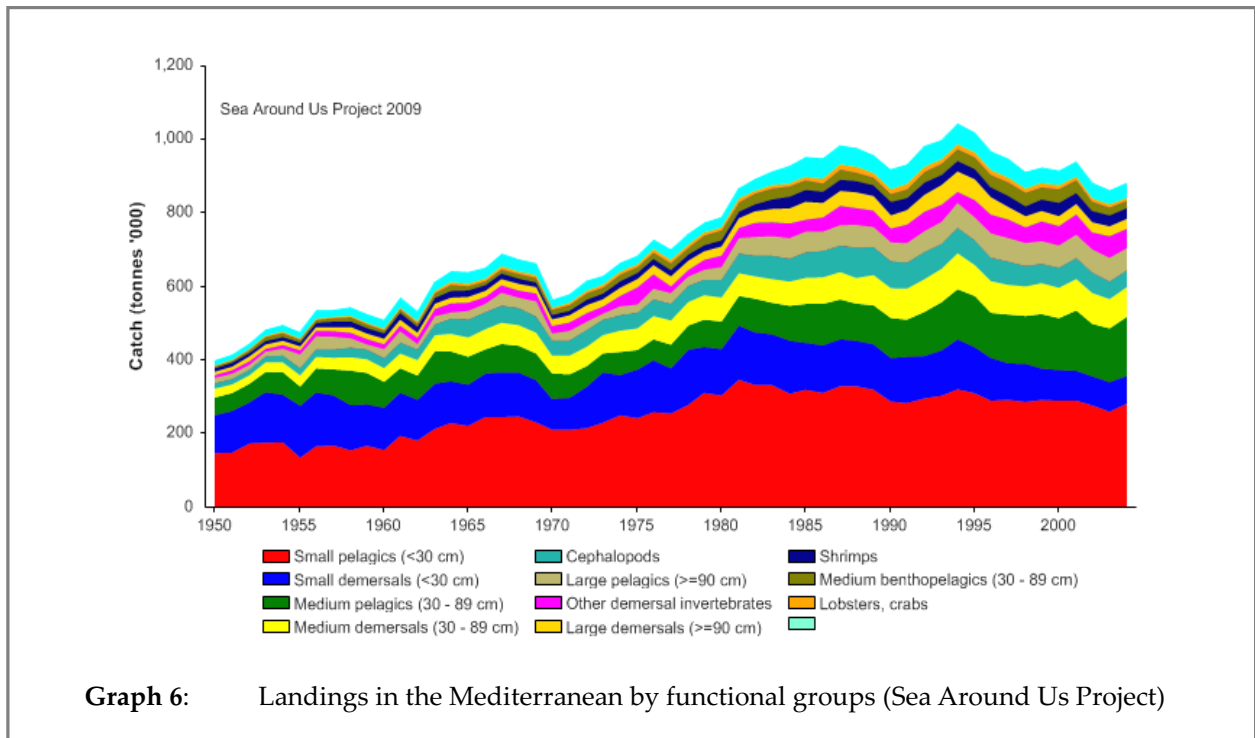
**Photo 5:** Various shark species are poorly identified for fisheries data and catch statistics.

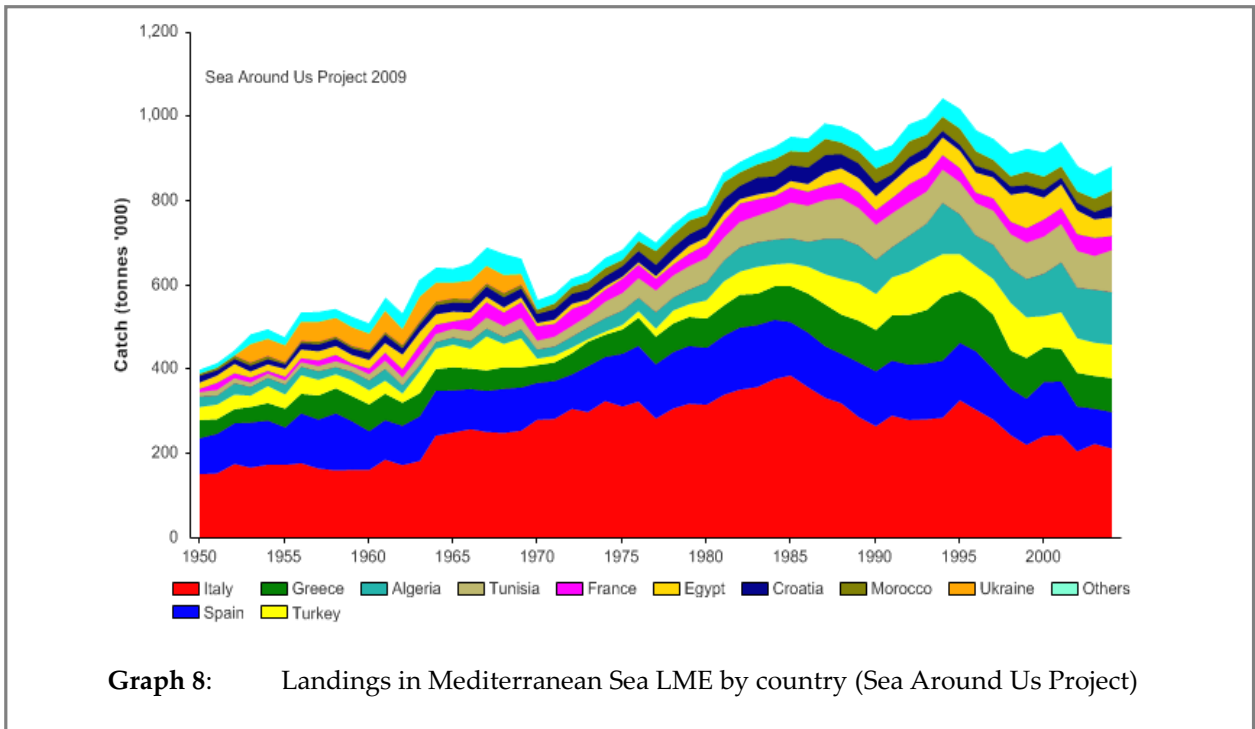
According to the EuroStat 2007, 9% of the EU-27 countries catches for 2005 came from the Mediterranean Sea, with Italy, Spain, France and other EU Mediterranean countries having the greater share of this. When it comes to aquaculture production by country in 2005, France, Spain and Italy represent the strongest contributors with 20%, 17% and 14% production respectively.

#### *Sea Around Us Project*

The Sea Around Us Project, a Fisheries Centre partnership with Philadelphia's Pew Charitable Trusts which started in July 1999 and is led by Daniel Pauly aims to provide an integrated analysis of the impacts of fisheries on marine ecosystems, and to devise policies that can mitigate and reverse harmful trends whilst ensuring the social and economic benefits of sustainable fisheries (Sea Around Us Project 2009). Useful national and regional illustrations of fisheries related measures can be obtained from the Sea Around Us Project website (Annex 3). The following graphs (Graph 4 to 8), focusing on the Mediterranean Region, show landings of particular species and commercial groups for various years, countries and fishing gear. From these graphs one may note the highest peak was reached at around 1995, after which there is a downward trend which is conflicting with the increased efficiency with which fishermen have targeted various marine resources. It is such conflict which highlights "*the tragedy of the commons*" in the Mediterranean Sea: "A dilemma in which multiple individuals acting independently in their own self-interest can ultimately destroy a shared limited resource even when it is clear that it is not in anyone's long term interest for this to happen" (Hardin 1968; 1994; 1998).









*Concerns around the bluefin tuna and swordfish fisheries*

“An example of this requirement can be seen in the care of the bluefin tuna (*Thunnus thynnus thynnus*) and swordfish (*Xiphias gladius*) stocks in the Mediterranean. These represent around 3% of the total reported catches, but their economic importance is far greater. ICCAT (International Commission for the Conservation of Atlantic Tuna) considers a single stock of Bluefin tuna for the Eastern Atlantic and the Mediterranean, and the Mediterranean holds the main spawning area. Long-line seines exploiting Bluefin tuna represent the only real industrial fleet in the Mediterranean. Driftnets have been banned by ICCAT and GFCM since 2005. Bluefin tuna reaching a landing of almost 40,000 tonnes in 1994, the value has declined to around 23,000 tonnes in the 2005, however due to the expanding tuna penning or ranching activities, these figures are doubtful. Concerns have rightly been expressed about the status of both Bluefin tuna and swordfish. In both cases the (apparently unrestrained) growth of fisheries over the last decade has increased vulnerability of these stocks as has regular fishing by non-coastal states on Bluefin stocks. Recently the number of coastal cages to fatten the Bluefin tuna caught in the open sea in order to increase quality and to make the market independent of the catch season has increased substantially. They are also believed to increase the fishing pressure, by opening new markets and because all catches may not be reported. These activities have an effect on many aspects of the assessment-management process as data collection and consequently the stock assessment. They have actual effects (statistical, biological, management) as well as potential ones (environmental, socio-economic, management)” (Lleonart 2008 pp. 57).

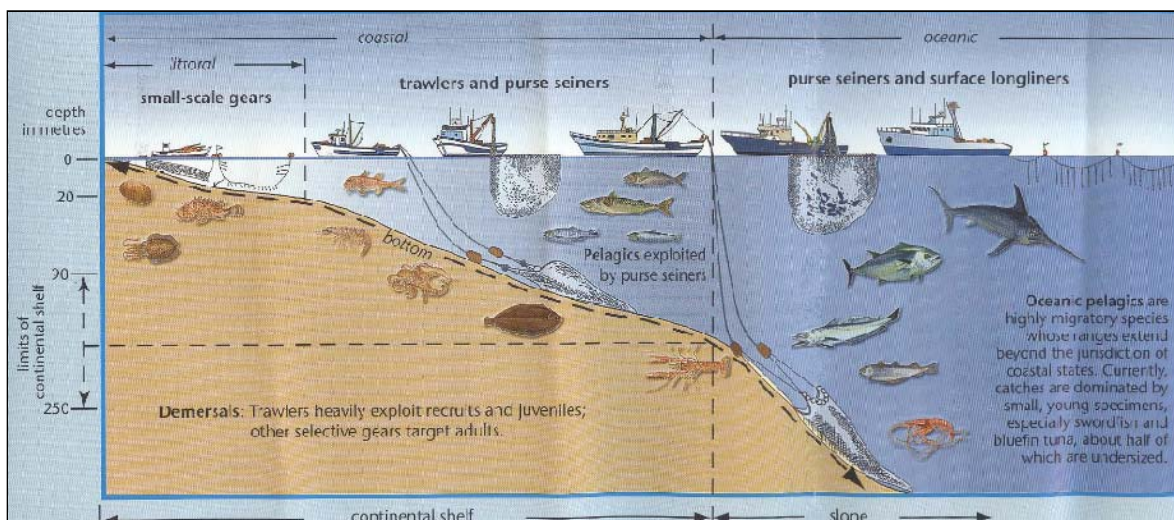


**Photo 6:** Tuna penning / ranching in Maltese territorial waters.

Unfortunately in the Mediterranean, 80% of commercial fish stocks have no robust assessment of their status and 60% of those stocks that do have robust assessment are being fished outside their safe biological limits (Streftaris 2004). The situation for capture catches fisheries (both for catches in the Mediterranean Sea - around 23% of total production in volume terms - and for catches by the countries in other seas) is worrying (Franquesa, *et al.* 2008 pp. 9).



**Photo 7:** Purse seine fishing has increased in Blue fin tuna spawning areas in the Mediterranean.



**Figure 1:** Fishing methods most commonly used in the Mediterranean (source FAO, 2000).

































### 3.2 Fishing efforts and competition for marine resources in the Mediterranean

#### Over capacity of fishing equipments

Modern fishing fleets have seen tremendous growth in navigation and fish-locating technology that have improved catch efficiencies, leading to increased exploitation and over fishing. In certain fisheries there is over capacity of fishing equipment (FAO Report 2003 pp. 196; Nelson 2008).

An overview of the most common fishing methods utilized in the Mediterranean, is illustrated in Figure 1 below, where one can distinguish small scale and usually artisanal fishing gears in the littoral zone from the increasingly more commercial and large scale fishing gear further off the coast, with trawlers, purse seiners and long-liners.

**Table 1:** Overview of Impacts of Common Fishing Methods used in the Mediterranean.

Fishing method and Gear	Impact on Habitat	Impact on Target species	Impact on Non-Target species
<i>Littoral</i>			
Trammel			
Gill nets			
Long-line			
Traps			
<i>Demersal</i>			
Trawler			
<i>Coastal Pelagic</i>			
Coastal purse seine			
<i>Offshore Pelagic</i>			
Purse seine			
Surface long-line			
Traps			
Key	 Low Impact	 Medium Impact	 High Impact

(Table 1 was adapted for the Mediterranean from Fishing Methods League Table by fishonline available at [http://www.fishonline.org/caught\\_at\\_sea/methods/Fishing\\_Methods\\_League\\_Table.pdf](http://www.fishonline.org/caught_at_sea/methods/Fishing_Methods_League_Table.pdf))

### *Employment in the fishing sector*

“From a social point of view, it can be roughly estimated that, at present, there are around 300,000 fishermen in the Mediterranean, apart from a significant number of part-time fishermen. Assuming that each job at sea generates 3 jobs on land (commercialization, fishmeal industry, administration, research and training, etc.) one can estimate that around 900,000 people are employed in the various fisheries sectors. Consequently, taking a minimum of 3 to 4 people per family, it is not unreasonable to say that about 3 million people depend on fisheries activities for their livelihoods, i.e. 2% of the population of Mediterranean coastal regions” (CIHEAM/Oliver 2002a pp.178).

### *Fishing overcapacity as the main challenge*

COFI, in its twenty-seventh session final report notes that: “a number of Members stated that overcapacity was as important an issue as illegal, unreported and unregulated (IUU) fishing.” (FAO 2007). “In actual fact, fishing overcapacity is likely to be the single most important factor affecting the sustainability of world fisheries, hindering efforts to achieve sustainable exploitation regimes. In many of the world’s most important industrial fisheries – many today in developing countries, as well as in many of the world’s most important artisanal fisheries (e.g. Southeast Asia and West Africa), fishing overcapacity is the primary root cause of stock declines, ecosystem changes, poor economic performance of the sector, and ultimately social strife. Access regulations in line with biological potential, and the limitation of fishing capacity, are the *conditio sine qua non* for profitable, sustainable and responsible fisheries management” Hosch, G. - FAO (2009 pp. 41).

As formulation of national plans to manage capacity is being urged by FAO, the diversity of consideration and action among different countries, including those around the Mediterranean and those utilizing Mediterranean resources is still slow. In 2004, the code’s implementation monitoring report noted: “Overall, stated trends have evolved little since last year’s evaluation.” referring to an independent capacity-focused progress assessment that had been published by FAO based on data of 2003 (FAO 2004).

“The single most important development for the future of wild capture production is how best to contain total catches at sustainable levels while allocating catches. To date, with only few exceptions, the matter of allocating resources among producers and other stakeholders has been addressed only indirectly, and not very successfully” (FAO Report 2003 pp. 209).

### *Variations in national production and fish prices*

“A very important aspect to be analysed is the comparative evolution of Mediterranean capture production by countries around the Mediterranean. Catches of the countries that make up the EU today account for only 39% of the total, whereas by the mid 1970s they caught 70% of the captures in the Mediterranean. At present, Turkey, Tunisia and Algeria are the new emerging countries in the

Mediterranean context, and are positioned close to or above the old European fishing “leaders” (Italy, Spain and Greece). Thus although the remarkable drop in catches experienced by EU countries in the Mediterranean during the last ten years (28%) has been partially compensated by North African countries, the total Mediterranean capture volumes in 2005 were 20% lower than in 1995. The drop experienced by Turkey since 1995 is probably due to the collapse of the fisheries in the Black Sea” (Franquesa *et al.* 2008 pp 20). “In a context with increasing population and a stagnated or reduced production, caused by the state of the resource, a future scenario of increased prices for fish products in the Mediterranean basin is likely. This involves positive (more added value for producers in the area) but also negative aspects (inflation pressure, pressure on the resources which become more valuable)” (Franquesa *et al.* 2008 pp 9).

#### *Need for new fisheries management strategies*

To achieve sustainable and equitable use, most fisheries stakeholders and administrators will eventually have to recognize the power of using instruments that create and enhance incentives, rather than administrative decisions. Fisheries management strategies based on explicit and well-defined access rights will have to become more common, or otherwise management entities will be overwhelmed by allocation conflicts. To facilitate decision-making, management responsibilities will need to be devolved to fishing interests and communities, with increased participation by stakeholder groups. As part of this, frameworks that control access to capture fisheries need to be strengthened, and created where they do not exist. This will not be a matter only for local or artisanal fisheries – the governance of high seas fisheries will also need to be more explicitly regulated (FAO Report 2003 pp. 209).

Rights-based management systems create positive incentives for the rights holders and clarify their responsibilities. However, the allocation of rights where they have not explicitly existed before is a complicated matter. Most living aquatic resources are hidden from our view, fluctuate in their abundance, span jurisdictional boundaries and can occur jointly. One consequence of these characteristics is that creating or setting up rights systems can be extremely contentious, complex and expensive. This is particularly true in situations where policies have led to excess fishing capacity and over fishing and where the introduction of rights-based management includes concurrent reductions in fishing capacity (e.g. vessel buyout programmes and redeployment programmes for fishers). Finally, the initial enforcement of newly created rights can be difficult. The result is that rights-based management systems are not being rapidly adopted and implemented. Progress is slow, and excess fishing capacity continues to exist in many fisheries. The problem is severe and occurs in most parts of the world, including developing countries (FAO Report 2003 pp. 210).

Because fisheries resources are becoming increasingly scarce, conflicts over the allocation and sharing of these resources are becoming more frequent. Most conflicts over fisheries resources arise when the

resource is (or is perceived to be) so scarce that sharing it becomes difficult. When rights are well defined, understood and observed, allocation conflicts tend to be minimized. However, when rights to the use of a stock are not well defined, understood or upheld, divergent assumptions about what rights users may have often result in conflicts over scarce fisheries resources (FAO Report 2003 pp. 23).

In the Mediterranean, such cases of scarcity of fish and relatively large numbers of fishermen with advancing technology to increase fishing efficiency is not a good prospect for conserving the available stocks unless immediate and concerted action is in place. Actions must also be based on well-documented and research work investigating the actual diversity among fisheries management or non-management of resources from the Mediterranean Sea. Such work should focus on the current differences between fisheries-exploiting countries and within countries for each fishing method. The economies and drives for the various species sought by different countries' fishermen need to be analysed and understood, so as to allow for feasible alternative income for fishermen that need to reduce fishing effort, change fishing methods/gear or even stop full-time fishing altogether to devote themselves to other activities like for example, small-scale fishing for cultural tourism.

“A fishery for a high-value species in coastal waters (which has a low cost of harvesting) will generate more profits (rent) to fishers than a fishery for a low-value species harvested at high cost in deep water. As more fishers join a profitable fishery they add to the aggregate costs of catching the limited quantity of fish available. As a result, the aggregate net benefits or economic rent decreases, or becomes dissipated among the fishers in the form of higher costs and lower returns for their fishing operations or fishing effort. The rents may even become negative when public financial transfers or subsidies are provided to support an economically unhealthy fishery. As more fishers make greater efforts (for example fish longer hours, or invest in more fishing gear) to maintain their previous profits or catch levels, fishers tend to deplete the fish stock capital which sustains the productivity of the fishery” (World Bank/FAO 2008 pp. 23).

### **3.3 *EU member states of the Mediterranean and non-EU member states: unity or conflict in fisheries affairs?***

An essential need in the Mediterranean's struggle to reform its fishing capacity and methods to come closer to the sustainable goals required, is the **unified and cooperative mode in which this needs to be undertaken**. As EU member states around the Mediterranean are increasingly expected to follow specific regulations which will reduce fishing capacity and reduce fishing effort to levels considered sustainable, non-EU Mediterranean states will be expected to do like wise and not neutralise efforts by EU states toward sustainable fisheries by increasing capacity and effort (Borg 2008).

Unfortunately if coordinated action will not occur at global, European, regional and national levels, it will be very hard to see effective conservation and sustainable fisheries measures become successful, while

tensions between Mediterranean States on shared resources may rise, due to discrepancies in measures taken to regulate fisheries.

### **3.4 GFCM and ICCAT: strengths and weaknesses**

*The FAO General Fisheries Commission for the Mediterranean (GFCM)*

The sole multilateral mechanism by which most countries of the Mediterranean can undertake joint action to safeguard fisheries in high-seas areas or work to harmonize management efforts in coastal waters is the FAO's General Fisheries Commission for the Mediterranean (GFCM). Established in 1949 with the mandate of promoting the development, rational management, responsible utilization and conservation of marine resources in the Mediterranean and the Black Sea, the GFCM is an intergovernmental body that brings together 24 Contracting Parties (representing the coastal states of the Mediterranean and Black Seas, including the European Union), on an annual basis to report on fisheries trends and share information, conduct joint scientific studies, discuss policy and issue management recommendations. In recent years it has reformed its operating rules and structure and has begun to emerge as a highly proactive intergovernmental regional fisheries management body. Membership is open to both Mediterranean coastal states and regional economic organizations as well as to FAO member states who frequently fish in Mediterranean waters. The list currently includes Albania, Algeria, Bulgaria, Croatia, Cyprus, the European Community, Egypt, France, Greece, Israel, Italy, Japan, Lebanon, Libya, Malta, Monaco, Morocco, Romania, Slovenia, Serbia and Montenegro, Spain, Syria, Tunisia, and Turkey (FAO news 2005).

Given the Mediterranean's complex and crowded geography, as well as its large number of distinct underwater ecosystems, undertaking coordinated regional scientific assessments and "*getting 24 different Members to agree on common management measures is not always easy*", says Alain Bonzon, the newly elected GFCM's Executive Secretary. "Sitting at the same table you have poor and rich countries; a country like Italy, with 18 000 fishing boats and nearly half of all Mediterranean fisheries production to its credit, and then you have a country like Slovenia, with just 40 boats; you have countries with well established mariculture activities and other in which this industry is in stage of infancy" he explains. Despite the challenges, says Bonzon, GFCM's members have built up the organization, especially in recent years, and it is playing an important role in fostering cooperation to establish responsible fisheries in the Mediterranean (FAO news 2005).

Through the work of its former sub-regional Consultations and now through the Stock Assessment Committee of SAC, GFCM depends on the presentation of stock assessments and analyses by member country scientists. However, assessment coverage and frequency of updating is poor, perhaps because the motivation provided by quota management requiring regular annual repetition of assessment activities as for Northern European seas is absent. Stock assessment databases are thus fragmentary, and

not very suitable as a basis for indicator series (IASON 2006b).

GFCM has signed increasing numbers of cooperation agreements with: 1) IUCN (which has been working with the GFCM for several years). A major keystone for the region was the ban, in 2005, of sea bottom-trawling fishing techniques beyond 1000m in the Mediterranean; 2) RAC-SPA (Regional Activity Centre for Specially Protected Areas of the Mediterranean Action Plan - UNEP/ Barcelona Convention) and; 3) the CIHEAM (International Centre for Advanced Agronomic Studies) (IUCN/GFCM news 2008). A necessary move forward in trying to incorporate the various environmental and scientific aspects required for sustainable fishing management.

“One of the great innovations of the UN Fish Stocks Agreement of 1995 was to place regional fisheries management organizations (RFMOs) at the heart of international fisheries management. It was hoped that a multilateral set of rules which created a stronger legal basis for RFMOs to manage the stocks in their jurisdictions, even vis-à-vis non-member countries, would rescue the bulk of the world’s fisheries from the tragedy of the commons. However, the reality has been different: high seas fisheries have continued to decline. The FAO’s recently released State of World Fisheries and Aquaculture 2006 reveals a stark picture: more than two-thirds of high seas fish stocks are either depleted or at high risk of collapse, especially the straddling stocks that move between national maritime waters and the high seas. RFMO performance has not lived up to expectation. The FAO publication went on to say that ‘strengthening RFMOs in order to conserve and manage fish stocks more effectively remains the major challenge facing international fisheries governance’. This is not just a scientific finding, but also a political one. As Michael Lodge notes in the introduction to this report, various UN bodies, including the General Assembly, have identified RFMO governance as needing improvement. This has created the space in which a robust debate on how to reform RFMOs can take place” (Tarasofsky’s Forward in Lodge *et al.* 2007).

The European Commission has in the meantime welcomed the measures adopted in 2007 by the GFCM to promote sustainable fisheries and aquaculture in the region at its annual general meeting in Rome. The new measures include effective implementation of control and inspections scheme; a recovery plan for the Bluefin tuna; improvement of data collected and recorded by setting up of a database; conservation of marine mammals in the Ligurian Sanctuary and strengthening of GFCM’s administrative capacity (Lomas 2007). To date most of these new measures are still in their infancy.

#### *The International Commission for the Conservation of Atlantic Tunas (ICCAT)*

The Economist (2008a) portrays the plummeting of the world’s stocks of Bluefin tuna as an excellent illustration of the tragedy of the commons, as this species is drastically declining in abundance after decades of poor management. The organisation responsible for the Bluefin tuna’s conservation is the International Commission for the Conservation of Atlantic Tunas (ICCAT), based in Madrid and

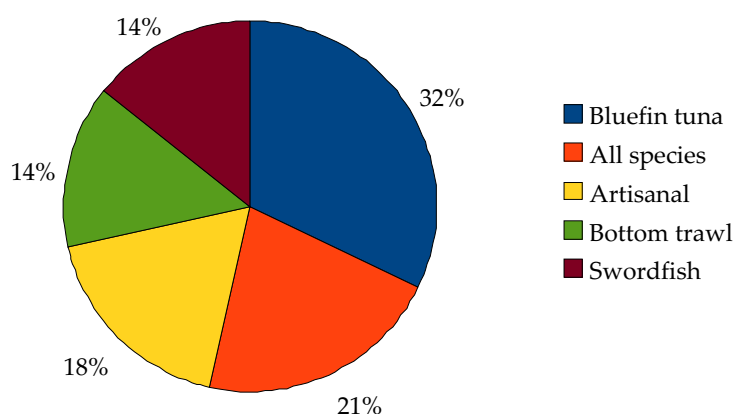
dependent on the cooperation and accuracy of data supplied by its member states. ICCAT is not responsible for the actual management and enforcement of recommendations but it relies heavily on the commitment of governments to take up the responsibility of conserving the species as much as they exploit it. Unfortunately, the constant decline in Bluefin tuna in the Mediterranean does not look too good on the whole ICCAT administration and government departments that have taken onboard Bluefin tuna conservation responsibility. "ICCAT, which was created in 1969, is one of the oldest of what are known as the regional fisheries-management organisations. Then, Bluefin tuna were so abundant that they were found throughout the North Sea and the Baltic, as well as in the Mediterranean. If this is an organisation that is working well, it is hard to imagine what failure would look like." (The Economist 2008a, "Managed to death").

Various NGOs, independent scientists and critical assessors of Bluefin tuna population dynamics and exploitation have indicated that not only data have probably not been accurate due to lack of appropriate personnel and infrastructure to allow for such requirement, but also due to blatant illegal and irresponsible over-exploitation and waste of this species out at sea. A summary report by the Community Fisheries Control Agency (CFCA) who gathered data on Bluefin and conducted inspections, concludes that "it has not been a priority of most operators in the fishery to comply with ICCAT legal requirements". Rules on reporting catches and banning spotter planes had been flouted too (The Economist 2008b, "Tuna in the Mediterranean - Gone fishing"). The annual report of the CFCA's work goes through the various issues (CFCA 2008).

As such unless international entities, such as, the GFCM and ICCAT do not manage to involve state representatives that prioritize on the resources' conservation over the exclusive economic gain of exploitation, there will be little point in continuing with this system. Independent scientists that have highlighted the fisheries situation with ongoing over-exploitation need to be given greater weight in decision-making if sustainable fishing and the conservation objective of these international bodies is to be achieved. Improvement in the effectiveness of both ICCAT and GFCM are clearly needed for sustainable production in the Mediterranean.

### 3.5 Focus on current problems and worries with Mediterranean Fisheries: input from questionnaire replies. (questions 4, 5 & 10)

**Q4.** From your experience which fisheries target species or sector may suffer from lack of appropriate management in your Country?



**Pie Chart 4:** Illustrating the % replies to question 4, with regard to what fishing sector suffers lack of appropriate management in the Mediterranean.

As illustrated in pie chart 4, 32% of the respondents to question 4, felt that Bluefin tuna is suffering most from lack of appropriate management; this is a further corroboration of what has been reported also in international media and scientific reports. This together with another 21% indicating that all species and fishery sectors have inadequate management and another 14% indicating swordfish is suffering most of mismanagement, bring large pelagic species to the highest overall vulnerable marine species exploited in the Mediterranean. This is followed by 18% indicating artisanal fishing as not being controlled properly due to the diversity and intensity of this activity in certain coastal regions, followed by bottom-trawling which is considered devastating to the biodiversity of life in our seas, even though it is considered a controlled fishing activity in some Mediterranean countries.

#### **Q.4 extended replies:**

In **Croatia**, all demersal and coastal fish especially those with a high price on the market (*Scorpaena scrofa*, *Mullus surmuletus*, Sparidae, Triglidae, Serranidae, flatfish), and those with specific life-spans (all slow-growing species, including some sharks and rays).

In **Cyprus**, the fisheries sector that may suffer from a lack of appropriate management is the artisanal fisheries targeting demersal species and the large pelagic fishery targeting Bluefin tuna, swordfish and albacore.





**Photo 8:** Trawling in the Mediterranean

In **Egypt**, delta and internal lakes (Brackish, saline or fresh) suffer from lack of integrated sustainable management measures.

In **France**, in open waters, the fishnet activities, such as pelagic trawls, are a threat to different large predator fish: especially the Bluefin tuna (*Thunnus thynnus*), other scombridae of the genus *Sarda*, swordfish (*Xiphias gladius*) (a local official ban of billfish catches and landings were taken from October 2008 to November 2008 due to abusive catches), the blue shark (*Prionace glauca*), the common tresher shark (*Alopias vulpinus*), others Alopiidae. All these species' catches are in severe decline due to the total lack of appropriate actions and plans for these species' conservation in the French Mediterranean area and in the Mediterranean Sea. Landings of *Prionace glauca* and *Alopias vulpinus* are in strong decline: around 12,500tonnes landed in 2006 vs. around 4000tonnes landed in 2008 (data of the fish auction room of Sète, Gulf of Lions). Some large pelagic shark species recently disappeared from all the French Mediterranean waters and from the Gulf of Lion such as the porbeagle shark (*Lamna nasus*) and the smooth hammerhead shark (*Sphyrna zygaena*) which has not been seen for the past ten years. All the shark species landed along the French Mediterranean coast are sold for consumption. The landings of sardines and anchovies, monkfish, red mullet and sole seriously declined in 2008. Each year many tons of these catches are rejected at sea in Gulf of Lions because the catches aren't the good length. The landings of hakes (*Merluccius merluccius*) in 2008 in Gulf of Lions were also rejected at sea due to the short length of the specimens.

The bottom trawl activity and especially its coastal use threaten some fish and invertebrates species. Landings of monkfish are now very scarce because of the past over-exploitation of their coastal nurseries

area in the Gulf of Lions by bottom trawls. The blue skate (*Dipturus batis*) and the other skate species seem to have totally disappeared from the Gulf of Lions and all along the French Mediterranean coast due to their past intensive exploitation by bottom trawl. The landings of thornback skates (*Leucoraja clavata*) and other rays species of the same genus are seriously in decline in the same area. The pelagic stingrays (*Pteroplatytrygon violacea*), the common stingray (*Dasyatis pastinaca*) and the marbled torpedo rays (*Torpedo marmorata*) (as other local torpedo rays) are caught in large number but these catches are discarded by fishermen. The population of lobsters (*Homarus gammarus*) off the Gulf of Lions is seriously exploited by bottom trawl activity. Concerning the landing of deep waters or bottom living sharks, some species totally disappeared in the past 30 years such as the angel sharks (*Squatina squatina*, *Squatina aculeata*, *Squatina oculata*) and the large spotted dogfish (*Scyliorhinus stellaris*). It seems to be the same situation for the others local Scyliorhinidae and the sharks from the Mustelidae family. The spotted dogfish (*Scyliorhinus canicula*) still to be caught in large number, without any restriction according to its captures or landings.

The spiny dogfishes (*Squalus acanthias*) also still to be caught in large number in Gulf of Lions but the population have shown a strong decline since 30 years ago. The newborn and juvenile bluntnose sixgill sharks (*Hexanchus griseus*) are commonly caught each year in summer all along the coast in the Gulf of Lions that could be a nursery area for the species in the Mediterranean Sea. Young and adult angular

**Photo 9:**

Swordfish caught in the Mediterranean is increasingly composed of small specimens. This highlights the reduction in large adult individuals in the Mediterranean Stocks.



rough sharks (*Oxynotus centrina*) are also commonly caught in summer all along the same area by bottom trawl.

Fishermen still use bottom-trawls intensively in the French Mediterranean coastal waters, more specifically in the Gulf of Lions, often in the same fishing site, destroying the benthic communities and often exploiting the nurseries' areas of various species.



**Photo 10:** Shark species are caught directly or as by-catch in the Mediterranean, seriously affecting their abundance.

According to the **Friend of the Sea**, the fisheries of anchovies, swordfish, octopus, and Bluefin tuna are the ones suffering most from lack of appropriate management in the Mediterranean.

In **Greece** to date there is no form of real management of any fisheries practice in Greece. The sector which faces most important lack of management is large scale fisheries by trawlers which are allowed to fish up to 1 nautical mile from the shore and 50m depth. Due to the lack of monitoring by the port police authorities trawlers frequently fish illegally to much shallower waters, causing irreversible damage to protected and highly productive habitats. In particular the coastal fishery activities is not managed, due to the variety of methods used and the large number of species targeted.

According to **Greenpeace**: Bluefin tuna; Mediterranean swordfish; all large pelagic targeted fisheries that are using illegal gear (i.e. driftnets); The overall environmental management, whether it is at national or international level, lack of: ambition, binding provisions and effective enforcement of measures by the Mediterranean countries.

In **Israel**, all of the fishing sectors suffer from lack of appropriate management, in particular recreational fishing is not managed at all at present and the phenomenon is gaining in strength in recent years so much that anglers (jig fishing mostly) may soon outnumber artisanal fishermen. Illegal fishing is

abundant (for example – there are probably at least 20 fold more illegal SCUBA diving fishermen than legal ones). The trawl fishery may be the easiest section to manage (small fleet size, better and centralized commercial organization) but other than freezing the fleet size and scant mesh size inspections, few management regulations are in place and enforced properly. This may change soon, however, as the above mentioned research may lead to implementation of some measures. Artisanal fisheries have been in serious crisis in recent years and include gill and trammel nets, inshore pelagic and bottom long-lining – which are all under-managed and under-surveyed due to the abundance of landing points and more random fishing patterns. The marine fishery has seen important species, red mullet, grouper, and calamari, dwindle in size and / or abundance.

In **Italy**, the Italian and especially Sicilian fisheries have been passing through some troubled times for some years because of the following: Fewer youths opt for the fishermen's job therefore having reduced numbers and at times completely broken down fishing communities, especially in the North of Italy; The constant increase of regulations on fishing from the EU so as to preserve Mediterranean stocks which increasingly limit the fishing activities; The increasing economic costs of fishing, including fuel and gear and maintenance costs, thus reducing profits from fishing. The artisanal fisheries are the least monitored, due to the several types and practical difficulties. In general, the management of all the Mediterranean fisheries needs to be improved, particularly for those species that are shared with non-EU countries. For the Bluefin tuna (*Thunnus thynnus*) management it would be desirable to have more reliable catch statistics. All the fisheries could be better managed than they are presently. Controls are seldom effective (including within marine reserves). There is the need to identify effective tool for fisheries management.

According to **IUCN-Mediterranean**, the worst managed fisheries include the bluefin tuna, deep sea shrimp and swordfish fisheries, as well as most of the shared stocks (acknowledging however the efforts done by GFCM).

In **Lebanon**, all the system is suffering. No effective management plans for the fisheries sector exist. Effort has been invested for many years now by the Ministry of Agriculture to regulate and manage the sector without any success. Laws are seldom implemented.

In **Libya**, Bluefin tuna (*Thunnus thynnus*) became a target species with appropriate management and catch period from end of April to July, since 1993.

In **Morocco**, all the Mediterranean fisheries are under GFCM (FAO) management recommendations like European Mediterranean countries. The shrimp-hake fishery is however not so well managed (mesh size, zoning, Commercial landing sizes only) but a management plan has been prepared for this fishery for 2009, this management plan was necessary because the fishery of shrimps and white hake are over-exploited.



In **Montenegro**, most vulnerable species are those caught by trawl fisheries, especially in shallow waters.

In **Malta**, Maltese fishermen are frustrated at how swordfish and albacore tuna driftnets (“*alalungara*” in *Italian*) seem to go rampant in the southern Mediterranean region with illegal-looking vessels.

Increasing use of coastal trammel nets and trawlers in territorial waters endanger various species of marine organisms. While long-lines found both around the coasts and offshore entangle and hook turtles and occasionally dolphins. Increasing purse-seine tuna capture for tuna penning is also seriously affecting Bluefin tuna survival in the Mediterranean.



**Photo 11:** Turtles still fall victim to hooks on fishing lines as can be seen in this photo of a turtle with a hook in its beak.

In **Spain**, OCEANA notes that all fleet segments in the Mediterranean are suffering from a lack of appropriated management or a simple lack of management that has lead both pelagic and benthic fishery resources in the Spanish Mediterranean to over-exploitation. Characteristics of Management in the Spanish fishing fleet based in Mediterranean ports, excluding Bluefin tuna purse seiners only represented by 6 vessels, can be summarized as follows:

1. Bottom trawlers: the most relevant segments in terms of capacity and income. Activity regulated under management plans that define parameters such as days at sea, hours of fishing operations, depth ranges for fishing activity or ban of trawling over some sensitive habitats, such as, Posidonia meadows or coralliferous beds. In this case, unsustainable management measures, overcapacity of the segment and infringements are the main characteristics.

2. Long-line fleet (bottom and drifting long-liners): Regulated under management plans. Measures to avoid by-catch of sea turtles have been recently put in place. Following the implementation of the Bluefin tuna management plan, this segment has known and increased management and control of its activity.

3. Small pelagic purse seiners: Managed.

4. Artisanal fleet: Only under an effective management in those cases where fishing areas are overlapped with Marine Protected areas.

In **Turkey**, tuna, swordfish and sea-grass are suffering from lack of appropriate management and invasive alien species.

**Q5. Are there possible improvements to the current status of affairs in the fisheries sector in your Country toward increasing the sustainability of fisheries?**

*Q.5 extended replies:*

In **Croatia**, some fishing gears and techniques have to be forbidden, and also proclaim closed seasons and areas for some species. Restrictions that have already been given have to be discussed again and again. The category of artisanal fisheries has to be rearranged.

In **Cyprus**, efforts are being made to reduce fishing effort in territorial waters. Most notable is the political will to remove the bottom trawl fishing within territorial waters. Also the reduction of fishing gear used by implementation of EC regulation (*Council Regulation (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea*).

In **Egypt**, NIOF, GAFRD, universities and some other ministerial and sub ministerial sources are working together to improve fisheries management.

In **France**, various activities would be required including:

The improvement of scientific surveys to have a better assessment of the state and the dynamics of local marine living resources;

The improvement of record taking at landings and on board fishing survey assessment by scientists;

The use of nets with a wider mesh for bottom trawl;

The control of the use of bottom trawl in the coastal areas: seasons of exploitation and of non exploitation of specific sites;

In the case of sharks or rays, estimated a zero TAC and/or release living caught specimens according to the species and its status.

Limitation of global fishing effort and of fishing effort on juveniles and large breeders. Protection of some essential habitats for protection of juveniles and adults. Regulation of the market and adaptation of the production to the demand to avoid discards and surplus.

According to the **Friend of the Sea** improvements are possible, but we miss a starting point as initial stock status data is often not available. There is poor coordinating management and data collection organization.

In **Greece**, unfortunately not even the EU regulation for fisheries in Mediterranean 1967/2006 has been adequately enforced. It seems that in terms of landings and revenue the Greek fishery sector reached its highest level during the 90's and then the decreasing phase started. Appropriate management plans and sustainability seems to be the unique alternative solution in order to stop the decline of production and revenue. The new EU Regulation gives the framework for this new adaptation of the sector.

According to **Greenpeace**, improvements are hopefully always possible. Nonetheless as long as fisheries management is based on short term economic interest it cannot reach any satisfactory level on sustainability. Only the establishment of an effectively managed network of no-take marine reserves can ensure the precautionary and ecosystem based management of fisheries resources that will contribute to the recovery of fish stocks and of artisanal fisheries' economy. Fisheries management should be developed within a comprehensive and effective environmental governance system, based on the ecosystem approach and the precautionary principles.

In **Israel** rising fuel prices make it less profitable for fishermen to go out to sea when there are no fish, plus many inshore artisanal fishermen have either gone out of business or reduced fishing effort. The case for trawlers may be in the making. As to less 'natural' causes - the issues of a summer ban of trawling, as well as enlarging marine reserves are being studied, reviewed, considered and recommended by the department and, pending suitable funding for fishermen compensation, will be implemented soon. Israel is trying to introduce new methods and new areas for fishing. Long term professional management, which is based on scientific knowledge and experience, can improve the sustainability of fisheries.

In **Italy**, a possibility to allow the Italian fisheries to go out of this crisis and allow Italian fishermen to survive is the opportunities being offered by the tourism based on fisheries and fishing culture, which would allow fishermen to obtain financial input from other activities other than the exploitation of marine resources. This is particularly useful to artisanal and traditional fishing activities. Another opportunity could be made available to such small scale fishermen, which involves the development of schemes where the fishermen would also be involved in the transformation and conservation of the catch for sale. Lastly, there is a need to increase the aquaculture activity from fishermen cooperatives to allow for financial assistance when not fishing. Fisheries management may improve if the GFCM will become effective. At national level, in Italy, there are positive signals from the new Minister competent on this, but there is a need of continuity in this politics otherwise illegal fishermen will keep not observing the current laws, and authorities (deprived of the political support) are not encouraged to keep doing what

they should do, i.e. to impose the observation of the law. So, at national level a double-scale approach is required: For large-scale fisheries there is a need to respect the current laws that regulate regional fishing activities, while at smaller, local-scale (e.g. where there are particular situations of over fishing) supplementary measures like the creation of marine protected areas, promotion of sustainable artisanal fishery and related cultural heritage should be put in place. Some experiences in applying management tools as exclusive fishing areas in particular in national marine protected areas were done.

According to the **IUCN\_Med.**, the most important would be that riparian countries understood that fisheries stocks are not a cake to be shared but a treasure to be conserved.



**Photo 12:** Tuna pens in Maltese coastal waters.

In **Lebanon**, a new law has been drafted but has not been submitted for endorsement by the Council of Ministers nor Parliament. Once the law passes, it will still to be seen if the management of the sector will improve. Law enforcement in this is paramount. In the absence of a national monitoring program, it will be difficult to assess indicators of success.

In **Montenegro**, improvements are possible with the stronger regulations and laws, with severe control at the sea and banning fishing during some part of the year.

In **Malta**, there seems to be little hope for improvement when even fishermen categories which include: AFA; AFB; AFC and AFD seem to be growing in number with little safeguard for the full-time fishermen and marine resources, as the only real full-time fishermen are found in the AFA category. The rest which have become the majority in number now may be part-time, sports fishermen or even tag-boat operators for the tuna penning/ranching industry. All these categories are benefiting from subsidies. This does not allow full-time fishermen to feel that there is an effort toward reducing over-capacity and conserving the limited resources. Full-time fishermen feel that in the current situation they should have the first rights on the marine resources exploited. Once this is recognised they would feel more responsible of the care and safeguard of that sea life they earn a living from. Sustainable fishing therefore should also depend on effective governance.

While increasing awareness of fisheries conservation has allowed for some care in policy making at both



local, regional and European level, weak enforcement and lack of accurate statistics on a long-term basis may not allow for sustainable fishing to be achieved, where abuses by some Mediterranean fishermen successfully going unchecked and unaffected may be seen as a reason to undertake intensive and competitive fishing efforts rather than responsible fishing efforts. Also the increasing business outlook in the fisheries sector developed through the large-scale commercial fishing and tuna ranching activities have discouraged small scale artisanal fishermen, who felt out-competed by ongoing unsustainable methods.

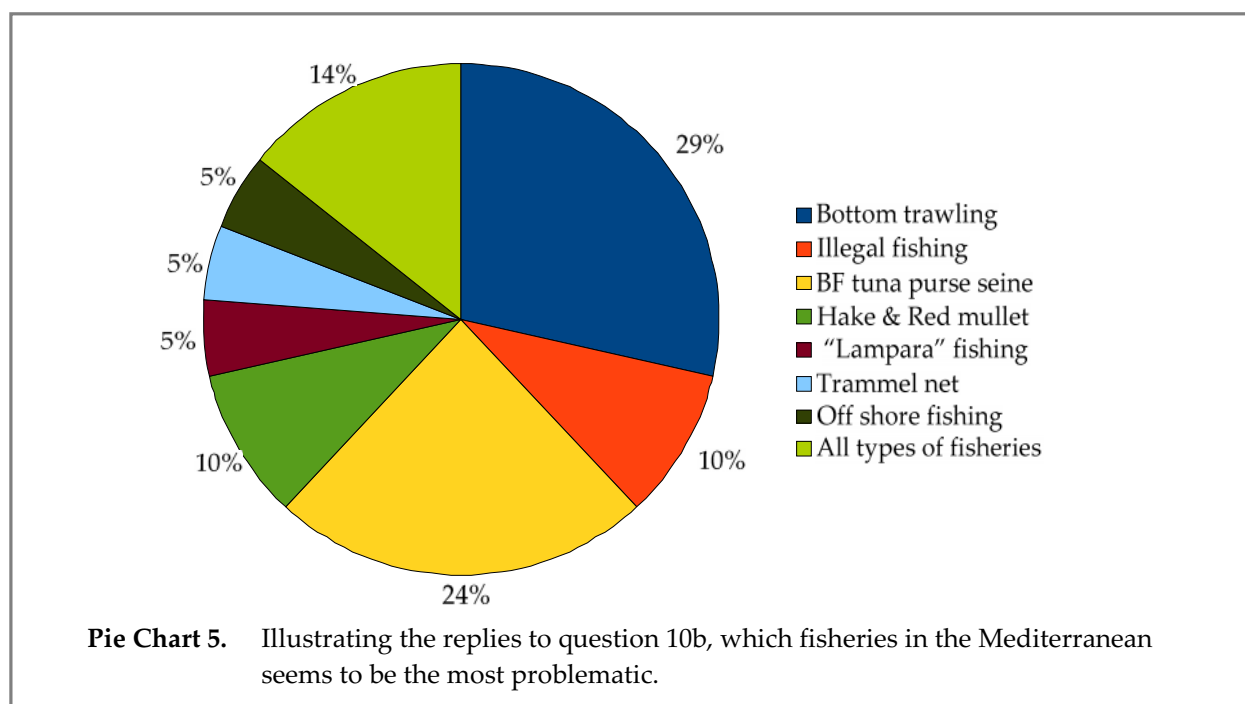


**Photo 13:** Tuna pen being towed in Turkish waters.

**Spain** is increasing measures towards sustainability in fisheries, but these improvements are “too few and too slow” to prevent the rapid declining of fish resources. As a positive example one can mention the capacity reduction programs for the bottom-trawling fleet harboured in Mediterranean ports. However, this trend cannot still be evaluated as positive until the management will be completely unlinked from the fishing industry short term economic interests.

In **Turkey**, common methodology to catch fish should be established and used in regional scale for Mediterranean Sea. Also Aquaculture should be supported.

**Q10. Which Fisheries in the Mediterranean seem to be:**  
**a) the least problematic (controlled catches and sustainable fishing methods used)**  
**b) the most problematic (uncontrolled and unsustainable fishing methods used)**



While 14% indicated that all types of fisheries in the Mediterranean seem to be problematic and need to be managed more carefully, 29% indicated that bottom and commercial trawling is the most problematic followed by 24% indicating that Bluefin tuna purse seine fishing is the most problematic. These could also be included in the 10% indicating that offshore fishing activities in the Mediterranean are not managed easily and adequately.

#### **Q.10a & 10b extended replies:**

In **Croatia**, The least problematic is pelagic fisheries which in the Adriatic is composed mostly only 2 species (*Sardina pilchardus* and *Engraulis encrasicolus*), and there is a good catch statistics and monitoring. The most problematic are coastal fisheries due to the existence of strong artisanal fisheries, lots of fishing gears (more than 55 types) which are used to catch more than 80 different fish species and there are no statistics.

In **Cyprus** The least problematic fisheries is the small pelagic fishery. An explanation might be the relatively low economical value of those fish and their relative high abundance. The most problematic is Bluefin tuna fisheries involving illegal, unreported, unregulated fishing and over-exploitation of the resources. Swordfish fishery is also problematic.

In **Egypt**, the short and medium range Egyptian fisheries in territorial water are less problematic where fishing laws are well enforced. The case may change in long range distant fisheries.

In **France**, all the fisheries in the Mediterranean Sea seem to be problematic, because the marine resources have been intensively exploited in this marine region for many decades in spite of an alarming lack of knowledge, assessment of the stocks' state, dynamics, biology and ecology of these marine species. This lack of knowledge is caused by lack of official support and funds to improve fisheries surveys and marine species stock assessments by scientists. The lack of funds for French marine scientists blocks the improvement of needed marine research work requested for an effective plan of actions in view of a suitable fisheries management in the French Mediterranean waters. There is still a lack of scientific links and communication between countries in a view of a relevant collective Mediterranean marine resources plan of management.



**Photo 14.** Purse seine fishing vessels in a Maltese port during Bluefin tuna fishing season.

Generally, the resources exploited exclusively by artisanal fisheries (particularly along the east French coast) are less problematic (except for crawfish) because of the limited areas affected by the fisheries and the low number of vessels. In this case, the activities of the fishing fleet are well controlled by the fishermen's organization that regulates fishing time, number and size of gear, and number of vessels. However, high value species (such as crawfish and bluefin tuna) or industrial products (such as sardines and anchovies), species of international interest (such as bluefin tuna, hake, red mullet, eel) or resources shared between different fleets (such as hake, sardine, bluefin tuna) are the most problematic because of the difficulties to control the fishing effort and the market demand.

According to the **Friend of the Sea** the least problematic are the small pelagic fisheries, such as those targeting anchovies, fished with purse seiners (selective and no impact on seabed), mussels farms and clams and shellfish if well managed, however driftnets for big pelagics, such as tuna and swordfish, and bottom-trawlers for octopus or fish living near the seabed have the greatest impact and are the most problematic fisheries activities.

In **Greece**, long-line fisheries, which are most selective, have minimal discards and catch high value fish are the least problematic, while Otter trawling, which as is not monitored and causes large destruction to protected, productive and priority marine habitats, as well as being unselective and having significantly large discards, is the most problematic.

The most problematic is the fishery of tuna and swordfish. Generally all fisheries targeting international stocks (except for amberjack probably) are problematic. Lack of severe international control and lack of a legislation of general applicability in the Mediterranean could be the reason. It seems that all marine populations in one way or another have several problems.

**Photo 15:**

Aerial view of tuna pen being towing in the central –southern Mediterranean region.





According to **Greenpeace Mediterranean**, the most problematic is the Bluefin tuna purse seine fishery as it currently targets a highly endangered species in its spawning grounds (Greenpeace campaigns and reports).

In **Israel**, the artisanal fishery, composed of trammel and gill nets, long-lining and pelagic inshore (seine) fishery are not so problematic and sustainable, although catches are not controlled or reported. Commercial trawling continues to be less sustainable and more problematic (habitat loss, discards etc.), although slightly more controlled/controllable. As for illegal fishing – due to unreported catches, sheer (unknown) magnitude and lack of enforcement poses a new and completely unregulated threat. Furthermore, recreational fishermen tend to be better off than artisanal ones and can thus allow themselves the luxury of an afternoon at sea fishing even when there are little or no fish. While all the fisheries are controlled, through licensing (both the boat and fishers), unless there isn't freezing of effort and in the near future a fishing ban in the summer, all sectors are problematic. Part of the problem is the area that Israel occupies. The Eastern Mediterranean Sea is notable for its lack of nutrients and small fish populations. The main fishing area is relatively small and intensively fished by all sectors. Thus the influence of one sector (trawls) can adversely affect other sectors by catching small (even if they are legal size) immature fish and large amounts of by-catch.



**Photo 16:** Pen laden with tuna.

In **Italy**, the least problematic is considered to be the small blue fish, such as sardine, (anchovies, mackerel, etc) fisheries which has been considered the most plentiful around the Italian coasts. Several artisanal fisheries and particularly those having well defined target species (e.g. pots, traps). The most problematic is the Bluefin tuna purse seine fisheries, trawl fisheries, pelagic long-line (mostly because their regulations are not well enforced). There is no fishing activity which is monitored properly, but

trawl fishery is better evaluated than others. The whole level of exploitation is high, including the one of the recreational fishing, also considering that a non negligible number of formally non-professional fishermen illegally sell what they fish not respecting the catch limits.

In **Lebanon**, all fishing methods in the Mediterranean are problematic as can be clearly seen from the reduction in catches, low recruitment rates, illegal fishing (even though countries claim that fishing laws are being implemented). The basin needs a well articulated regional fisheries management plan supported by law enforcement and awareness raising toward fishermen and consumers alike.

In **Libya**, some fishermen use illegal fishing methods which may affect endangered species, for example sea Turtle, when they use nets for sharks called "Kanaga".

In **Morocco**, all the fisheries in Morocco are only controlled in the ports at landing sites and some control for the fishing zone are done periodically. The most problematic are offshore activities' control and the mesh size used.

In **Montenegro**, the least problematic is pelagic trawl fisheries, while the most problematic is benthic trawl fisheries because it is non-selective and destroys all benthic communities.

In **Malta** the most problematic is the Bluefin tuna (purse-seining) and there are increasing number of vessels from increasing number of countries fishing in the spawning area South of the Maltese Islands. Turkish purse seine vessels can be found close to Medina Bank, south east of Malta, apart from Tunisians, Italians, French, Spanish, Japanese, that are found to fish South of the Maltese Islands. Due to the tuna penning industry lack of monitoring of when indeed the Bluefin tuna is caught may lead to most fishermen reporting their maximum catch even before reaching it by the deadline for fishing closure, so as to continue fishing after the deadline without problems of tonnage reported prior to the deadline. Satellite location monitoring of all bluefin tuna vessels should be undertaken with clear checks on the whereabouts of these vessels after the imposed fishing deadline.

Swordfish (drift-net fishing) by Italian fishermen, South East of Malta also use the "alalungara" to catch albacore tuna (*Thunnus alalunga*). Driftnets are also used by Tunisians South West of Malta. Bottom trawling in the Central-Southern Mediterranean, occurs also too close to coast, such as close to the Maltese Islands, trawlers reported at just 3 miles off Comino (why aren't these boats penalized, and controlled via satellite location systems too?). Also certain sites should not be allowed for trawling if found to be productive/nursery ground sites, such as the Hurd Bank close to Malta. Lampara net fishing along Tunisia and trammel net fishing along the Maltese coasts seem to operate with minimal or no control, with increasing net lengths and smaller mesh size of the nets. Also important is the need to have enforcement of regulations so as to make sure that there are no abuses, such as greater horse powered boats and greater use of technology than is possible for sustainable fishing. The enforcement of a closed

season for EU-member countries, while other countries in the Mediterranean may continue, is not the right way forward to promote sustainable fishing in the Mediterranean. GFCM needs to really involve all states that fish in the Mediterranean Sea to follow all regulations put out to EU-member countries aimed at conservation and sustainable fishing needs.



**Photo 17:** Drift nets are still used illegally in the Mediterranean.

While species with short life-spans, fast-development and high reproductive rates seemed to be the least problematic, such as the dolphin fish (*Coryphaena hippurra*) species (Vella, 2000), the increasing fishing effort of such species by increasing numbers of fishermen in the Mediterranean may still pose some problems for these in the future. The European hake and the red mullet are local examples of species which have shown great reductions in their catch in recent years. Long-lived species with slow growth rates and low reproductive rates and offspring production may be in real danger of becoming over-exploited directly, such as the blue fin tuna (Vella 2002, 2006; 2008) or indirectly as by-catch, such as, many elasmobranch species (Dalli 2004; Dalli & Vella 2006; *in prep.*) or affected by being disturbed in their habitat or finding less prey, such as, cetacean species (Vella 2001). Certain fishing methods and gear may also be causing greater pressures on marine resources, biodiversity and habitats. Research in Malta has focused on such issues (e.g. Muscat 2001; Vella *et al.* 2007b), highlighting the impacts of trawling with greatest wastes and impact on marine biodiversity. More research in various regions of the Mediterranean is required which can accurately assess exploitation and ecosystem impacts of each fishing gear and target species. At the same time there is the need for training of personnel and officials responsible for accurate recording and reporting data relevant to sustainable fisheries management is necessary if future data collection is to improve. Greater cooperation between the Ministry for fisheries and various local research entities would encourage more research in this necessary sector.

In **Spain**, the less problematic: purse seiner for small pelagic species. Mesh sizes, depth range and catch volume per day are managed among other measures. Environmental impacts are considered acceptable, and this fleet segment is not included among the offenders, with infringements more related to the non-compliance with minimum landing sizes.



**Photo 18:** Artisinal boats in the Maltese fishing port of Marsaxlokk.

The most problematic: Otter bottom trawling is an unsustainable fishing method that has destroyed most of valuable benthic habitats of the Mediterranean. In spite of the existing management plans and restrictive measures for this fleet segment, Spanish trawling fleet is oversized, operating in a continued non-respect of the current regulations, specifically on what concerns depth and engine power restrictions. Blue boxes have been installed in order to improve control of this fleet, but the effectiveness of the system and sanctions not deter enough and seems not to be able to prevent new infringements.

In **Turkey**, in Mediterranean sea, uncontrolled and unsustainable fishing methods are used.. There is no effective common control, or methodology for the fisheries' catch. One side belongs to EU territorial waters, another to African countries' territorial waters or Asian countries.





**Photo 19:** Small-scale catch by artisanal fishing may still effect survival of certain vulnerable species, if unchecked.

## **4 Measures to promote sustainable consumption**

### **4.1 Initiatives to encourage sustainable consumption in the Mediterranean: awareness campaigns, information and education.**

The human appetite for seafood has intensified and so has over-fishing and damage to marine ecosystems. Recently, the response to the fisheries crisis has included a considerable effort directed toward raising the seafood awareness of consumers in North America and Europe. The resulting campaigns aim to affect the seafood demand and to lead to a sustainable seafood supply. Though there are indicators of some regional successes, lack of support by the Asian market and the proliferation of self-serving seafood labels are but two of the many significant limitations of these campaigns (Jacquet & Pauly 2007).

#### *“Slow Fish” movement*

“Slow Fish” is an international movement that presents and discusses sustainable fishing and production, responsible fish consumption and the health of sea and fresh water ecosystems by involving a wide range of viewpoints - academics, researchers, members of fishing communities, representatives of public bodies and enthusiasts - in conferences, meetings, workshops and tasting sessions. “Slow Fish” is developing ways to promote sustainable seafood. At the Slow fish 2007 meeting in Liguria, Burlando, President of Slow food Italy concluded that “After two editions the project has proved that it works, reinforcing in a unique context the defence of typicality and the products from our seas, the protection of biodiversity from the risks of pollution in the Mediterranean and the safeguarding of international fishing communities” Slow Fish news (2007).

The Mediterranean Basin has a strong identity and is the meeting place for many cultures. Thus, Slow Fish represents an important opportunity for discussion between these countries - both EU members and non-members - on the future of fishing in the region, particularly with new stricter fishing regulations due to become effective in 2010 for European Community countries.

The Slow Fish market is a trading and exhibition space where visitors would find rich selection of fresh and preserved fish as well as a range of oils, spices, salts and seaweeds. The exhibitors from across Italy and the world are forbidden to sell products containing additives or artificial flavours or any fish species threatened by extinction such as red tuna, swordfish, eel or salmon. Among the market’s stallholders, visitors would be able to meet with Presidia producers and Terra Madre food communities - outstanding examples of fishermen living in harmony with their surrounding environment, maintaining healthy fish stocks and increasing the value of their work by selling high quality, fresh catch as well as excellent processed products. The Slow Fish program of water workshops would provide many opportunities for in-depth discussion of various problems relating to fishing and the sea (Slowfish Italy website).

Slow food is founded upon the concept of eco-gastronomy and the recognition of the strong connections between plate and planet. So that food needs to be good, clean and fair. The information on such food qualities would need to be available so that consumers may actively support producers of such food and thus contribute to sustainable production and consumption (Slowfish USA website).

#### **4.2 Seafood labelling for consumers: eco-labelling for sustainable consumption**

The use and need of eco-labelling schemes to create market-based incentives for environmentally friendly products and production processes was internationally recognised at UNCED. At Rio, governments agreed to “encourage expansion of environmental labelling and other environmentally related product information programmes designed to assist consumers to make informed choices” (Paragraph 4.21 of Agenda 21 - UN (1993)). “Moreover, consumer organisations in many countries, and some international consumer unions, argue that consumers have a right to get information about products offered on the market that is relevant to their values and preferences, especially information pertaining to product safety or impacts on health and the environment. Another basis for international eco-labelling efforts is also provided by the FAO Code of Conduct for Responsible Fisheries and other international and national instruments that emphasise the importance of achieving sustainability objectives through market-based measures and improving the identification of the origin of fish and fishery products traded. All eco-labelling schemes share the common assumption that purchasing behaviour of consumers is not just motivated by price and mandatory quality and health standards. Rather, product attributes taken into account by consumers can relate to environmental and ecological objectives as well as economic and social objectives (e.g. fair trade; support to small farmers; discouragement of child labour)” (Deere 1999, pp 4).

##### *Guidelines for the eco-labelling of fish and fishery products*

The Guidelines for the Eco-labelling of Fish and Fishery Products from Marine Capture Fisheries are of a voluntary nature. They are applicable to eco-labelling schemes that are designed to certify and promote labels for products from well-managed marine capture fisheries and focus on issues related to the sustainable use of fisheries resources. The guidelines refer to principles, general considerations, terms and definitions, minimum substantive requirements and criteria, and procedural and institutional aspects of eco-labelling of fish and fishery products from marine capture fisheries (FAO 2005, abstract).

Eco-labelling schemes entitle a fishery product to bear a distinctive logo or statement which certifies that the fish has been harvested in compliance with conservation and sustainability standards. “Eco-labels are seals of approval given to products that are deemed to have fewer impacts on the environment than functionally or competitively similar products (OECD, 1991; West 1995; Preiss 1997). The rationale for basic labelling information at the point of sale is that it links fisheries products to their production

process. Product claims associated with eco-labelling aim at tapping the growing public demand for environmentally preferable products. Eco-labels generally rely on life-cycle assessment” (Deere 1999, pp. 5). The logo or statement is intended to make provision for informed decisions of purchasers whose choice can be relied upon to promote and stimulate the sustainable use of fishery resources (FAO 2005 pp. 5).

The requirements and criteria are to be based on and interpreted in accordance with the suite of agreed international instruments addressing fisheries, in particular the 1982 UN Convention on the Law of the Sea, the 1995 UN Fish Stocks Agreement and the 1995 Code of Conduct for Responsible Fisheries, as well as related documentation including the 2001 Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem (FAO 2005 pp. 6).

*Labelling of fisheries products according to origin and species.*

“A preliminary step toward eco-labelling is simply the labelling of fisheries products according to origin and species. Identification of fisheries products by country of origin and species is not a counter proposal to certification or an alternative to it. Rather, it is an independent way to provide minimal information where none currently exists. The importance of the identification of the origin of fishery products was highlighted in the Code of Conduct for Responsible Fisheries. Article 11.1.11 of the Code states that “states should ensure that international and domestic trade in fish and fishery products accords with sound conservation and management practices through improving the identification of the origin of fish and fishery products treated” (FAO 1995). Furthermore, labelling for countries of origin and species would serve as a simpler and far cheaper test case for the working out of operational issues that bedevil certification schemes (e.g., accurate monitoring of chain of custody, products composed of multiple species, products processed in third countries) (EDF 1997). It is also a first step toward building the consumer information and public consciousness needed to expand demand for eco-labelled products and to make ongoing eco-labelling efforts more effective” (Deere 1999 pp 13).

*Technical guidelines for eco-labelling of products*

Paragraph 11 of the FAO Technical Consultation on the Feasibility of Developing Non-Discriminatory Technical Guidelines for Eco-Labelling of Products from Marine Capture Fisheries, 1998 states that eco-labelling should follow certain principles namely:

1. be of a voluntary nature and market driven;
2. be transparent;
3. be non-discriminatory, do not create obstacles to trade and allow for fair competition;
4. establish clear accountability for the promoters of schemes and for the certifying bodies in conformity with international standards;
5. there should be a reliable auditing and verification process;

6. recognize the sovereign rights of States and comply with all relevant laws and regulations;
7. ensure equivalence of standards between countries;
8. be based on the best scientific evidence;
9. be practical, viable and verifiable;
10. ensure that labels communicate truthful information;
11. must provide for clarity (FAO Report 1999).

“Processes for developing labels and standards should not take place between governments alone, but should be conducted in fora that enable a broad range of stakeholders to be involved in their deliberations (e.g. relevant industry, environmental groups, development groups, scientists and civil society organizations with appropriate expertise on sustainability and fisheries)” (Deere 1999 pp. 30).

Certification of where, when and how fish are caught is emerging as an important fisheries management tool. The history of eco-labelling in the fisheries sector is relatively short and actual experiences of eco-labelling are limited, although an emerging trend is shaping in European and US markets. Eco-labelling in fisheries gained increased impetus with the development of the non-government Marine Stewardship Council (MSC) in 1996 (Potts & Haward 2007).

#### Marine Stewardship Council (MSC) certification

“The MSC is an independent, not for profit, international body headquartered in London, UK. It was initiated by the World Wide Fund for Nature (WWF) and Unilever, a large fish retailer, to promote sustainable and responsible fisheries and fishing practices worldwide. The MSC has, in collaboration with a selected group of parties interested in and experienced with fisheries issues, established a broad set of Principles and Criteria for Sustainable Fisheries. Fisheries meeting these standards will be eligible for third party certification by independent certifying bodies accredited by the MSC. On a voluntary basis, fishing companies and organisations are expected to contact certifiers in order to have a certification procedure carried out. Fish processing, wholesaling and retailing companies will be encouraged to make commitments to purchase fish from certified fisheries only. Unilever, for example, had pledged to buy only MSC certified fish by 2005” (Fowler 1998; Deere 1999 pp. 11). However by 2005, Unilever managed 46% of its European fish products from MSC certified fisheries, the bulk of this was Alaska Pollock (Unilever 2007; Jacquet & Pauly 2007). By opting to use the MSC logo, producers of fishery products are expected to give consumers the option to buy fishery products that have been derived from sustainable sources. The MSC offers stakeholders the opportunity to publicly endorse the organisation’s mission, by signing a Letter of Support” (Deere 1999 pp. 11).

According to the MSC, “A **sustainable fishery** is defined, for the purposes of MSC certification, as one that is conducted in such a way that:

- it can be continued indefinitely at a reasonable level;

- it maintains and seeks to maximise ecological health and abundance;
- it maintains the diversity, structure and function of the ecosystems on which it depends as well as the quality of its habitat, minimizing the adverse effects that it causes;
- it is managed and operated in a responsible manner, in conformity with local, national and international laws and regulations;
- it maintains present and future economic and social options and benefits;
- and it is conducted in a socially and economically fair and responsible manner” (MSC website; Deere 1999).

“As an independent organisation the MSC has established a program of assessment, product certification, and promotion of sustainable fisheries. The central belief is that through promotion of the label, fishers, processors, marketers, and retailers secure benefits through marketing sustainable fisheries. A key challenge is the creation of suitable markets and promotion of ongoing consumer interest to ensure that the incentive remains for commercial involvement. In 1999 the MSC become an independent authority and sourced its own funding from a range of charitable foundations and private organisations (MSC, 2002). The creation of the MSC met with initial scepticism from fisheries managers, fishing industries, and environmental organisations other than WWF. However the current empirical evidence suggests that the MSC program is increasing in popularity by consumers and is creating incentives for fishing industries to become involved” (Potts & Haward 2007, pp. 98).

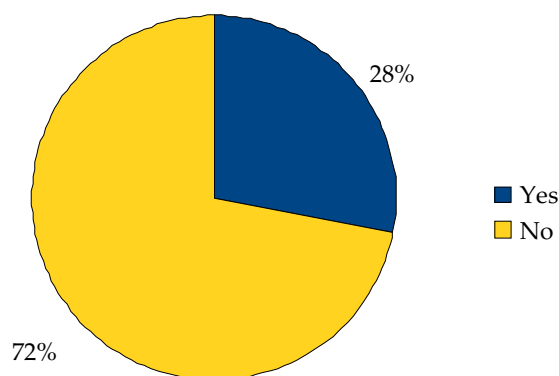
#### *Considerations around the proliferation of labels and green marketing*

Financial incentives associated with marketing a product as ‘eco-friendly’ have the unforeseen effect of inspiring fishers and seafood companies to misrepresent their seafood product. Although the Food and Agriculture Organization (FAO) of the United Nations has no official label, Nile perch fillets from Lake Victoria are sold with a self-attributed eco-label claiming the fish were caught under the FAO’s code of conduct for responsible fisheries (Pitcher 2003). This type of misrepresentation is widespread (Jacquet & Pauly 2007, pp 310), and may cause confusion with consumers losing trust in such schemes.

The proliferation of labels does not necessarily ensure that conservation goals will be met. Chuenpagdee and Pauly (2005) suggest that NGOs try initiating a ‘slow fish’ movement, which would emphasize the need to slow the rate of fishing, reduce fishing capacity, and support small-scale over industrial fishers. NGOs could encourage fisheries to join such campaigns on the premise that quality can be a more important and profitable attribute than quantity (Martinez-Garmendia & Anderson, 2005). Perhaps NGOs should even consider a ‘no fish’ campaign that encourages boycotting fish altogether and distribute bumper stickers reading, ‘Save the Oceans! Eat a Chicken’ (Jacquet & Pauly 2007, pp. 311-312).

### 4.3 Current considerations of the extent of information on seafood available to consumers in the Mediterranean

**Q9. Is there any way in which the local consumer is given information on the local / Mediterranean seafood it purchases? Such as area of origin, method of capture, date of capture, and whether it is part of sustainable fisheries schemes**



**Pie Chart 6:** Illustrating replies to question 9 on whether information on seafood is supplied to consumers in their country.

Pie chart 6 clearly illustrates the lack of information consumers in the Mediterranean are given on the seafood products.

#### *Q.9 extended replies:*

In **Croatia**, no information is made available on seafood from the local market. Some information is available on seafood that is sold in big shopping centers.

In **Cyprus**, The DFMR is responsible for the implementation of the EU regulation related to the Common Fisheries Market (i.e. labelling of fisheries products, Council Regulation 104/2000 Common organization of the markets in fishery and aquaculture products). Apart from the information about the origin of fisheries products which is compulsory for all fisheries products, there is no other specific information on Mediterranean sea food. However, the DFMR has the intention to run campaigns in order to promote Mediterranean sea food, especially from local fishery.

In **Egypt**, local consumers suffer from few or even no information about local fresh seafood. Local and imported fishery products are labeled with limited information.

In **France**, no reliable data is given to inform the consumers. Labelling (and eventually ecological labelling) with respect to name of origin (e.g. Mediterranean products, aquaculture products) is not usually provided. Some initiatives are recently being carried out at regional levels supported by Regional subsidies. For example "Ultra-fresh products" (less one day landing) carried out by pelagic trawl for

sardine or “provençal fish soup” for small coastal trawlers from East Mediterranean coasts.

According to the **Friend of the Sea**, labels of origin (in FAO area) are in place and implemented in some EU countries. It is a relatively respected rule in Italy, for example. Certification schemes such as Friend of the Sea allow for identification of products from sustainable fisheries.

In **Greece**, no but it seems that we are underway for the general application of such a system of labelling in the country. In the last three years Greece started a program for the application of traceability in seafood labelling, but until today the system is not applied in most of the cases. The consumers’ organizations around the country worked also last year in a pilot project aiming to underline the importance of this information for the local markets. Information on the sustainability is not included in the proposed label.

According to **Greenpeace**, there is poor seafood traceability in general and there is no reliable system to assess the sustainable practices of Mediterranean fisheries.

In **Israel**, none through shopkeepers or chefs – who receive fish from merchants who are mostly ignorant themselves about the origin of the fish. Nevertheless there is still a small amount of people who come to the ports to buy directly from fishermen. The consumer has no knowledge of the local seafood other than its freshness, unless they buy directly from the fisherman.

In **Italy**, in recent years more information is delivered to the consumers from the Italian fishing industry. The Sicilian region has also financed numerous projects to promote marine resources caught and its health qualities. The product promotion could be improved. There are precise laws and rules about this, at the national and EC levels. But further info are provided by several organizations (Slow Food, WWF, Marevivo, Legambiente, Fondazione Acquario di Genova Onlus, etc.). This kind of info is absolutely scarce, but it would be important to make this information available for the customer or consumer to make a choice and give value to the local products of artisanal fisheries. No specific information on the sustainability of the catches is available. The information is mainly given to inform the consumer on the origin of the product.

According to **IUCN Med.**, it depends on each country. In most cases the info is very poor or wrong. Traceability of seafood is an important issue.

In **Lebanon**, No. Imported fish are sold on the market without any labelling of country of origin or date fished and the like. Consumers rely on the information provided by the fish-mongers.

In **Morocco**, Yes, INRH, ONP, DPMA and Professionals organize every year seminars to sensibilise the consumer on the Mediterranean seafood, for its origin, its exploitation state and researchers prepared presentations for this issue. For the local market, the fishes are sold fresh in the same day when this fishes



are landed and all the consumers know that and know that coastal fisheries who sell fishes for local market spend almost one day in the sea. The landings for the deep water fisheries are exported for other countries.

In **Montenegro**, most of seafood products contain all of this information on the product declarations.

In **Malta**, consumers should be informed according to Maltese fishermen, but again this should pass through independent certification and vetting to make sure of accuracy in information.

This is essential and as an effort to inform the consumers and restaurant clients, there is a developing local BICREF project to produce local awareness for a better understanding of the sustainability issue linked to some of the fish or marine resources utilised or available locally. However accurate labelling of certification schemes of fresh fish caught locally is an important need that has not yet been developed.

In **Spain**, **Oceana** reports that visible traceability is compulsory in Spanish markets. But the information contained in this labelling is scarce and limited to general parameters such as FAO area of origin, wild captured or coming from aquaculture. No mention to the method of capture is included, unless this implies an additional value for the consumer (which is the case of long-line hake from the Cantabrian Sea which is traditionally appreciated).

In **Turkey**, No it isn't but generally fishermen inform you orally, while fish from aquaculture carries some information.

#### **4.4 Protecting Mediterranean artisanal fishing: Socio-economic and marine conservation reasons for this need**

In 1999, the Organisation for Economic Co-operation and Development (OCDE) Committee for fisheries decided to develop fisheries social and economic indicators to be used as tools in policy analysis and in 2002 agreed that the overall goal of this activity should be to contribute to improvement in the measurement of economic and social dimensions of sustainable development of fisheries and, where possible, relate these to resource and environmental dimensions.

The Scientific, Technical and Economic Committee for Fisheries (STCEF) of the European Commission in 2001 issued a document presenting a **general set of economic and social fisheries stability indicators**. The underlying notion is that to be economically and socially sustainable a fishery must be capable of being exploited profitably at some biologically sustainable level. The purpose of indicators must therefore be to show whether a fishery is currently sustainable, economically, socially and biologically, and, if not, whether it is capable of being exploited sustainably at all and, if so, at what levels of capital, of labour employed and of fish stocks.

A set of *economic indicators* include:

- Harvest value
- Fisheries contribution to GDP
- Income
- Value of fisheries exports (compared with value of total exports)
- Investment in fishing fleets
- Processing facilities

*Social indicators* may include:

- Employment/participation
- Demography
- Literacy/education
- Fishing traditions/culture
- Gender distribution in decision-making

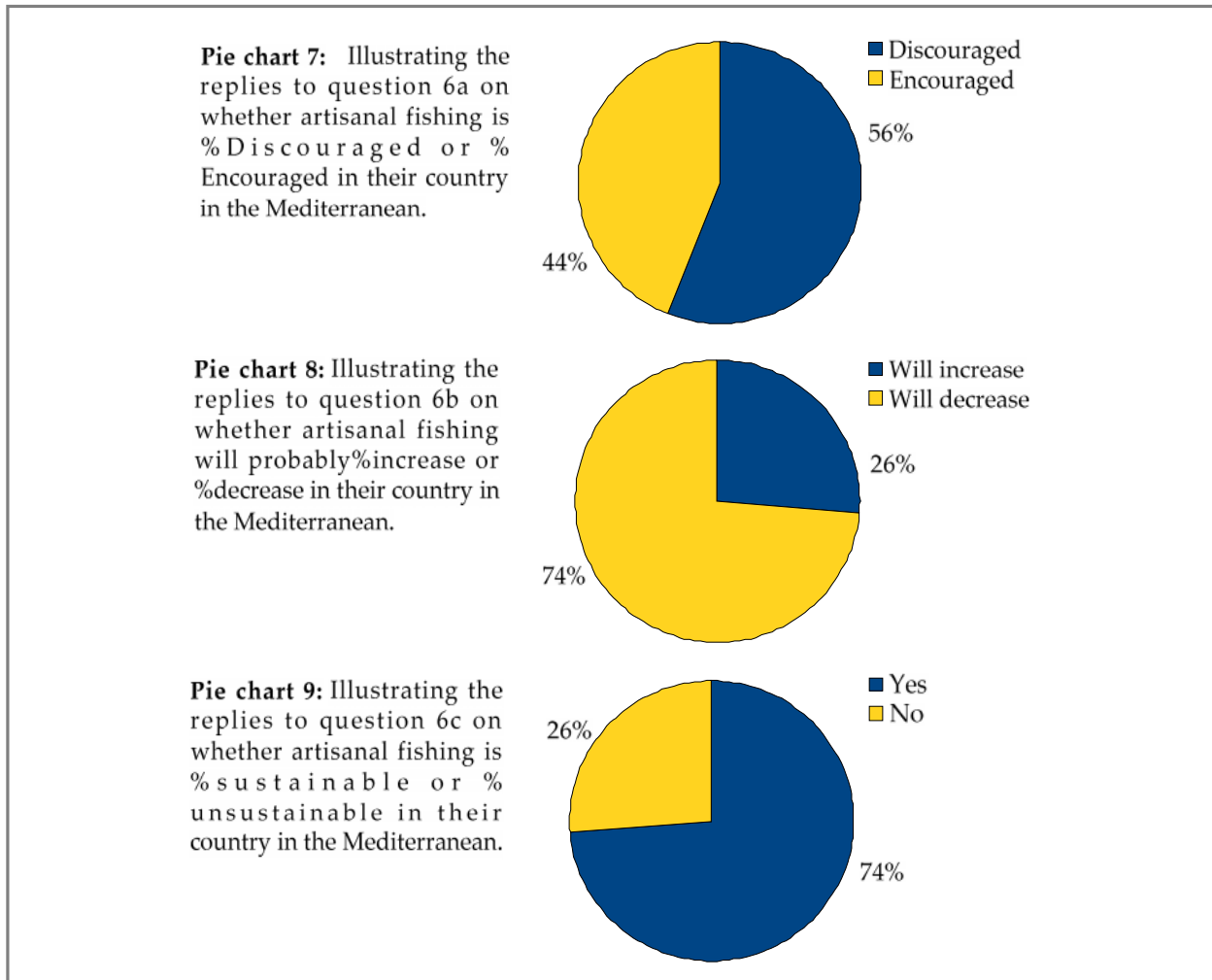
To assess and report for **Sustainable** Management of fisheries it is needed to identify a set of indicators (CIHEAM/Oliver, 2002b pp. 213-214).

The exploitation of the variety of marine resources of commercial interest in the Mediterranean concentrates mainly in the coastal zone where juveniles of several species are found (Berraho 2008), but increasingly also offshore where pelagic species may spawn, such as Bluefin tuna (Vella 2006). The co-existence between artisanal and industrial activities is often difficult as these have different perspectives, targets and strategies to earn a living out at sea through the exploitation of marine resources. Therefore conservation of Mediterranean stocks and biodiversity will require addressing these differences.

According to the (FAO 2006), EU-15 fisheries fleet reflected reductions in Number (by -12.4%), tonnage (GT) (by -11.4%), and Power (KW) (-11.1%). However if these changes are not wide spread among fishers using Mediterranean resources and address the sustainable use issue according to the species, habitat used and biological needs of these to regenerate, than these reductions would not achieve the desired goal.

#### 4.5 Focus on current situation and needs in the Mediterranean Fisheries: input from questionnaire replies. Question numbers 6 a, b, c.

- Q6a) Are artisanal fisheries still encouraged or discouraged in your Country?  
 Q6b) What is your opinion on the future of artisanal fisheries in your Country?  
 Q6c) Do artisanal fisheries allow for more or less sustainable fisheries in your region?



##### Q.6a, 6b, 6c extended replies:

In **Croatia**, artisanal fisheries are being discouraged, while commercial and sport fishing is encouraged. It is thus expected to decrease with time.

In **Cyprus**, artisanal fisheries are encouraged and receive financial support for their activities through the European Fisheries Fund that provides funds for a variety of actions such as the modernization of the fleet (safety of fishermen and hygiene of fishery products), innovative fisheries techniques and education. It is noted that legislation restricts the number of vessels licensed to operate in the artisanal fishery.

The future of artisanal fisheries in the country, with the measures that are being taken by the DFMR, are expected to provide for a sustainable fishing sector. Such measures are: Modernization of the sector; Diversification of fishing activities (i.e. Fisheries tourism); Limitation on fishing effort (i.e. gear restrictions, seasonal closures, closed areas)

It is believed that artisanal fisheries allow for more sustainable fisheries.

In **Egypt**, social fund for development (SFD) and some other agencies as NGO's and NIOF/101 are assisting in developing artisanal fisheries cutting-boat motorization and fishing gear improvement are some examples. It will be of great importance in supplying local and foreign markets fish species of high quality to elite consumer. It may allow for less sustainable fisheries particularly further off from the coast in Egyptian waters, unless a comprehensive and effective management is in action.

In **France**, artisanal fishing is not encouraged. No future in the actual economic situation in France. Artisanal fisheries allow more sustainable fisheries in French Mediterranean area because it generates a less intensive and seasonal fishing activity. We have to avoid the confusion between small scale fisheries and artisanal fisheries because Mediterranean fisheries are in most cases artisanal, even fisheries using purse-seine or trawl. The concept of industrial refers to an exploitation mode including all the angles of the fishing subjects, producing and selling fish in an industrial way. Small-scale fisheries are encouraged because they represent a potentiality to assist the population along the coasts, to limit unemployment and to preserve regional traditions.

A new reason to maintain or to develop small-scale fisheries is that they could be more easily adapted to an ecosystem fisheries management due to the short links existing between their production, the resource and the local consumers. Small-scale fisheries are often littoral and may be good indicators of the health of the ecosystem. Sustainability in fishery implies a good regulation system based on the agreement of fishermen. In French Mediterranean waters, small-scale fisheries are ruled by local fishermen organization (Prudhomies) which regulate number of fishing units and amount of gear by season, by type of métier for specific areas. These regulations must be also in accordance to national rules. When artisanal fisheries are working offshore for foreign markets sustainability is more difficult to reach because the competition between fleets, métiers, markets are bigger than in coastal areas and more difficult to regulate.

According to the **Friend of the Sea**, artisanal fisheries are not encouraged and new generations are unlikely to maintain the tradition. It is potentially very important for tourism, high quality fish, lower impact on the environment if managed, so it is more sustainable especially due to the smaller boats, less power, smaller nets, more selective gear.

In **Greece**, artisanal fishing is neither directly encouraged nor discouraged, though its social importance

is stressed. However, due to the lack of management of any fisheries practices, the catches of artisanal fisheries are decreasing significantly making the survival of artisanal fishermen increasingly difficult, and hence one could say that indirectly they are discouraged. The artisanal fishery needs appropriate management measures as the rest of the fishing methods/sectors.

It is a mistake to say that artisanal fishery is selective and then it is not so. It is important to apply new and more severe management measures. Artisanal fisheries may target particular species during their migration from and to the spawning grounds. This phase of the biological cycle is important for several species living in small populations along the coast and we must take some measure in order to manage the effort applied in these areas.

If fisheries activities do not start undergoing any sustainable management schemes for the various gears, then artisanal fisheries will inevitably stop being a viable sector.

Therefore the application of certain simple management measures could make artisanal fishing highly sustainable.

Artisanal fishery is more selective in comparison of other fishing methods, as bottom trawlers or purse seine. As we found in several studies trammel nets (the most common fishing gear in Greek coastal fishery) have common target species with trawlers but in comparison the latter fish larger specimens. However it is not clear until now the effect of different gears in different phases of the same population. We don't know yet which part of the fishing mortality is most deleterious for the stocks. As a precautionary measure we must include in our management plans all the gears fishing a particular species or a group of species, considering that all the stock segments and life-stages are important.

According to **Greenpeace**, artisanal fisheries are suffering due to the level of catch and profit of industrial fleets. Artisanal fishermen must demand the change needed in fisheries governance – pushing for sustainable and equitable fisheries management, including the establishment of a network of marine reserves. Marine reserves enable exploited populations to recover and habitats modified by fishing to regenerate. In addition, there is a growing body of evidence to suggest that the establishment of a network of marine reserves can lead to enhanced yields in adjacent fishing grounds. This can be the result of either the spillover of adults and juveniles across reserve boundaries or from the export of larvae or eggs from reserves to fished areas. Marine reserves can help provide a more predictable catch from year to year, hence enhancing fisheries stability. They also serve as a form of insurance against uncertainty and reduce the probability of over fishing and fishery collapse.

In **Israel**, this year some government funding was allocated to support fishermen (aid in the purchase of new engines or equipment) however, in the port of Jaffa, artisanal fishermen feel they are being shoved aside by real-estate stakeholders (namely the city of Tel-Aviv) to serve as picturesque scenery. Though

there is no discouraging of fishermen, no encouragement seems to feel bad enough. Prospects of seeing artisanal fishing continue for long into the future seems bleak – rising fuel prices, the Aswan dam on the Nile, migratory puffer fish, erection of a gas pipeline which may limit coastal recruitment, the rise of angling, the shallow pockets of most artisanal fishermen, over-fishing evidence and high fishing intensity by trawlers – all suggest a continuing decline of artisanal fishing, however – should a trawl ban and/or MPAs be implemented – thus if, for any reason, there will be more fish in the sea, the scaling down of the artisanal fleet may allow the survivors to keep fishing and endure. Artisanal fisheries are a part of the excessive effort, however they are surely more environmentally sustainable than commercial trawlers – as they employ (and thus provide for) 10 times more people and mouths, have a much smaller discarded fraction in the catch and do not disturb the seabed as much. If a long-term management program for sustainable fishery will be planned, this fishery can be managed through a dialog with the fishermen community.

In **Italy**, artisanal fishing is discouraged very much since there is a push toward following the regulations imposed by the EU to reduce catch. Even national and regional law aims at reducing fishing by artisanal fishermen. Artisanal fishing constitutes an important cultural and social identity of the Italian and Sicilian fishermen. So it would be important to direct such important character toward tourism focusing on maintaining this identity. This could also encourage the use of gear which is mostly very selective and thus of low impact on other organisms in the sea, thus being eco-compatible. The current state, as well as future perspectives, of artisanal fisheries is not homogeneous in the Mediterranean. Artisanal fisheries need to be well managed in order to be sustainable, like other systems. The artisanal fisheries should face the challenge of improving the quality of the distribution chain. It is difficult to say this in the absence of a full assessment of the various stocks concerned. For sure, the artisanal fisheries are able to better manage the resources and provide a well balanced socio-economic effect on coastal communities.

While there is the need to reduce the number of vessels to the level that the nature can sustain, we still need proper research that may indicate the way to do this. Marine protected areas are extraordinary scenarios for such experimentation. If the situation remains like this, there is no way to avoid extinction (i.e. catch are lower and lower, costs rise more and more, fishermen are getting older and older, with young people that do not invest in this activity).

The adaptive management of exclusive fishing areas restricted to artisanal fishery could be a good solution to implement the fishery sustainability.

According to **IUCN-Med** artisanal fishermen in the Mediterranean are not taken that much into consideration. They are basically not regulated, except in some countries with strong local cooperatives system. It might be maintained if protected with some strong measures from the medium scale fisheries, such as trawling and purse-seines, that compete for the same resources. Land-based pollution is also a

major issue for small-scale fisheries, especially due to the human pressure on the coastal regions. Ideally the current level could be maintained with some measures of regulation.

In **Lebanon**, there are only artisanal fisheries and no fishing at industrial level is permitted. However, it will most likely disappear in the next 20 years as the trade is not passed from parents to children any more.

In **Libya**, all fishermen are discouraged. The artisanal fisheries need more support and funds to encourage young fishermen to revive work in the artisanal fisheries sector.

In **Morocco**, they are encouraged by PDA (managed landing sites), by using more selective fishing gears. The future is not so clear because of the over-exploitation of all the species targeted by this fishery and also by the conflicts between artisanal fisheries and other coastal fisheries. Artisanal fishing is more sustainable because of the use of selective fishing gears.

In **Montenegro**, artisanal fisheries are discouraged in most of Mediterranean Countries. Artisanal fisheries should be forbidden but with preservation of traditional types of fisheries according to sustainable management. In Montenegro there is a specific situation in Boka Kotorska Bay where juvenile sardine and anchovy are caught with illegal mesh sized nets, but this type of fisheries has existed since the 13th Century. Based on the research this type of fishery can be allowed with regulation of licenses number per year.



**Photo 20:** Tuna pens in Maltese coastal waters.

In **Malta** it is discouraged and is expected to decrease though it allows for more sustainable fishing. Closed fishing season does not allow for sustainability as reduction of fishing efficiency year round is possible from controlled artisanal fishing.

Some countries may have too many “artisanal” fishing boats which fish vulnerable species without any control. E.g. the lampara net fishing for sardines in Tunisia ends up also fishing other juvenile species,

such as, young Bluefin tuna due to the small mesh size of the lampara net. Maltese fishermen recall Tunisian fishermen selling horsed mackerel with juvenile blue fin tuna caught in the same netting during the month of August.



**Photo 21 :** Bluefin tuna penning has increased the convenience of catching and trading this species in large scale.

The development of large-scale fishing industries in Europe and in the Mediterranean may affect artisanal fishing in some respects. E.g. on the onset of tuna penning in the Maltese Islands in 2001, though serious concerns put forward by both fishing cooperatives and local NGOs this development was started just the same with the current set of issues that include: impacts on local fishermen who caught much smaller amounts of tuna and lowered the income to the local Bluefin fishermen communities; impacts on the coastal biodiversity where the cages are kept; impacts on the tuna increasingly pursued with the latest technologies and caught with losses during transport of the cages. Other problems arise from conflicts between tuna pen towing and long-line tuna fishing in the same region with damages to the long-liners when tuna pens are dragged past or across the long-lines.



**Photo 22:** Fisherman working on his gear.



6b) while some artisanal fishing, such as that using trammel nets, fishermen may be allowed to increase until the coastal biodiversity is too poor, due to ever decreasing mesh size and ever increasing lengths of nets used around every part of the coast, some other artisanal fishing, such as that for tuna may be hindered due to the incomparable competition posed by the large-scale fisheries in the same region.



**Photo 23:** Small scale artisanal fishing boats were the most common in Maltese fishing ports up until ten years ago.

6c). Artisanal fishing once also meant small numbers of fishermen, with small gear and little effort to catch just enough to utilise and at most store some for the days when bad weather hinders any fishing activity. Now the numbers have risen together with many part-time and hobby/sport fishermen with gear and effort which have often multiplied in numbers and increased competition between fishermen. This may somewhat jeopardise the practice of the traditional artisanal fishermen, if the various fishery sectors are not checked and regulated.

In **Spain**, **Oceana** indicates that artisanal fisheries are seriously impacted by the current crisis in the fishing sector as well as by the over-exploitation of the resources carried out by other fleet segment, such as bottom-trawlers in shared fishing areas.

Despite the fact that artisanal fishers are a very large representative segment of the fishing sector, they are only promoted in Spain through the allocation of subsidies that can't ensure the economic sustainability of the activity and that keep promoting over-fishing. Thus, artisanal fishing is being changed to unsustainable fishing.

Spanish artisanal fishing is very varied with a wide number of specificities. A specific management of artisanal fisheries together with a market added value through quality labels for their products and direct sales without retailers, in order, to increase the income of fishermen can ensure sustainable artisanal fisheries in all the Spanish Mediterranean Coast.

In **Turkey**, artisanal fisheries are encouraged. However there is no optimism for the future of artisanal or recreational fisheries, because valuable fish resources stocks are decreasing. Artisanal fishermen can not

find the usual fish anymore. They may catch alien species. Artisanal fisheries allow more sustainable fisheries in Mediterranean scale.

## **5 Issues to consider for sustainable fisheries in the Mediterranean**

### **5.1 Climate change and Mediterranean consumption and production patterns**

Without doubt climate change is a recognized factor considered to affect biodiversity and human survival globally. Among the international efforts toward assessing ways of advancing ecosystem management and integrated coastal and ocean management by 2010 in the context of climate change one finds the 4<sup>th</sup> Global Conference on Oceans, Coasts and Islands (GOC 2008), which highlighted various issues on fisheries too, particularly on small-scale fishing, and stressed the need for more flexible measures to allow for adaptation to changes expected in view of climate change. This issue is more accentuated in a relatively enclosed sea as the Mediterranean, where the various side effects of climate change on sea temperatures, winds, sea currents, sea salinity, water masses, sea water acidity, etc., may produce changes in habitat quality and primary production, plankton composition and fish communities (Lloret 2008; *Plan Bleu* 2008; UNEP 2008).

#### *Changes in species populations*

In the Mediterranean, climate change may be noted through the enhanced *Tropicalisation*, which started with the opening of the Suez Canal, and the *Meridionalisation*, shifting southern most species to occupy northern regions of the Mediterranean Sea. How this will affect ecosystem side by side with various other environmental changes caused by human activities is not easy to foresee. “Over-fishing, for instance is leading to a sharp decrease in sea urchin predators and this in its turn is causing an increase in sea urchin populations that, with over-grazing destroy algal canopies leading to barrens that surely cause a lower efficiency in the functioning of ecosystems, if efficiency is measured in terms of production. This occurrence of sea urchin barrens thus is not linked to global warming but is a symptom of a global change due to the global impact of fisheries” (Boero 2007 pp.18). “Another symptom of over fishing might be the increased frequency of jellyfish blooms, possibly triggered by increased food availability at low levels of trophic networks due to our removal of large fish. A void is formed, rapidly filled by vicariants. The global ocean is shifting from fish to jellyfish, and this is occurring very rapidly in the Mediterranean Sea, since the eighties” (Boero 2007, pp.18).

Therefore, while climate change is considered to be caused by human activities, changes in our sea are caused by various direct and indirect human activities, other than climate change: The impacts of which are synergistic, difficult to tease apart and fully understand or predict due to the complex, dynamic environment of the Mediterranean Sea.

“Climate change is projected to impact broadly across ecosystems, societies and economies, increasing pressures on all livelihoods and food supplies, including those in the fisheries and aquaculture sector.

Food quality will have a more pivotal role as food resources come under greater pressure, and the availability and access to fish supplies will become an increasingly critical development issue” (COFI 2009, pp. 6).

*Consequences for fisheries and aquaculture management*

The COFI (2009 Annex 1) – supplies excerpts from: Report of the FAO Expert Workshop on Climate Change Implications for Fisheries and Aquaculture in 2008 which includes a summary of the dimensions and scales of likely climate change impacts on fisheries and aquaculture including livelihoods of fishing and fish farming communities. The over-arching theme is that: “Climate change is a compounding threat to the sustainability of capture fisheries and aquaculture development. Impacts occur as a result of both gradual warming and associated physical changes as well as from frequency, intensity and location of extreme events, and take place in the context of other global socio-economic pressures on natural resources. Urgent adaptation measures are required in response to opportunities and threats to food and livelihood provision due to climatic variations” (COFI 2009, pp.6).

“The existing pressures of demand, and anticipated challenges, will require better multi-scale understanding of the impacts of climate change and of the interacting contribution of fisheries and aquaculture to food and livelihoods security. Climate change will increase uncertainties in the supply of fish from capture and culture. Such uncertainty will impose new challenges for risk assessment, which is commonly based on knowledge of probabilities from past events. Data for determining effects of past climate change at best cover no more than a few decades, and may no longer be an adequate guide to future expectations” (COFI 2009, pp. 9).

An ecosystem approach to fisheries management should also integrate the issue of impacts due to climate change and responses to prevent and mitigate these impacts and adapt to them. It should be based on current impacts and projections of expected impacts on the marine environment, and in particular its living marine resources, with a view to prepare efficient climate change adaptation strategies urgently (EU-CSWD 2007).

*Actions to minimise vulnerability of species to climate change*

Controlling climate variability is an impossible task. However, eliminating other sources of disturbance could reduce the vulnerability of species and ecosystems. By acting on introductions, we can try to check the arrival of competitors for space and resource, new pathogens or parasites. By **acting on emissions** of pollutants, we avoid synergy with heat stress. By **limiting the fragmentation** of habitats, we are facilitating dispersion while maintaining connectivity between populations. Moreover, it is also possible to **increase connectivity** by providing corridors of habitats. This approach is a priori very attractive, but its value is often very “species dependent” and cannot always be appropriate. Thus, the management plan must not automatically focus on corridors for “nature in the wild” at the expense of appropriate

management of larger marine protected areas (UNEP MAP RAC/SPA, Perez 2008).

To this day, work done on the impact of climate change on coastal biodiversity has been the fruit of national initiatives or the collaboration of a small number of European countries.

The existence of sets of long-term temperature records demonstrated, in the north-west Mediterranean, a warming trend of about 1°C in 30 years and a rise in the frequency of extreme events. Since this kind of data is often lacking in the other parts of the Mediterranean, suitable strategies should be set up to develop prediction models for changes in the environmental conditions (warming, movement, nutrient content) (UNEP MAP RAC/SPA, Perez 2008).

#### *Arrival of new species*

Among these movements we note the arrival of several species of fish (Sardinella, barracudas, coryphenes) which are gradually taking their place in the regional fisheries. Beyond these positive effects we are also witnessing the collapse of stocks of small pelagics (sprat, anchovy) and/or modifications of the life-cycles of certain favoured catches (tuna, amberjack). Biological invasions are often seen as an element of global change since they affect biodiversity and often appear to be linked to climate change, encouraging, especially in the eastern Mediterranean, the advance of Lessepsian species (Erythrean invasion migrated across the Suez Canal from the Red Sea). Moreover, recent cases of the introduction of exotic dinophyta with biotoxins or the proliferation of species producing mucilages, have also been correlated to the occurrence of climate anomalies (UNEP MAP RAC/SPA, Perez 2008).

#### *Extreme climate events*

Extreme climate events are experienced as acute stress that disturbs the normal functioning of a biological system. Today, heat stress is widely recognized as the main factor in triggering diseases at sea, with a visible tendency for these events to become increasingly frequent in the Mediterranean. It has been shown on several occasions that temperature anomalies could trigger the virulence and/or condition the propagation of pathogenic agents (*Vibrio*) for sponges, cnidaria or echinoderms. Furthermore, the action of pathogenic agents could be facilitated by an inhibition of the defence capacities of organisms subjected to heat stress.

In 2003, after a survey done by Garrabou *et al.* (2003), the arrival or increased abundance of thermophilous species in the north-western Mediterranean and/or the disappearance or reduced abundance of “cold” species, was shown. In all, 46 significant changes of distribution were noted, over 50% of which concerned fishes and over 2/3 of which very mobile species (Garrabou *et al.*, 2003). This information was obtained from a review of the literature, including technical reports, and through information provided by various Mediterranean marine laboratories. Mostly these were species that were easy to identify (fishes, macroinvertebrates and macrophytes), which ensured the reliability of the

information. Today, this information even comes from “non-professional” users of the marine environment, like anglers or divers. Among today’s happy encounters, the coryphene *Coryphaena hippurus*, basically tropical or subtropical, used to be extremely rare in the north of the basin, whereas it could be caught by specialist fishermen in the south (Tunisia, Libya). Today it is caught fairly frequently by fishermen in the north-western Mediterranean and is found on fishmongers’ slabs (UNEP MAP RAC/SPA, Perez 2008).

#### *Lack of specific information*

Major information is still lacking before we can assess with precision the resilience of invertebrate populations affected by extreme climate events (UNEP MAP RAC/SPA, Perez 2008):

- Good knowledge of life-cycles, reproductive effort, successful reproduction and recruitment of larvae, contribution of asexual reproduction and regeneration in keeping up populations;
- Good characterization of the genetic structuring of populations permitting the flow of genes between them, and the dispersion capacities of the propagules, to be assessed;
- Tools enabling the possibilities of adaptation to the stress generated by overall change in the Mediterranean to be appraised, whether this means physiological adjustments (phenotype plasticity) or microevolutionary processes.

Faced with the evolving Mediterranean environment, possible adaptation options deserve in-depth strategic reflection. So at the end of this inventory, a few paths are put forward:

- Widen the base of knowledge, and study the effects that can result from other variables linked to climate change: modifications of rainfall regimes, currents, biogeochemical equilibria;
- Develop predictive models that incorporate aspects of the life-history features of sensitive species, intra- and inter-specific competition, or prey/predator relationships;
- Improve the visibility of Mediterranean marine biodiversity conservation issues in the context of climate change;
- Develop economic indicators to measure the consequences of modifications of biodiversity for the human activities that it underpins;
- Give assistance to the developing countries to assess their vulnerability in the face of climate change;
- Develop correct ecological engineering;
- Reduce other sources of disturbance to marine biodiversity, minimize the fragmentation of habitats, and facilitate dispersion by maintaining connectivity between populations;
- Protect relic systems (not impacted at all, or little impacted) by putting them into reserves.

(UNEP MAP RAC/SPA, Perez 2008)

#### *Scientific research*

Of course long-term research is fundamental to be able to reach scientifically rigorous results, as in a

highly dynamic and complex environment as the sea, various factors can affect the distribution of various species, including those of fisheries importance. The greater numbers of endangered dusky groupers (*Epinephelus marginatus*) could also be the result of conservation areas (MPAs) and protection measures that have been put in place in the NW of the Mediterranean, while the highly migratory coryphene (*Coryphaena hippurus*) species which has been exploited for a very long time in certain countries of the Mediterranean, such as in the centrally situated Maltese Islands (Vella 2000), and has relatively recently been exploited commercially in other European countries also due to reductions of other marine species usually exploited.



**Photo 24:** Shrimp species on sale at a Maltese fish market

In some cases, the effects on fisheries can result in changes in the life cycle. This phenomenon particularly concerns species that used to migrate in the autumn to their winter habitats but today stay longer in the northern and central Mediterranean (Bombace, 2001). This is the case, for example, of the amberjack (*Seriola dumerili*), whose winter quarters are usually in the southern Mediterranean, with a northward migration in the summer. Today, it happens increasingly frequently that this big pelagic remains until the winter in the northern basin. Similarly, the Bluefin tuna (*Thunnus thynnus*), a migrant from the Atlantic, today remains an increasingly long time in the north and the centre of the Adriatic Sea, thus offering itself to local fisheries over longer periods (Bombace, 2001) (UNEP MAP RAC/SPA, Perez 2008).

Long-term and genetic studies are increasing our understanding of Mediterranean species and therefore



also allowing for appreciation of the underlying reasons why species are diversifying in various parts of the Mediterranean. Bluefin tuna (*Thunnus thynnus thynnus*) once thought to exclusively migrate from the Atlantic to the Mediterranean on a seasonal basis to return back to the Atlantic, recently have been found to do otherwise. The developing research works have increasingly illustrated how indeed the situation may be more complex than this and may have also evolved through the years (e.g. Carlsson *et al.* 2004; Vella 2006, 2008).

Before being in a position to assume or predict climatic changes in species of fisheries importance, these species and their relation to their habitat will need to be understood. Where such work is missing it will be best to act with great caution due to the various synergistic natural and anthropogenic factors affecting and altering the marine environment in the Mediterranean.



**Photo 25:** Half-filled box of mullets at a Maltese fish market, indicating the reduced abundance of these fish.

## **5.2 Degradation and impoverishment of the Mediterranean Sea**

### *Commercial species are threatened*

In 1996, the World Conservation Union listed many marine creatures as “threaten” for the first time, most of them were commercially important species of fish, including the Atlantic cod, Bluefin tuna and swordfish. Finding fish – once an art - is now highly mechanized and precise, making use of the latest technologies. Every last fish in some populations is targeted and scooped into giant nets that do not distinguish between young and old, male or female, target species or not. If such techniques were used to capture birds and deer, chances are that we would have long ago given up fishing for them because of the obvious destruction and costs involved with dragging nets across fields and forests (Earle 1997).

However since most of the consumers and public do not get to see that a scallop dredge or shrimp trawl is to the sea, what a bulldozer is to a forest, marine ecosystem degradation and impoverishment due to fishing has been allowed to continue. Technologies to make fishing environmentally friendly are still lagging behind.

When a tanker wrecks news crews flock to film gooey beaches and dying animals. Journalists rush right past the picturesque fishing boats whose huge nets wreak far more havoc on the marine world than spilled oil. Fishing annually extracts more than 80 million tons of sea creatures world wide. An additional 20 million tons of unwanted fish, seabirds, marine mammals and turtles get thrown overboard dead. Over-fishing has depleted major populations of cod, swordfish, tuna, snapper, grouper and sharks (Sagina 2000). World-wide, the population of large predatory fish is now less than 10% of pre-industrial levels. Over-harvesting has devastated both ocean and inshore fisheries (Myers & Worm 2003; Pauley, *et al.* 2003; IUCN 2008).

#### *Scarcity of many marine species*

The Mediterranean and its biodiversity, in the last decade, following intensification of the exploitation of marine resources and its degradation due to increased pollution and disturbance is suffering a serious trend toward scarcity of many marine species with the dramatic consequences that this procures on the health of the marine environment and communities. For example, the exploitation of the sea date banks in the sea of Kariat Arkman (Nador, Morocco) degraded the cliffs where this species was found (Berraho 2008).

According to FAO fisheries statistics, the mean trophic level of the Mediterranean catches declined by about one trophic level during the last 50 years (Pauly *et al.* 1998).

Studies and observations on some fish species population, such as Hake (*Merluccius merluccius*) (Reale *et al.* 1995) and the red mullet (*Mullus barbatus*) and striped red mullet (*Mullus surmuletus*) (Tserpes *et al.* 2002), show an increasing presence of younger individuals with fewer adults contributing to future generation EEA Report (2006).

As more research focuses on conservation issues of both protected and endangered species, such as Common dolphins (*Delphinus delphis*), in the Mediterranean (e.g. Vella 2002; Bearzi *et al.* 2003; Vella 2005; Stockin *et al.* 2005) and the theory and practice of fisheries sustainability (e.g. Vella *et al.* 2007b) the more planning and actions can be undertaken with useful information.



**Photo 26** Mediterranean Endangered Common dolphins in Maltese waters.

Discarded species composition resulting from trawling activities at 150-400m depth in the Mediterranean vary between the western and eastern Mediterranean according to HCMR based on Carbonell *et al.* (1998) in the western Mediterranean there was 32% fish, 25% molluscs, 16% crustacean, 9% echinoderm and 18% other discards respectively, while Machias *et al.* (2001) and TRIBE (1997) indicate that for eastern Mediterranean there was 41% fish, 14% molluscs, 36% crustacean and 9% echinoderm discards respectively EEA Report (2006).

#### *Need for improving trawling activities*

Sacchi (2008) gives a recent review of the use, problems and selectivity options of trawling in the Mediterranean and clearly indicates possible solutions for improvements through technical and management measures that would need to be taken up across the GFCM region and at European level. This would be necessary due to the impacts of this fishing method on both target and non-target species and their habitats. Globally by-catch has been estimated to go up to 40% of fisheries catches (WWF 2009; Davies, *et al.* 2009).

#### *Value of marine biodiversity*

Biological diversity or biodiversity is a “cluster of concepts” which covers many interrelated aspects from genetics and molecular biology to community structure and habitat heterogeneity. However, the most fundamental meaning of biodiversity probably lies in the concept of species richness (May, 1995), that is the number of species occurring in a site, region or ecosystem. The Mediterranean fauna and flora have



evolved over millions of years into a unique mixture of temperate and subtropical elements, with a large proportion (28 %) of endemic species (Fredj *et al.*, 1992; UNEP/MAP 2004)

Biodiversity as defined in the Convention on Biological Diversity – namely, “the variability within species, among species, and of ecosystems, and the ecological complexes of which they are part” (CBD 1993) – is a basic element necessary for sustainable fisheries and aquaculture. The biodiversity of natural populations provides the resource base for commercial fisheries and the means to adapt to environmental changes and fishing pressure, and the biodiversity of farmed fish allows for continued breed improvement to meet production and changing market demands (FAO Report 2003 pp. 200).

Healthy marine ecosystems generate a range of ‘intangible’ values, which are difficult to estimate as a result of the absence of a robust global datasets and agreed valuation methods. These values arise from marine biodiversity, the existence value of mega fauna and the value of environment services from natural as sets such as healthy reefs (Cesar 2000; UNEP-WCMC 2006; Worm *et al.* 2006). There may be additional potential benefits from ocean carbon sequestration resulting from healthy fish stocks (Lutz 2008). There is substantial excess capacity in the global fishing fleet. A global fleet that is ‘imbalanced’ with the fish stocks can substantially reduce the carbon footprint of the industry. The bioeconomic model does not include a valuation of these ‘intangibles’ (World Bank/FAO 2008).



**Photo 27:** Marine biodiversity and dusky grouper in Maltese waters.

*Towards more marine protected areas?*

“In order to limit the impacts of over-exploitation, which affect more than one stock and lead to degradation of the marine environment. Marine Protected Areas may assist in the preservation of marine biodiversity. Here again in the Mediterranean region there is great diversity of concepts and bodies involved in the planning and management of such conservation areas. Often the different MPA categories are managed by the same ministry (mostly the Ministry of the Environment). However at times the management of the MPAs falls within the responsibility of different Administrations in the same country as is the case of Morocco and Algeria, where there are MPAs that are not designated, whose management responsibility fall upon the Ministries of water, forests and the coastal authority, respectively. In Tunisia there are 2 MPAs belonging to categories II and IV that are managed by the Coastal Authority. Likewise, in Egypt there are 2 non-designated MPAs while in Libya there are none” (Berraho 2008 pp. 156).

“The EU needs to increase marine conservation areas, even in the Mediterranean Sea, covering both coastal and offshore regions. Areas that are regularly assessed for their efficacy also within the climatic changing environmental conditions expected. Such increased regard for our common marine resources, biodiversity and ecosystems would need greater input from local marine and conservation biologists with local knowledge and dedication. The local to regional collaboration should be facilitated through an integrating maritime policy” (CBRG & BICREF 2007 pp. 4).

While there are some differences in the management objectives of MPAs in Europe, they are commonly seen as an instrument for improving both fishery management and marine environmental protection. However, in most cases the real effectiveness of MPAs seems to be limited to nature conservation and the increase in biomass and individual fish size inside protected areas (Ravenga & Badalamenti 2008). Necessary work focusing on marine larvae dispersion, patterns of movement of juvenile and adult phases of fish, behaviour of water masses in the vicinity of complex coastline, knowledge of the actual impacts of fishing and design of MPAs in such a way to allow rigorous demonstration of sustaining or enhancing yield in surrounding regions (Sale *et al.* 2005). Recent work in connection with European MPAs as tools for fisheries management has been tackled by EU projects, such as EMPAfish (2005-2008), MarBEF (2004-2009) and various other Regional and National research projects also presented at symposia on MPAs, fisheries management and ecosystem conservation (MARBENA 2006; MarFISH 2007 & 2008; MarBEF 2004-2009; EMPAfish Symp. 2007).

The reduction of the environmental impacts of human activities on the seas has a significant fisheries component, and a number of linked actions are proposed to ensure that the CFP plays its part in increasing the sustainability of these human activities. In this context, the proposed action for the progressive elimination of discards is one of a series of actions aimed specifically at reducing the

environmental impact of fisheries, thus strengthening the ecosystem approach to the management of maritime activities (EU-CSWD, 2007).

*Action plans for specific species*

The International Plan of Action (IPOA) for **Seabirds** seeks to reduce seabird mortality and by-catch in fisheries where these are most common and conspicuous. These are long-line fisheries above all. In 2007, COFI proposed that the IPOA–Seabirds be extended to trawl fisheries as well, seabirds also getting killed by trawl cables extending from the stern of vessel down to the water surface, (Hosch, G. - FAO, 2009 pp. 43).

As seabirds, **sharks** suffer from elevated by-catch rates in long-line fisheries. Sharks tend to have similar reproduction strategies as large marine birds, reaching sexual maturity late, and giving rise to few offspring at any given time. In addition to this, there is a flourishing high value Asian market for dried shark fin products – turning sharks into a highly lucrative so called “by-catch” species when indeed it would be a target species. In addition to this, sharks are the target of intensive shark fisheries in several parts of the world (e.g. West Africa and Madagascar) where shark meat is traditionally valued and locally marketed – in addition to the overseas market avenues for dried shark fin products. Ecosystem and climate change are also thought to play an important part in shark population declines, Hosch, G. - FAO (2009 pp. 45).

The Action Plan for the Conservation of **Chondrichthyans** in the Mediterranean is a suggestion for setting up regional strategies, and setting out priorities and actions to be undertaken at national and regional level, for regional cooperation is necessary for ensuring that conservation methods are put into effect. IPOA-Sharks suggest that FAO member states develop national action plans when their fishing fleets catch sharks, either intentionally or accidentally. In compliance with this recommendation, the Contracting Parties to the Barcelona Convention are strongly invited to elaborate national action plans according to the priorities defined in the present document to ensure the conservation and management of chondrichthyan resources in their environment, as well as their sustainable use. Within the framework of the Barcelona Convention, some chondrichthyans are already protected, mainly the **great white shark** (*Carcharodon carcharias*), the **basking shark** (*Cetorhinus maximus*) and the **Mediterranean Manta ray** (*Mobula mobular*). Also, some Mediterranean countries have introduced specific protection measures for these species to strengthen their protected species status (UNEP MAP RAC/SPA 2003). However, all these and more species may still be by-catch during fishing activities. Unless a record of the by-catch is taken note of during fishing activities, we may never know how well any legislation is effectively protecting such species. The improvement of catch sampling and species-specific recording is required. For this reason, a training course for species identification may be needed.

*Need for more information on fisheries – knowledge based management*

Information on fisheries, fishing gear and ground fishing are essential in order to estimate the fishing effort associated to the catch of these species and for setting appropriate management measures.(UNEP MAP RAC/SPA 2003)

Knowledge of life-history data is needed for the application of demographic models. At the same time, information on the temporal and geographical distribution at species level is essential in definition of critical habitats such as mating grounds, spawning beds and nursery areas. This could be based on the data recorded within the international commissions or programmes like GFCM (General Fisheries Commission for the Mediterranean), ICCAT (International Commission for the Conservation of Atlantic Tunas), MEDITS (MEDiterranean Trawl Surveys), MEDLEM (MEDiterranean Large Elasmobranchs Monitoring), or based on data from national research programmes already operative.(UNEP MAP RAC/SPA 2003)

*Protection of sharks*

Europe's fishing commissioner, Joe Borg, has launched a plan to save the dwindling numbers of Europe's sharks, which are under threat from over fishing and hunting. In the first ever conservation plan for one of the world's most vulnerable predators, the European commissioner for maritime affairs and fisheries, pledged in February 2009 to tighten hunting controls on sharks. His proposals – to limit shark catches, tighten rules on fishing tackle and reduce the number of days when trawlers can hunt for sharks in sensitive areas – will be considered by Europe's ministers later this year. Borg also called for a ban on discards – sharks that are caught as a by-catch with other species and thrown back into the sea, where they are unlikely to survive (Aldred 2009).

Sharks are especially vulnerable to fishing activities because many species are slow breeders that have long gestation periods, few young and reach sexual maturity late in their life, but also due to the low priority given in the species identification and accurate data collection at fisheries landing sites (Dalli 2004; Dalli & Vella 2006).

*Interactions between fishing activities and cetaceans*

The increased competition between cetacean species and fishermen fishing close to the coast or offshore has also increased the hostility of fishermen to these protected species. Due to their elusiveness and movement most of these species are difficult to monitor and to safeguard unless effective management of human activities out at sea do not take into consideration the needs and presence of these species. While illegal drift-netting is well-known to kill any species of cetacean, turtles and sharks, coming across it, other fishing methods which either over-exploit cetaceans' prey, or disturb cetaceans in their feeding, reproductive and young-rearing locations may indirectly cause reduced options for survival to these



species in the Mediterranean. The knowledge on such problems has recently developed through research on cetacean-fisheries interactions, however much more research will be required to manage to elucidate the intricate ways in which Mediterranean fishing activities affect various cetacean species, without necessarily ending up entangled or hooked in fishing gear (Northridge 1984; 1991; Buck 2003; Di Natale 2009; WWF 2008). ACCOBAMs and regional fisheries entities, such as GFCM, are starting to cooperate toward considering cetacean needs.



**Photo 28:** Bottlenose dolphins in Maltese waters.

A significant impact is seen on protected species such as marine mammals, especially whale and dolphin populations. On the one hand they get caught accidentally in driftnets, on the other hand they compete directly with fishermen for small pelagic resources ('fodder species') such as anchovies and which are common in their diet (Northridge, 1984; 1991; IASON, 2006c) Though various studies have allowed for some understanding of the direct and indirect impacts of intensified fishing activities in the Mediterranean (Northridge 1991; Pace *et al.*, 1999; Vella 2001; WWF, 2008), it would seem clear that a long-term Mediterranean-wide project using well-agreed techniques for population abundance estimates with the largest possible participation of scientists is necessary to better assess the status of cetacean populations and their interactions with fisheries in the Mediterranean (Di Natale 1992; 2009).

For the various environmental and biodiversity protection reasons mentioned above there is a growing recognition that environmental stewardship is a new form of fisheries governance (Gray & Hatchard (2007)).

### **5.3 New species and changes in the marine ecosystem of the Mediterranean**

Evidence is accumulating that changes in biodiversity patterns in the Mediterranean are linked to direct drivers such as climate change and invasive species, in addition to the well-established drivers of habitat change, over-exploitation and pollution. By the middle of the century, climate change and invasive species may be the dominant direct drivers of biodiversity loss and increased risk of extinction for many species, especially those already at risk due to low population numbers, restricted or patchy habitats, and limited climatic ranges (Galil 2007b).

The Erythrean aliens are thermophilic, originating in tropical waters. It stands to reason that rising sea-water temperature enhances the reproduction, growth, and survival of the Erythrean aliens, and provides them with a distinct advantage over the native Mediterranean biota (Galil 2007a). The location of the Israeli coast “downstream” of the prevailing current from the opening of the Suez Canal means that it is the first haven for the *Erythrean propagules*. Most of the Erythrean aliens known from the Mediterranean Sea have been first recorded from Israeli coast. (Galil 2007b)

The profound changes in the biota off the Israeli Mediterranean coast caused by the intrusion of Erythrean aliens should serve as a warning - if unheeded and unchecked they are likely to spread beyond the easternmost Mediterranean Sea (Galil 2007b).

Whether intended or accidental, **introduced or “alien” species can become invasive** - having serious impacts in the marine environment, competing with native and endemic species for food and space - often dramatically altering the structure of communities and habitats. The intentional release of new species can occur as a result of species being brought into an area (for example to establish aquaculture or for aquariums), and subsequently spreading into the surrounding waters. An example in recent years is the “killer alga” *Caulerpa taxifolia* that has smothered vast areas of the north western Mediterranean ever since it was discarded accidentally from an aquarium in Monaco. The alga has no known predator and transforms diverse bottom habitats from lush zoological gardens of hundreds of species of invertebrates and fishes to near monocultures of the alga as uniform and depauperate in associated species as a field of wheat or corn (Jackson 2005). Some species are accidentally transported in ballast water or attached the hulls of vessels and end up being released far from their origin . The North American comb jelly *Mnemiopsis leidyi* was introduced to the Black Sea through ships’ ballast, and reached an estimated total biomass exceeding the world’s total annual fish landings, adding to the effects of over-fishing and contributing to the near collapse of Black Sea fisheries, until it too fell victim to another predator invader. (EU mag. 2007)

In recent years, the International Commission for the Scientific Exploration of the Mediterranean (CIESM)

produced four monographs on the immigrant species that entered the Mediterranean Sea, often through the Suez Canal. They cover fish, molluscs, crustacean decapods and algae and are continuously updated through the web page of the Commission ([www.ciesm.org](http://www.ciesm.org)). The list of aliens is very long and it becomes even longer when considering all phyla (Boero 2007, pp. 18).

#### **5.4 *Illegal/pirate fishing world-wide and in the Mediterranean.***

In 2006, the General Assembly of the UN stated that it “emphasizes once again its serious concern that illegal, unreported and unregulated fishing remains one of the greatest threats to marine ecosystems and continues to have serious and major implications for the conservation and management of ocean resources, and renews its call upon States to comply fully with all existing obligations and to combat such fishing and urgently to take all necessary steps to implement the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing of the Food and Agriculture Organization of the United Nations” (UN 2006).

##### *Fighting against Illegal, Unregulated and Unreported (IUU) fishing*

EU proposals on the protection of fisheries resources in international waters include action to eliminate Illegal, Unregulated and Unreported (IUU) Fishing and action on destructive fishing practices (EU-CSWD 2007).

Action against IUU Fishing has been ongoing for some time, including a European Commission Action Plan adopted in 2002 (COM(2002) 180, 28.5.2002). International work in this area is also continuing, both in the UN (FAO) context, and within regional fisheries management organisations (EU-CSWD 2007).

“Measures to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing were submitted by the EU executive for approval by the Council on 29 May 2008. Members of the European Parliament (MEPs) had voted to back the plans during their Strasbourg plenary on 5 June 2008. They were initially proposed by EU Fisheries Commissioner Joe Borg in October 2007. Meanwhile, the regulation on the protection of marine ecosystems represents the transposition into EU legislation of a December 2006 UN resolution on sustainable fisheries. The EU is the largest market for fisheries products in the world. The Commission estimates the total value of fisheries products illegally imported into the bloc at over €1.1bn” (EurActiv 2008).

This action is part of an integrated approach towards the protection and sustainable management of marine resources, and is linked to actions for the protection of the high seas, the integration of the ecosystem approach within fisheries policy, and the regulation of destructive fishing practices (EU-CSWD 2007)

Scientific evidence has demonstrated the very damaging effects of certain fishing practices, including bottom trawling, on the marine environment. Coherent action is required in EU waters, Regional

Fisheries Organisations and also in the high seas. For the latter, the European Commission has been playing a lead role in the discussions of this subject in international fora (EU-CSWD 2007).

This action is also part of an overall approach towards the ecosystem-based management of maritime activities, and part of an integrated marine environment strategy to ensure a seamless and coherent approach to the sustainability of the EU's maritime economy (EU-CSWD 2007). Traceability and the prevention of trade in illegally harvested resources are also relatively new disciplines, toward control against IUU fishing.



**Photo 29:** Trawlers in the port of Lampedusa.

#### *Traceability as a means to fight against illegal fishing*

Traceability serves as much the purpose of applying quality and safety standards, enabling the identification of the place of origin – covered above – as it can serve the purpose of preventing the putting to market of seafood that was harvested by identified illegal, unlicensed, or otherwise non-compliant entities. Traceability schemes come in many forms, ranging from catch documentation schemes, practiced by Regional fisheries management organizations (direct management mandate), to health certification schemes practiced by importing blocks such as the EU (EU Reg, 2006) all the way to producer-level labelling of products of particular or special interest (artisanal line-caught sea bass producers of Brittany). Traceability schemes should enable processors, traders and consumers alike to know where the *fish in the box* or the *fish on the plate* originate(s) from. Traceability schemes permit to improve quality and safety of products, they enable market segmentation for specialized products, and they help curbing fraud (Hosch, G. - FAO, 2009 pp. 33).

*Need to balance European supply and demand*

When looking deeper into the EU market, for example, it emerges that enormous quantities of illegally caught or misreported fish enters the EU market on a daily basis. The New York Times, in an article published in January, 2008, (Rosenthal, 2008) states: "In Europe, the imbalance between supply and demand has led to a thriving illegal trade. Some 50 percent of the fish sold in the European Union originates in developing nations, and much of it is laundered like contraband, caught and shipped illegally beyond the limits of government quotas or treaties. The smuggling operation is well financed and sophisticated, carried out by large-scale mechanized fishing fleets." Irrespective of which figure is closer to the truth, this essentially entails that very few European processors, buying raw material landed in European ports, and originating from developing countries, have a firm grasp on where the fish really originates from, and whether it has been harvested legally. The article further states: "Tracing where the fish come from is nearly impossible, many experts say. Groups like Greenpeace and the Environmental Justice Foundation have documented a range of egregious and illegal fishing practices off West Africa. Huge boats, owned by companies in China, South Korea and Europe, fly flags of convenience from other nations. They stay at sea for years at a time, fishing, fuelling, changing crews and unloading their catches to refrigerated boats at sea, making international monitoring extremely difficult." Hosch, G. - FAO (2009 pp. 34).

*Awareness-raising campaigns*

In their research and campaigning efforts Greenpeace and Oceana have contributed to increase awareness on the continued problems of illegal fishing practices in the Mediterranean. Greenpeace reports, swordfish were recovered from illegal Italian driftnet on the MV GREENPEACE in the Sardinian channel and 800 Kilometers of driftnet were confiscated by the Italian coastguard (Italian Coast Guard press release of Friday 17 March 2005, Greenpeace). The lack of effective management systems and increased commercial pressure on our dwindling fishery resources has helped fuel an illegal, unregulated and unreported (IUU) fishing industry. A good example is the extensive use of illegal driftnets in the Mediterranean Sea. Of all the Mediterranean countries, Spain is the only one to have adopted a National Plan of Action to combat the problem of IUU fishing, as mandated in the International Plan of Action of the United Nations Food and Agriculture Organization. No regional register for fishing vessels exists and there is a lack of funding and infrastructure to implement the laws intended to combat illegal fishing in international waters (Greenpeace Campaign - Defending our Mediterranean). The impact of driftnets, often up to 17kms in length, has long been scrutinised because of the by-catch associated with it. Populations of larger sea creatures including endangered sea turtles, dolphins and sharks are of particular concern. Numerous regulations have been put into place since 2003 to ban the use of driftnets in the Mediterranean Sea. They have been made illegal by several laws, yet they are still widely used and some driftnet fleets are even expanding. Morocco has admitted to operating over 300 drift netting

vessels. Other fleets include the Italian fleet, numbering 90-100 vessels, the Turkish fleet comprising 45-100 vessels and the French fleet of between 45 and 75 vessels (Greenpeace Campaign – Defending our Mediterranean). Oceana estimated more than 137 Italian vessels continuing using illegal fishing after receiving substantial subsidies for conversion (Oceana 2007).

#### *New community system to prevent illegal fishing*

The EU Agriculture and Fisheries Council adopted a Regulation on September 30th 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing, which will apply from January 1st 2010 (Con.Reg. (EC) No1005/2008).

This includes as one of its main tools the establishment of a certification scheme covering all imports of fishery products. The aim is to halt the import of IUU fishery products into the EU. According to an EU representative, the scheme is to place strong emphasis on checking, inspection and verification activities, ‘to be carried out according to common criteria governed by risk management and assessment’. This would allow targeted trade flows to be controlled as a matter of priority (Con.Reg. (EC) No1005/2008).

For processed products imported into the EU and obtained from imported raw materials, EU importers will have to submit a statement issued by the processing company of the exporting country providing information establishing the link between the processed products and the fish used as raw material. This raw material should be accompanied by the catch certificates validated by the flag state of the fishing vessel. The number of the health certificates and the approval number of the processing plant will be mentioned on the statement to ensure a link with the implementation of health legislation (Con.Reg. (EC) No1005/2008).

### **5.5 Increasing role of aquaculture?**

Aquaculture means the farming of aquatic organisms including fish, molluscs, crustaceans, aquatic plants and other aquatic organisms. It includes capture-based aquaculture and the production of aquatic organisms which are harvested by an individual or corporate body which has owned them throughout their rearing period. It excludes aquatic organisms which are exploited by the public as a common property resource: these are the harvest of fisheries. Farming means some form of intervention in the rearing process to enhance production, such as regular stocking, feeding and protection from predators and involves individual or corporate ownership of the stock being cultivated. Capture-based aquaculture means the practice of collecting “seed” material, from early life stages to adults, from the wild and subsequent on-growing to marketable size using aquaculture techniques .(EuroStat2007)

#### *Aquaculture statistics*

The national authorities of EEA countries submit aquaculture production data to Eurostat under the terms of: Council Regulation (EC) no. 788/96 of 22 April 1996 on the submission by Member States of

statistics on aquaculture production (OJ L108 of 01.05.1996) FAO receives aquaculture production data from national authorities on the FISHSTAT AQ questionnaire. This questionnaire uses the same concepts and definitions as the EU legislation and the data from the two sources are comparable. The FAO Fisheries Department performs a check on the quality of the data and makes the results available to Eurostat for inclusion in the NewCronos data-base. The data are recorded in the live weight equivalent of the product weight (EuroStat2007).

#### *GMOs and aquaculture*

Many resource managers, aquaculturists and scientists believe that genetically modified organisms (GMOs) and transgenics will eventually become accepted in aquaculture and will contribute to increased production. Clear and accurate information on the benefits and risks of GMOs, and policy guidelines for their responsible use, are urgently needed in order to allow the field to progress (FAO Report 2003 pp. 203).

The continued strong growth of global aquaculture output endows the sector with paramount importance, and its monitoring is essential in order to guarantee that forces at work and arising needs be properly understood and addressed.

#### *New pressures on the marine ecosystem*

Aquaculture is expanding rapidly - often without proper environmental assessment - and currently accounts for 30 percent of the fish protein consumed worldwide. The industry claims that farmed seafood lessens the pressure on wild fish stocks, yet many of the farmed species are carnivorous, consuming up to five times their weight in wild fish. Mediterranean coastal areas are already over exposed to human influence, with pristine areas becoming ever scarcer. The aquaculture sector adds to this pressure, requiring areas of high water quality to set up farms. The installation of fish farms close to vulnerable and important habitats such as seagrass meadows is particularly concerning. Aquaculture production in the Mediterranean also threatens biodiversity through the introduction of new species to the region, the impact of the farms' organic and chemical effluents on the surrounding environment and coastal habitat destruction (Allsopp, *et al.*/ Greenpeace 2008).

It is unrealistic to expect any sudden change or marked increase in the rate of aquaculture growth worldwide over the next decade or so, unless significant market shocks destabilize the production of other protein sources that currently serve as substitutes for fish in general and aquacultured fish in particular. Nevertheless, it seems possible that the growth in aquacultured fish and shellfish production will continue, at least until 2015, at close to the fairly high growth rates recorded recently (5 to 7 percent p.a.) (FAO Report 2003 pp. 205)



### *Tuna ranching*

In order to meet the growing demand for high-grade tuna meat in Japan, tuna ranching has developed in the Mediterranean, increasing the strain on the already depleted stocks. Juvenile tuna are caught and put into pens to fatten up. It takes up to 20 kilograms of bait to produce just one kilogram of tuna. The bait is made from other fish species, predominantly caught around West Africa, the North Atlantic and US waters. Tuna ranching is fundamentally unsustainable but it also carries other risks. The 'foreign' bait used can introduce diseases to the local fish populations, as happened in Australian tuna ranches. The spread of disease to important local fish stocks such as anchovy or sardine could be disastrous for local fishermen (Allsopp, *et al.*/ Greenpeace 2008)

### *Need to strengthen the legal framework of aquaculture activities*

“Formal legal and institutional frameworks for the responsible development of national aquaculture sectors are a relatively new development in most countries, aquaculture having developed in a relative legal and administrative void in most countries where it was not a classic or traditional activity. Even in countries where aquaculture was a traditional activity, modern developments in intensive aquaculture where not legislated for – and called for the development of more comprehensive regulatory texts, and more dedicated institutions to ensure the proper implementation of new regulatory frameworks.”  
Hosch, G. - FAO (2009 pp. 37)

**Organic enrichment:** Selective enhancement of invertebrate pops that serve as vectors or intermediate hosts of certain parasite groups (e.g. gastropods and other molluscs (hosts for digeneans) and annelids (for Myxozoa)) (CIESM 2007).

**Antibiotic resistance:** Considering the high volume usage of anti-bacterial drugs in the Med fish farming, there is an urgent need for monitoring drug contamination in water and sediments and examining non-target species in the vicinity of fish farms for potential bioaccumulation (CIESM 07).

### *Introduction of new species for aquaculture activities*

Various introduced species in the Mediterranean are driven by aquaculture due to the high permeability of the facilities. E.g. *Pagrus major*, a eurythermal sparid fish was imported to Croatia from Japan and raised in cages off Pasman Islands till 1999. In 2004 a mature individual was caught off Molat Island (Dulcic and Kraljevic 2007). It had survived in the E. Adriatic for at least five years.

*Aggregation of wild fish around farms*

At the same time floating fish farms are associated with important aggregations of wild fish around them. Several studies (Sánchez Jerez *et al.* 2007) have shown that there is an important aggregation around all of the Mediterranean farms throughout. The most abundant families are clupeids, sparids, carangids, mugillids and pomatomids, although the dominant species varied markedly among farms and seasons. This important aggregation affects the behaviour and physiology of the local ichthyofauna, and may have important consequences for wild fish populations and local fisheries on a regional scale.



**Photos 30a,b:** Empty tuna pens being towed long distances at high speed and passing through long line fishing grounds.

*Variations in prices (aquaculture/fishing)*

“The increasing competition of fish substitutes will force wild capture fisheries to deliver products that enjoy price premiums. For example, at the beginning of the 1990s, imports of farmed tilapia (fillets) were believed to depress prices of white fish in the United States market. Similar situations have been observed

in south European countries with respect to European sea bass and sea bream. In 1991 some 3800 tonnes of European sea bass came from culture, or just under 40 percent of the total supply. By 1999 aquaculturists produced more than 41,000 tonnes of the species, accounting for 85 percent of the total supply, and sea bass prices dropped. Similarly, the sheer volumes of cultured European sea bass, which became available, have affected prices for these and other substitutable food sources" (FAO Report 2003 pp. 205-206).

#### *Need for a sustainable aquaculture*

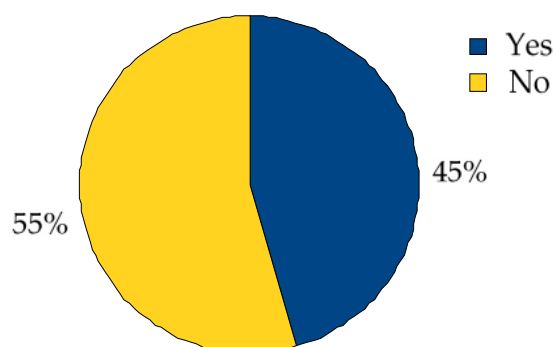
Aquaculture now accounts for over 50% of fisheries products around the Mediterranean basin. The tasks and mandate of the GFCM's Committee on Aquaculture have been reviewed in 2007 to make it more effective. Three working groups have been set up to examine 1) the sustainable development of aquaculture, 2) marketing and 3) the selection of aquaculture sites (Lomas 2007).

It is obvious that for aquaculture to be sustainable, greater rigour in risk assessments and management making use of the latest technologies, also in terms of the site's organic matter load and its biochemical composition, needs to be considered and taken up to make sure the environmental impacts are reduced to an effective minimum. Refining the monitoring techniques to include a wider encompassing set of assessments will also need to develop. Policies and legislations at both local and international level also need to focus more closely on the various types of activities, species and impacts related to this expanding business.

Various entities have devoted increasing energy and provided guidance toward improving aquaculture's mode of operation so as to minimise and eliminate its environmental impacts (IUCN 2007: FAO Report 2009). Management and enforcement of required action is urgently needed. However apart from the environmental considerations, aquaculture and more so tuna ranching have socio-economic impacts on artisanal fishing that need to be considered too.

## 5.6 Focus on current issues in Mediterranean Aquaculture – input from questionnaire replies (Question numbers 11 and 12):

Q11a) Is aquaculture a sustainable seafood resource in your Country / Mediterranean Countries? Kindly explain why? b) Which species are used for aquaculture in your Country.



**Pie Chart 10.** Illustrates % replies to question 11a on whether aquaculture is sustainable or not in their Mediterranean country.

Pie chart 10 shows a near 50/50% reply to whether aquaculture is a sustainable activity in the Mediterranean. This may reflect the various aspects that need to be considered to consider fish farming sustainable and the increasing knowledge of both the impacts and possible solutions.

### Q. 11 Extended replies:

In **Croatia**, the species which are used in (99%) aquaculture are: European seabass (*Dicentrarchus labrax*), Gilthead seabream (*Sparus aurata*), Mussel sp. (*Mytilus galloprovincialis*), and Oyster sp. (*Ostrea edulis*).

In **Cyprus**, Seafood aquaculture is a sustainable resource and shows prospects for growth. Off shore cage culture methods are used which are considered to substantially reduce environmental impacts. The farms are located in open sea, exposed mainly to south, western and eastern winds. The main advantages of the Aquaculture sector in Cyprus are the: (a) application of the offshore cage culture technology, (b) very favorable environmental conditions (clean sea, high temperatures), (c) absence of serious fish diseases, (d) existence of entrepreneurship and strong interest for investments, (e) existence of know-how and human capital and (f) Existence of relevant infrastructure and legal framework. Species used for aquaculture in Cyprus during 2008 were: Seabream- *S. aurata*; Seabass – *D. labrax*; Bluefin tuna – *T. thynnus thynnus*; Indian shrimp – *P. Indicus*; Rabbitfish – *S. rivulatus*; Pandora fish – *P. erythrinus*; Japanese seabream – *P. major*; Rainbow trout – *O. Mykiss*; Siberian sturgeon – *A. baerii*; Gold fish – *C. auratus*; Koi Carp – *C. Carpio*.

In **Egypt**, aquaculture is a rich resource. Magnitude of production has increased substantially from about 128,489mt in 1998 to 635,517mt in 2007 (GAFRD). Mullet, sea-bream and seabass and shrimp are used for

aquaculture.

In **France**, aquaculture has improved for shellfishes (mussels and oysters) but the marine fish production stays up until 2008 an experimental seafood productions. The bred fish species in aquaculture in Southern France was the European seabass (*Dicentrarchus labrax*) and Gilthead seabream (*Sparus aurata*). In France, the major problem to solve is the need of food to feed the aquacultured fish, a food that consists in main part of other fish. Marine fish of the aquaculture are all predators and need to eat others marine resources. It also lacks sites at sea to improve such activities.

Aquaculture can be a sustainable seafood resource because it is the only way to answer positively to the exponential demand in seafood products in Mediterranean areas due in particular to the large development of tourism all along the Mediterranean coasts. To-day two main problems posed by its development are the need to reduce its environmental impact (pollution and fish silage) and find solution to competition in littoral area (port infrastructures and tourism).

Fish aquaculture of certain species as seabass, sea breams, turbot, etc. is well developed in France. Oyster and mussel farming have been conducted for many generations and trout culture by private farms produce about 15 000 t/year but fish aquaculture stagnated around 4000 tons/year with less than 5% of European production for seabass and seabreams, due to the lack of sites and new enterprises. Nevertheless, France owns large technological advances in hatchery experience and export of fry to other Mediterranean countries.

According to **Friend of the Sea** aquaculture is generally of lower impact with reduced danger of escapes, good monitoring and efficient production.

In **Greece**, aquaculture does not seem to be sustainable, as it is carried out in a very intense manner, hence causing degradation and pollution in surrounding ecosystems. The two main species used in Greek aquaculture are seabream (*Sparus aurata*) and seabass (*Dicentrarchus labrax*). In Greece there are more than 250 units of marine aquaculture producing almost 120.000 tons or the 48% of the Mediterranean production and 10% of the national consumption of fresh seafood comes from aquaculture units.

According to **Greenpeace**, as long as aquaculture of carnivorous fish implies dependence on fish feed, such practice cannot be considered as sustainable. Main issues related to aquaculture in the Mediterranean include: heavy fecal and chemical pollution; habitat degradation/destruction in coastal areas; industrial/ over fishing of small pelagic fish species to feed other farmed species is only a diverted way to empty our oceans; introduction of alien species and diseases through foreign fish feed species is highly problematic for the endemic ecosystems, particularly in the Mediterranean that host 8 to 9 % of the world's marine biodiversity.

In **Israel**, sea bream, with a production of around 3000t/y represent almost all of the mariculture species. In comparison – Mediterranean catches in Israel were reported as 2,219 tons in 2006. Aquaculture accounted for over 19,000 tons of production in 2007. The major species are carp, Tilapia, grey mullet, and sea bream. Mariculture provides ca. 0.4-0.5 kg fish per capita.

In **Italy**, till today aquaculture has not managed to replace fishing due to the lower quality of the fish produced. The high culinary standard in Italy requests freshly caught fish from the wild. There is also a lack of consumer trust on aquacultured fish due to the diet these fish would be subjected to. In Italy there is lots of aquacultured fish from Greece which do not have the health quality standard checks requested from the Italian government. So much of this fish is not used due to lack of careful quality standard checks and labelling schemes to guarantee the quality and origin of the fish.

Aquaculture could be another way to involve fishermen, even if only in determined period of the year, i.e. throughout the reproduction period of target species, would reduce pressure on stocks and, at the same time, the fishermen could have another form of income. Aquaculture can be a good integrative source of sea food, especially if rules for protecting environment and fish well-being are in force. The typical and more common species are: rainbow trout (*Oncorhynchus mykiss*), sea bream (*Sparus aurata*), sea bass (*Dicentrarchus labrax*), mussel (*Mytilus* spp.) and venus (*Venus* spp.). Recently the breeding of red tuna (*Thunnus thynnus*) has been improved. Aquaculture can contribute to supplying fish proteins, but it is always necessary to assess not only the direct environmental impact, but also the indirect impact (i.e.: on the species used as food for aquaculture); furthermore, the ethical side should be also assessed (is it ethically correct to use more than 10 kg of good edible fish to create 1 kg of luxury product?). Official available data are furnished by the MiPAF (Italian Ministry for the Alimentary and Forestry Politics) [www.politicheagricole.it/default.html](http://www.politicheagricole.it/default.html)

According to **IUCN-Med.**, aquaculture is improving in the Mediterranean. The awareness of aquaculture producers regarding sustainability issues is high.

In **Lebanon**, no aquaculture industry exists. There is one small shrimp farm that produces one cycle/year according to ambient sea-water temperature.

In **Libya**, aquaculture is not sustainable, but in the Mediterranean it is economically sustainable due to the EU Funds for same country, like Greece. In Libya the species used for aquaculture include seabass, seabream and *Tilapia* spp.

In **Morocco**, The aquaculture doesn't play a big role and is still in development. The production of the aquaculture is very low.

Shell fish farming for mussels, *Ostrea* spp, and fish farming of *Tilapia* spp. and some other species. Now the INRH is developing the aquaculture for some other species like courbine and *Sparus* spp.



In **Montenegro**, in most Mediterranean Countries aquaculture is a significant seafood resource. In Montenegro aquaculture is still under development. In Montenegro the only fish species in aquaculture are sea bass and sea bream, and shellfish aquaculture contains mussels and ostra.

In **Malta**, aquaculture sustainability is believed to depend on how it is run. Unfortunately locally the seabream (*Sparus aurata*) aquaculture has affected other coastal fish due to lack of control of the management of these activities. The seabass (*Dicentrarchus labrax*) and amberjack (*Seriola dumerili*) are also used for aquaculture locally.

While aquaculture can give another small to medium scale contribution to Maltese economy, this activity has developed locally as though it can be expanded at large scale industrial levels, with limited consideration for the impacts on local coastal marine biodiversity and marine environment. The extensive development of wild caught tuna penning/ranching activities around the Maltese Islands have further impacted local marine environment with deterioration of sea water quality, production of strong pungent smells in whole areas affecting the pleasure of locals and tourists going out at sea. NGOs, such as, BICREF (Malta) have followed the development of tuna penning and its effects around the Maltese islands often reporting the increasing organic discards and load in surrounding waters. Possible impacts include the promotion of opportunistic behaviours (feeding from farm feed), spreading of disease and increasing abundance of scavenging/blooming species over typical species found around the coast.



**Photo 31:** Polluted waters close to tuna pens.



In **Spain**, OCEANA reports that at the moment the aquaculture industry cannot be considered as sustainable. Spanish aquaculture is intensively focused on species, such as, seabream (*Sparus aurata*), seabass (*Dicentrarchus labrax*) and brill (*Scophthalmus rhombus*). Eutrophication and disease expansion to wild species are only some of the major impacts.

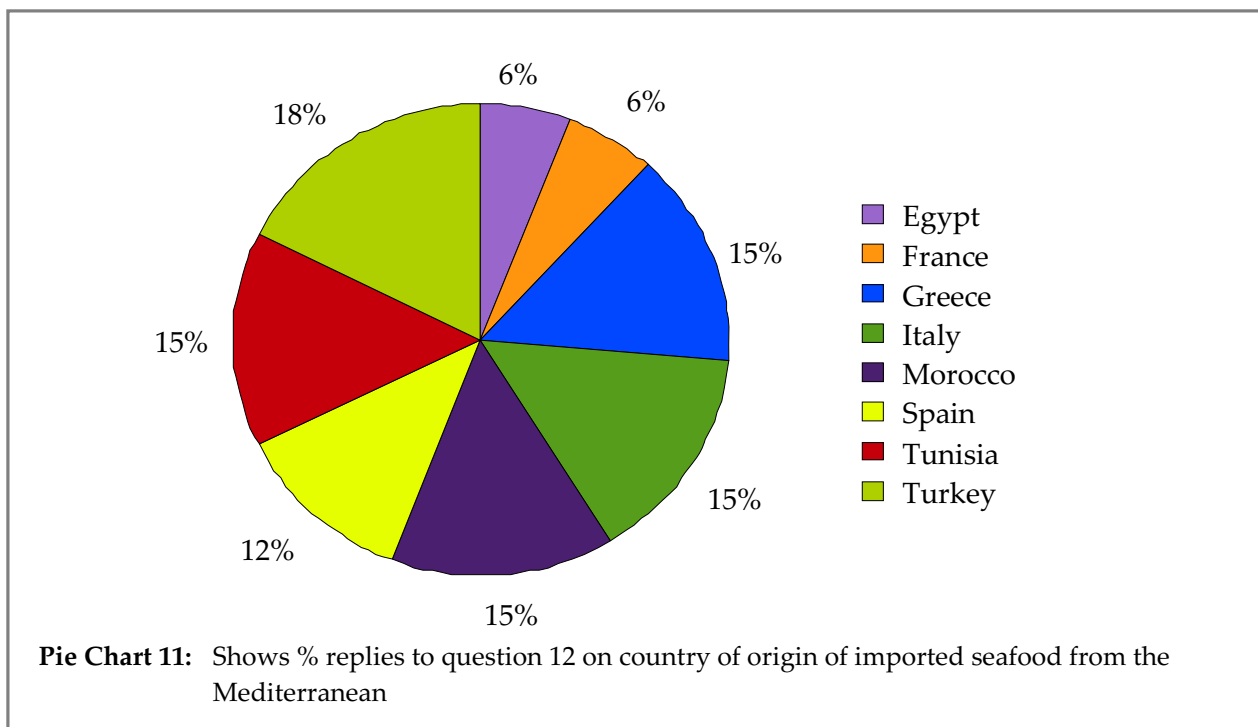
Currently there is no national regulation defining sustainable or “ecological” aquaculture parameters, but already there are some corporations working with fresh water aquaculture of sturgeon and trout developing an eco-aquaculture themselves, in a completely sustainable manner and also with a better quality of the final product. Managing eco-labelling for aquaculture products and the development and promotion of sustainable aquaculture needs to be prioritized in Spain.

In **Turkey**, aquaculture is considered as sustainable, as one can find fish the same size and in abundant numbers any seasons. This is especially so for sea bream, sea bass, and tuna.

According to a **Japanese** researcher working in the Mediterranean on blue fin tuna, tuna farming in the Mediterranean is not sustainable because it depends on natural stocks.

**Q12. Do you know if your Country imports seafood from other Mediterranean regions? If yes:**  
**a) from where? b) what types of seafood? c) what amounts?**

Pie chart 11 shows the eight main Mediterranean exporters of seafood to other Mediterranean countries, with Turkey and Morocco among the highest exporters.



**Q. 12 Extended replies:**

In **Cyprus**, imports important amounts of seafood, especially from Morocco, Tunisia and Greece. Both fresh whole fish and frozen products are imported. Amounts imported can be obtained from the Cyprus Ministry of Economy (Statistics Department).

In **Egypt**, imports from other Mediterranean countries come from Morocco, Algeria, Tunisia, Greece, Italy and Spain.

In **France**, large sharks landed at the fish market of Sète (Gulf of Lions, Hérault, France) are often exported for their consumption through out Europe and others Mediterranean countries.

France imports seafood from Spain, Italy, Morocco, Tunisia, Greece (mussels), and Turkey. In particular it imports fresh fish; crustaceans, mussels. In France the importation represented more than 1 million of tons (net weight) in 2007 (equivalent approximately to 2 millions in live weight). 60 % come from third countries. 40% are fresh fish.

It is difficult to know exactly the quantities of imported seafood. Nevertheless, the most part of importation pass often in transit from other French markets (Paris-Rungis, Boulogne/mer, etc.) by the way of fishmongers network and are not recorded by the regional office of the French customs. It is not easy to determine this level of importation by the way of the fish consumption. The difficulty is amplified by the fact that 67% of the fresh products consumed in the Mediterranean region are managed by the large scale distribution and only 15% by regional market and 13% by local fish shops. Lastly, the most part of fish landed by small scale fisheries is sold directly to the consumers and only trawl landings are sold (and registered) in local fish auctions. This situation may occur in most part of Mediterranean countries, particularly those which have two facades (as Spain, France, and Morocco).

According to the **Friend of the Sea**, in Spain, there are exports of mussels to elsewhere in Europe; exports of bluefin tuna from Italy, Spain and France to Japan; Export of seabream and seabass to Northern Europe; Swordfish to Germany, Switzerland, etc.

In **Greece**, imports amount to almost 30% of the total seafood consumed at national level. They are mainly fresh products from other Mediterranean countries, (Italy, Turkey) and frozen products from all over the world.

**Greenpeace** indicates that it is estimated that 80 to 90 % of the Bluefin tuna catch in the Mediterranean are directed to the Asian and Japanese market in particular.

In **Israel**, imported fish represents about 66% to 90% of the fish consumed. There is also a new trend (the magnitude of which is still undetermined) of importing cultured groupers (*Epinephelus aeneus*) from Egypt. Israel imports an average (last 5 years) of 39,686 tons of seafood (Ranging from invertebrates-

crabs, and shrimp, to salmon, tuna, and hake). Most of imports are from East Asia.

In **Italy** imports are from various countries: From Greece – aquacultured fish such as: seabass and seabream; From Spain, mussels; from France oysters; from Morocco, Turkey and Tunisia, sardines to be salted; From Norway, Denmark and Scotland, herring and cod.

The imports include living fish, freshly fished fish, refrigerated fished fish: sea bass (*Dicentrarchus labrax*), sea bream (*Sparus aurata*), scomber mackerels (*Scomber* spp.) and tuna (*Thunnus* spp.).

From those country, as well as other countries, Italy imports frozen seafood too: common squid (*Loligo* spp.), Octopuses (*Octopus* spp.), Cuttlefishes (*Sepia officinalis*) European filyng squid (*Illex coindetii*), Swordfish (*Xiphias gladius*), tuna (*Thunnus* spp.), sea bass (*Dicentrarchus labrax*), caramote prawn (*Penaeus* spp.), red shrimp (*Aristeus antennatus*), Norway lobster (*Nephrops norvegicus*). The import from foreign countries is about the 67% of the internal needs. Official available data are furnished by the MiPAF (Italian Ministry for the Alimentary and Forestry Politics at: [www.politicheagricole.it/default.html](http://www.politicheagricole.it/default.html)).

For **Lebanon** the following specific records are made available:

**Table 2.** Total quantity and value of landings in North Lebanon.

YEAR	CPUE (Kg/day)	TOTAL QUANTITY (TONS)	TOTAL VALUE (US\$ MILLION)
2006	24.3	3462	10.7
2007	14.85	2623	36.3

**Table 3:** Total catch and value of the top 10 commercial species in the Mohafaza of North Lebanon from January-December 2008. Source: *Marine Resources & Coastal Zone Management-University of Balamand.*

Species	Catch (Kg)	Price (US\$)	Value (US\$)
<i>Spicara maena</i>	244,783	0.83	205,482
<i>Diplodus sargus sargus</i>	209,613	4.51	946,596
<i>Siganus rivulatus</i>	188,128	4.81	905,801
<i>Pagellus erythrinus</i>	145,280	11.63	169,073
Crab	123,983	2.98	369,487
<i>Lichia amia</i>	97,720	5.36	524,320
<i>Euthynnus alletteratus</i>	85,643	1.92	164,511
<i>Siganus luridus</i>	81,654	4.82	394,192
<i>Seriola dumerili</i>	47,037	14.91	701,659
<i>Boops boops</i>	43,153	3.97	171,321

**Table 4:** Total quantity and value of imported fresh and chilled fish for 2005 (excluding fish fillets and other fish meat). *Source: Lebanese Customs, 2005 (<http://www.customs.gov.lb/>)*

Country	Imports (Kg)	Imports (US\$)
<b>Turkey</b>	<b>2,291,284.00</b>	<b>5,772,799.00</b>
<b>Egypt</b>	<b>1,061,042.00</b>	<b>2,786,150.00</b>
United Kingdom	496,887.00	3,030,980.00
Senegal	292,898.00	1,018,236.00
United Arab Emirates	182,574.00	836,471.00
Norway	181,385.00	1,103,309.00
Oman	145,131.00	628,913.00
Mauritania	132,033.00	448,732.00
<b>Tunisia</b>	<b>27,597.00</b>	<b>95,272.00</b>
India	11,520.00	39,311.00
Pakistan	10,020.00	33,333.00
Yemen	8,232.00	27,671.00
<b>France</b>	<b>4,148.00</b>	<b>79,370.00</b>
Uganda	2,270.00	9,841.00
Belgium	1,913.00	39,760.00
Ivory Coast	1,800.00	7,361.00
Netherlands	1,741.00	36,667.00
Reunion	450.00	4,716.00
<b>Libyan Arab Jamahiriya</b>	<b>345.00</b>	<b>1,127.00</b>
Japan	132.00	4,973.00
Australia	124.00	6,001.00
Canada	98.00	2,126.00

**Table 5:** Total quantity and value of imported frozen fish for 2005 (excluding fish fillets & other fish meat). *Source: Lebanese Customs, 2005 (<http://www.customs.gov.lb/>)*

Country	Imports (Kg)	Imports (US\$)
Armenia	1,947,962.00	2,373,604.00
United States	1,474,314.00	1,735,341.00
Morocco	1,419,063.00	1,089,806.00
United Arab Emirates	1,142,314.00	1,395,922.00
Argentina	960,981.00	1,169,428.00
Oman	659,331.00	638,654.00
Mauritania	555,701.00	631,797.00
India	523,228.00	530,906.00
<b>Spain</b>	<b>402,207.00</b>	<b>460,482.00</b>
Indonesia	348,852.00	280,169.00
Uruguay	250,210.00	292,802.00
Chile	104,941.00	97,938.00
South Africa	104,018.00	146,638.00
China	74,166.00	100,013.00
Netherlands	72,852.00	81,266.00
<b>Italy</b>	<b>55,999.00</b>	<b>77,864.00</b>
Sierra Leone	44,560.00	44,264.00
<b>Greece</b>	<b>40,144.00</b>	<b>56,033.00</b>
Senegal	37,017.00	38,991.00

Republic of Korea	26,285.00	31,124.00
<b>Turkey</b>	<b>25,000.00</b>	<b>34,615.00</b>
Saudi Arabia	21,000.00	14,395.00
Ireland	15,768.00	12,863.00
Pakistan	5,526.00	21,783.00
Philippines	4,250.00	48,471.00
Japan	3,169.00	42,727.00
Gabon	2,861.00	2,396.00
Yemen	2,538.00	2,762.00
New Zealand	581.00	1,500.00
Norway	407.00	3,445.00
<b>France</b>	<b>300.00</b>	<b>3,630.00</b>
Denmark	254.00	14,630.00
Bahrain	190.00	2,169.00
Sri Lanka	156.00	2,229.00
Canada	28.00	643.00
Thailand	18.00	516.00

**Morocco** is a big seafood producer and it exports seafood to European, American and Asiatic countries. However Morocco, imports in some cases a small amount of processed and conserved fish.

In **Montenegro**, most of the imported seafood products origin from Italy and Spain, which include frozen fish, shrimps and shells; canned fish; salted fish.

In **Malta**, there are imports mostly from Italy but also from other countries. Maltese fishermen are aware that in actual fact the Mediterranean Countries import from outside the Mediterranean too, such as from Peru, Argentina, New Zealand, Swordfish from Morocco and red snapper (*Lutjanus* spp.) and rockfish from Oman, Africa. Unfortunately, some of these species are sold to EU countries as though they were from the Mediterranean.

Malta imports from various countries, greater caution on the origin of marine resources needs to be put in place as this may also allow for a better appreciation of the impacts of fish economy in EU and the Mediterranean. This is the same as with forest management and conservation. It is time that technologies and techniques to cut on illegal or unreported trade are introduced for fisheries conservation reasons. The identification of fish at importation centres in EU should allow for such important checks. Molecular genetics is one accurate way of checking such species' origin through their stock identification in an accurate way while also checking the genetic health of the stocks exploited and used commercially (Vella *et al.* 2007a).

**Spain** imports seafood from: Italy (sardines, anchovies), Morocco (octopus, swordfish), Tunisia (shrimps), Turkey (seabass), or Greece (seabream and seabass). The total amount of imports entering Spain from other Mediterranean countries has been, for the year 2007 of 26,438 tonnes, and the total exported to the same countries has been around 29,000 tonnes (Eurostat). Some of this data, mainly those

regarding intra EU trade, only reflect market strategies. This is the case of Bluefin tuna trade flow among the countries, and, as an example, the well known case of Bluefin tuna export from Malta to Spain and other EU countries.

**Turkey** imports from Japan, EU countries, especially tuna, seabass and seabream (as live or processed). The amounts imported are huge and it depends on seasons and price.

## **6 Human and financial resource limitations in Mediterranean affecting fisheries**

### **6.1 Fisheries record taking and statistics improvements**

“Conservation Risk Assessment should start featuring more rigorously with the need to train and develop tomorrow’s generations of capable conservation scientist required in most sectors of maritime development. A maritime policy that would take this need in to consideration would ensure that apart from economically valid, the EU maritime activities will be in a position to consider on a daily basis the preventive measures, risks, and impacts of such activities on the marine environment to ensure local to global safe-guard of our seas. No business works without its accountant, manager/s, lawyer and work force, however business in/on a natural environment where so much has been taken for granted and for free, it is useful to consider the need of greater participation of conservation scientists to allow for the connection and understanding to be made clear and to find appropriate management strategies. Such scientists would also allow for accurate feedback on the success or not of actions and plans in every sector of maritime activities. Such emphasis on more science in planning, monitoring and management would allow for a new opportunity for work in an increasingly EU scientific community” (CBRG & BICREF 2007 pp. 3).

The diversity of sectors demanding new knowledge and technology, from coastal development to fishing technologies and gear is vast. We are still far from using our seas with minimal pollution from the increasing sounds, chemicals, lights, wastes, garbage, lost fishing gear and sinking vessels. Cleaner technologies need to be applied and kept updated constantly to improve on past methods as new knowledge develops. Rich or poor countries alike need to be able to adopt technologies and research strategies that may minimize the environmental impacts of ongoing maritime activities. Scientist capable of contributing to such technological innovation should also originate from all countries giving the right incentive to all EU members to fully participate in the EU’s drive to improvement and sustainable development. Such equality of opportunities through out Europe would promote the EU’s cutting edge of knowledge and technology, while providing jobs through out the EU member states (CBRG & BICREF 2007, pp. 4).

Equally so **regional cooperation between EU and non EU countries around a common and shared resource**, as is the Mediterranean Sea, **needs to be strengthen** and allow for effective collaborative research and management.

### **6.2 Fishermen education and communication strategies**

The Regional Advisory Council (RAC) for the Mediterranean became operational on the 15<sup>th</sup> of September 2008, thus completing the list of seven RACs that share the waters and resources exploited by



European Union Fishermen (EU Newsletter 2009). Mediterranean fishermen now have a forum in which to make their views known to the Commission and Member states, and to issue opinions and recommendations on anything related to fisheries management. The RAC includes representatives of fishermen, fish farmers, the processing industry, traders, sport fishermen, environmental organisations and consumers. **Mediterranean fishers need to be made aware** of such forum and encouraged to pass their concerns related to the status and changes of the sea and fisheries they operate on.

### **6.3 Fishing observers and enforcement: combating illegal activities**

Ultimately, it will be the **improvements in legal provisions, the documentation and inspection regimes, and the sanctioning regimes put in place that will determine success** in this domain. On the question about the availability of sufficiently qualified personnel, a similarly mitigated picture emerges. Many countries do not have enough personnel at hand to generate sufficient knowledge to manage fisheries in a way that is based on best knowledge, and would guarantee responsible and sustainable management outcomes. This finding goes hand in hand with earlier findings on the relatively low number of fisheries managed on the basis of comprehensive fisheries management plans. It is an indication of the fact that, globally, not enough resources are being made available to train staff, and to recruit technically competent staff into fisheries research structures. In a host of developing countries, dedicated fisheries research facilities are a lack altogether – while overall fisheries research funding is insufficient in many other places. In other instances yet, competent technicians do exist at the national level, but civil service salary scales are so unattractive that retaining competent staff in key positions often proves elusive. Hosch, G. - FAO (2009 pp. 36)

### **6.4 Fisheries research on fishing technologies and methods**

The information available on various aspects of marine resources is often missing, particularly in population dynamics and the biological cycle; **this lack of information has a negative influence on the quality of stock assessments and consequently on the measures taken in fisheries management.** In order to achieve the objectives of resource conservation and sustainable management, a better coordination of research is needed, to be achieved through a close integration of the regional and sub-regional research networks and the establishment of integrated management plans together with accompanying measures, such as the creation of protected marine areas and the strengthening of North and South Mediterranean cooperation but also between the southern regions themselves (Berraho 2008).

*Need to imply varied research sectors and fishermen*

Not only must research be coordinated, but also out-right encouraged in the Mediterranean region through the involvement of various research sectors from both non-government academic institutions and government institutions so as to encourage a transparent and critical dialogue on the results obtained and the management proposed. So while on the one hand it may be proposed that diversity of research

entities entrusted with fisheries research is a constraint that prevents collaboration (Berraho 2008), proposing the exclusive right for such research to government institutions or regional bodies may limit the required exchange of ideas, results and best practice in this field. So much more research is required to deal with the variety of resources and factors affecting the future of the Mediterranean, that we should not limit entities able to undertake such necessary research but make sure that all research and support for such research is widespread and integrated to allow. This would allow the implementation of the best fisheries research in fisheries management for sustainable use. The involvement of fishermen, themselves in participation and assistance to research and the development of national expertise within and outside government institutions, in the fisheries sector of each Mediterranean country, should be a priority, while allowing for exchange of regional expertise until this national requirement is reached.

#### *Standardization of research methods*

While standardization of research methods would be useful for comparative work and outputs, creativity and innovation are essential in the fisheries research area, especially taking into account the conditions found in the different regions of the Mediterranean. Research that encompasses and integrate the economic, social, and biological aspects of Mediterranean fisheries will need to be considered, as part of the conservation and sustainable development required by the whole region.

Leadership in sustainable maritime development at European level has to depend on rigorous and up-to-date information gathered by scientists in all fields of maritime activities in collaboration with businesses and authorities with an emphasis on the natural environment, its biodiversity and ecosystem's requirements. This is no easy task and will not be possible without the full encouragement and involvement of all experts available at local level collaborating at EU level too. Leadership in sustainable maritime management can only be attained through leadership in scientific research including conservation science and environmental technology working to improve the many methods which proved to have failed in the ongoing over-exploitation of marine resources and pollution of European seas, including the Mediterranean Sea (CBRG & BICREF 2007 pp. 3).

### **6.5 Fisheries policies promoting and protecting artisanal and sustainable fishing**

If there is to be a future in maritime industries without jeopardizing the same seas we depend on so closely, **it is imperative to change course toward a really environmentally sustainable development.**

#### *EU maritime policy*

The EU maritime policy may be the means toward this necessary process. The essential contributions of the local and regional to EU and Global actions cannot be underestimated. Integration would make sure that valid all-encompassing regulations may assist the unification of EU activities, while recognizing the

different local requirements in research, monitoring and actions in full respect of the diversity of conditions found in every country and sea. The conservation of marine biodiversity at genetic, species and ecosystem levels, with particular consideration of endemic and threatened populations, must be a priority in all EU countries (CBRG & BICREF 2007, pp. 2). The maritime policy needs to be based on fair and effective EU regulations derived from knowledge, caution, and environmental sustainability. This policy would need to surmount the difficulties of integrating the maritime policy with other EU policies and involve non-EU countries in striving toward common goals. The higher considerations of and assistance to small island member states, increasingly faced with many more maritime issues and problems, need to be addressed in such an EU policy. Conservation and marine science needs to be developed further throughout the EU toward preparing the necessary scientific expertise making sustainable development research, monitoring, reporting, guidance and management possible and durable (CBRG & BICREF 2007, pp. 2).

#### *Conflicts on coastal occupation*

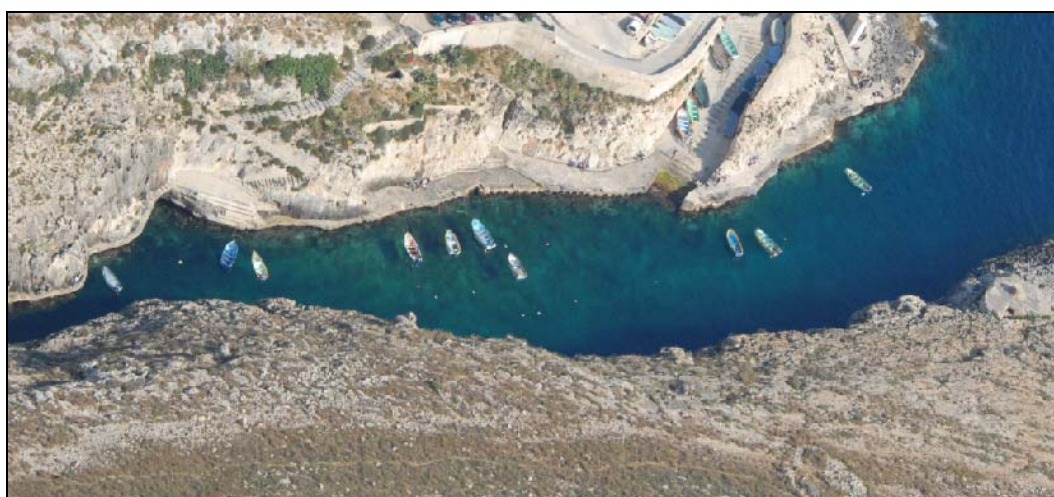
Coasts are increasingly becoming congested, and heavily utilized a problem clearly seen in small Island States, such as the Maltese Islands, and in many countries around the Mediterranean Sea. These fragile ecosystems have had to withstand various tribulations with relatively little conservation practice strictly in place to make sure that indeed the coasts can continue to offer diversity of income, leisure, beauty and natural life forms in years to come. Research and experts on the various local coastal needs is clear in EU member states so as to offer the much needed information on the changes and threats to these sites in the face of increasing tourism, human coastal development, changing water levels and climate, over-exploitation and risks of small to large pollution episodes. Technologies need to be applied efficiently in the maritime surveillance and monitoring work. Data should be local but also shared in an integrated effort to unify systems while allowing issues to be dealt with locally as much as at regional or EU level when required. Long-term research and monitoring has to be emphasized and funded so as to obtain the much needed scientific data to follow and understand the complex dynamic changes of the marine environment and life forms inhabit it (CBRG & BICREF 2007, pp.6).

#### *Spatial planning and resource sharing*

Spatial planning should keep in mind the individual countries' needs but also optimize the resource sharing and sustainable use or exploitation for the region. The sea has a three dimensional aspect to planning which increasingly needs to be addressed. More and more research and data will be required on the physical and biological setting and dynamics of these parameters before we may fully be capable of planning all the various ongoing human and marine events, including the conservation needs of already threaten marine species (CBRG & BICREF 2007, pp. 6).

The research project on International Action for Sustainability of the Mediterranean and Black Sea

environment (IASON) between 2002 and 2006 assessed the projected socio-economic impact of the various hazards and threats on the Stability/sustainability of the System. Over-fishing has two clear and dominant impacts: these are loss of income and lack of employment for fishermen. Consequently an increase in price of fish to consumers is noticed. There was one dominant driver for this issue, which was not the lack of regulation, nor the need for better-designed regulations but the lack of enforcement of existing regulation which produces poor compliance. The most effective responses to this problem were identified as more efficient regulation to control fishing effort and improved assessment using the ecosystem approach.



**Photo 32:** A fishing village in Malta that has increasingly depended on tourism.

#### *Existing global agreements*

There are a number of existing global agreements, such as the FAO Code of Conduct for Responsible Fisheries (1999) and the UNCLOS Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (2001) but the majority of states in the region have not signed up to either of them. There is clearly a need to encourage all states to sign up to and ratify (and subsequently enforce) these agreements. There are some international efforts to tackle specific problems. For example the International Convention on the Conservation of Atlantic Tuna (ICCAT) was established in 1966 to manage, amongst other species, Blue Fin Tuna fisheries but there is growing evidence that stocks are now on the brink of collapse. This is yet another example of the problems endemic in fisheries management – inaccurate estimate of stocks, management complacency and weak enforcement of controls. Other responses include establishing protected areas, which should be addressed following the WSSD, and influencing consumer demand through education using eco-labelling something that is frequently achieved through a coalition between environmental groups and retailers. However, given the underdeveloped nature of both of these sectors in many countries in the Mediterranean and Black sea regions this type of intervention is unlikely to be of

short-term significance (IASON 2006a).

The expansion of aquaculture to feed the growing demand in the region is not seen as a solution but more of an exacerbation of the problem as it invariably involves unsustainable harvesting of feedstock fish, which is inefficient and associated with the ecological problems of fishing down the food chain. This issue provides more justification for adopting the ecosystem approach to fisheries management (IASON 2006a).

*EU actions for sustainable fishing/aquaculture*

EU is working toward **improvements for fishermen at work in health and safety** aspects that may also require assistance to fishermen to increase their boat size above 15 metres so as to take on board such practice. Indeed a report of the Commission on the practical implementation of the provisions of the Directive 93/103/EC concerning the minimum safety and health requirements for work on board fishing vessels was adopted in 2008. However such measures may at the same time be increasing the fishing capacity and efficiency unless surveillance of fishing activities by such up-graded vessels is not also in place. At the same time EU indicates that efforts to achieve capacity reduction and the conservation and restoration of fish stocks must go hand in hand with improving the social well-being of those active in the fishing sector (EU-CSWD 2007).

Implementation of a **policy to progressively eliminate discards in European fisheries** in order to avoid having to dump overboard dead, unwanted fish caught as by-catch is a serious issue that needs to be addressed as a priority by the Common Fisheries Policy. In its Communication of March 2007 (COM(2007) 136 final), the Commission set out the principles of a policy for the progressive elimination of discards.

According to EU (2007) Fisheries management must take into account the welfare of coastal communities, the marine environment and the interaction of fishing with other activities. The recovery of fish stocks will be energetically pursued, requiring sound scientific information and reinforcement of the shift to multi-annual planning. **The Commission will take action to ensure that the Common Fisheries Policy reflect the ecosystem-based approach of the Strategy for the Marine Environment, and will work to eliminate Illegal, Unreported and Unregulated fishing in its waters and on the high seas.** Managing fish stocks at Maximum Sustainable Yields will provide a better future for the European fishing community and ensure its contribution to Europe's food security this should be achieved by 2015 in line with international commitments (COM(2007) 575 final). In the list of actions the commission is targeting, one also finds the promotion of the development of an environmentally safe aquaculture industry in Europe. All these policies and measures should assist in moving toward a more sustainable fishing in Europe, including the Mediterranean, if coordinated efforts are found through out the Mediterranean.

The commission and the court of Auditors have observed that national catch registration, control and

inspection systems leave a lot to be desired. Basic data are incomplete and unreliable and vary between the member states, which makes it impossible to ensure a fair and effective control and sanctions policy EU Newsletter (2009).

WWF news (2008) reported that every year in December, European Fisheries Ministers meet to decide how much fishers can catch the following year. Quotas, however, do not include the amount of fish which are caught in nets and then discarded.. This happens when fishermen catch fish for which they don't have a quota, or when they have already reached their quota. Sometimes they get rid off less valuable but healthy and marketable fish to provide storage for bigger specimens..

“Europe's Fisheries Ministers and the EU Commission have presided over a systematic failure in fisheries management. If they want to be serious about ensuring a prosperous and sustainable fishery for Europe, they should get around to dealing with the large amount of discards. The next years, with the preparation of the Common Fisheries Policy reform, they have a chance to end the failure.” says Aaron McLoughlin, Head of the European Marine Programme at WWF.

Irresponsible fishing practices and lack of controls have produced in the last year records of discard rates. Despite the EU commitment last year to reduce discards to 10%, scientists report that by the end of 2008 discard rates will be even higher than last year.

The paper by Grafton (2005) draws upon a rich literature to show that social networks help determine levels of trust and co-operation in society, and have a major impact on outcomes in fisheries. In particular, social connections in the form of ‘strong ties’ within communities, ‘weak ties’ across communities and links between fishers and the regulator are important in ensuring successful fisheries management outcomes. The significance of social capital is particularly relevant to fisheries governance and to related issues of co-management and rights and responsibilities. Actual management practices will, and should, differ across fisheries, but the basic conclusion is that social capital can be nurtured by providing fishers and their communities with both rights and responsibilities to improve management outcomes. Better fisheries outcomes, at lower overall management cost, require explicit consideration of social capital and social networks within and across fishery stakeholders. It also demands a redirection in priorities and funding away from ‘top-down’ fisheries management towards ‘co-management’ where fishers have both rights and responsibilities to be effective partners in ensuring sustainable fisheries.

## **6.6. Fisheries policies and strategies to educate and inform the consumer**

Without doubt a really new and innovative maritime policy that sets the track line to sustainable development in the maritime field will need a strong financial support due to the demand on information, education, training, research and changes required. Using the media and both formal and informal education to reach to the public needs to focus on our maritime heritage, marine biodiversity, and

marine economies working hand in hand for a better maritime future. These educational programs should be encouraged in every EU member country to include local and regional activities, such as in the Mediterranean, in order to make each EU citizen closely identify and understand how indeed things can improve from a local to global level. The vital contribution of independent NGOs that work at the local or regional level can also be useful human resources toward this effort (CBRG & BICREF 2007 pp. 7).

The EU Commission will further explore options for a more comprehensive approach to the future of fishing communities, including the development of local labelling initiatives. In addition, a working document should have been published on the potential role of fishers as *Guardians of the Sea*, performing environmental and other services to the community, in 2008 (EU-CSWD 2007), however such a document is not available till now. As EU Mediterranean fishers are encouraged and directed to more sustainable management and environmental responsibilities, equal requirements will be needed from non EU Mediterranean countries in order to allow for effective cooperation in the whole region.

Other entities, such as the Regional Activity Centre for Cleaner Production (CP/RAC) in collaboration with the centre for research and information on consumption (CRIC) have also produced an educational publication to educate consumers on fisheries and conscientious fish consumption (RACCP-CRIC 2008). Mediterranean seafood sustainable use needs the implementation of eco-labelling schemes and consumer information and awareness projects, such as MSC and Slowfood.



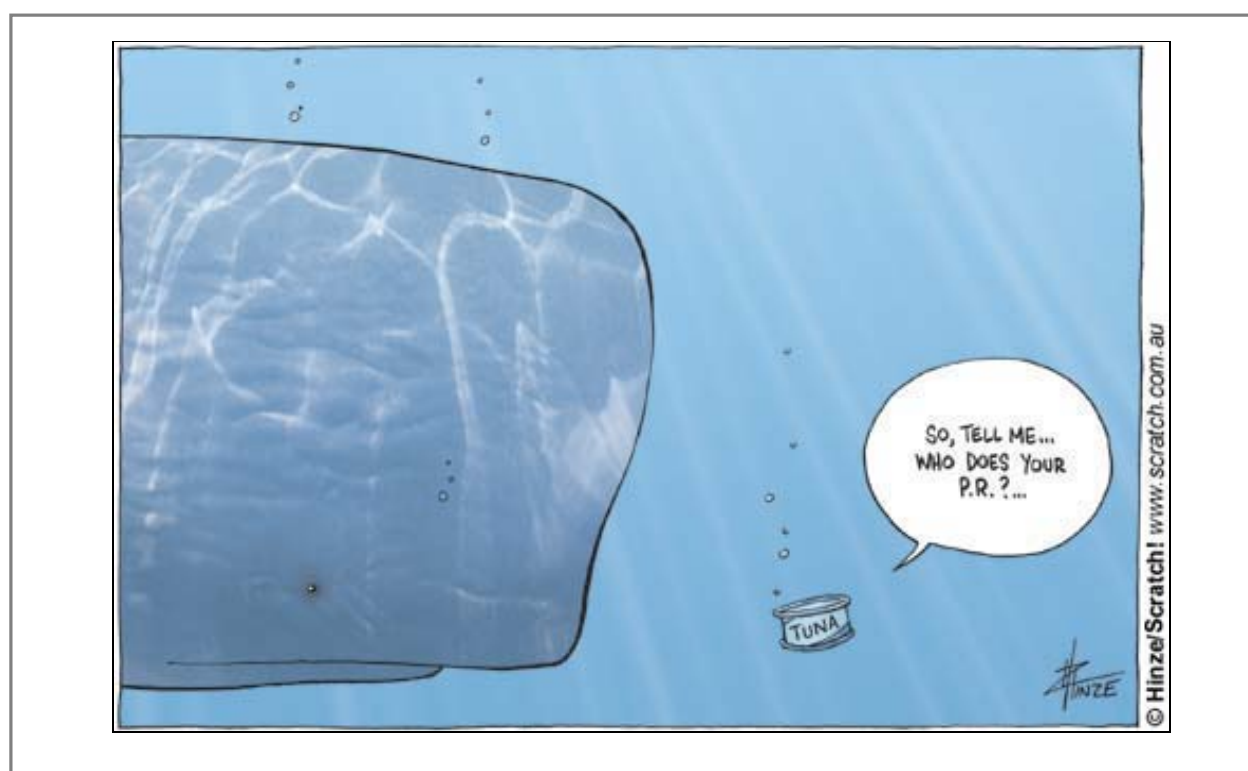
## **7. Conclusions**

Over-fishing and marine habitat damage has generated a global crisis in the production of seafood. In order to respond to this crisis we need systems for the management of seafood production and consumption that will comprehensively reduce and eventually eliminate wastefulness in both capture fisheries and aquaculture systems. Thirteen papers addressing these issues have been recently published in a special issue of the *Journal of Cleaner Production* (2009), with focuses on: seafood harvesting practices, fish processing, life cycle assessment, eco-efficiency, management of wastes, seafood distribution and consumption, total energy costs, eco-labelling, and the conservation of resources and biodiversity. Ayer, Côté, Tyedmers and Willison (2009) conclude that major changes are required in our approaches to the management of both the marine environment and our seafood capture and production systems. It also concludes that steps have been taken in this direction, but there is still far to go. Similar warnings come from UNEP's rapid assessment reports (UNEP 2008; 2009). Such realisation of the urgent need to solve problems procured by many years of inappropriate action, highlights the increasing world-wide agreement that mankind cannot post-pone adequate and effective actions toward the conservation and sustainable use of natural resources.

The questionnaire results obtained for this report indicate diversity in the fisheries status record keeping, assessments, research, consumer information, awareness and management across the Mediterranean region. However many contributors clearly indicated that there is a need to change unsustainable fishing methods, to allow for required regeneration of fisheries and marine habitats. Equally relevant is the need to increase awareness through accurate information and advice to consumers, fishers and traders to achieve sustainable consumption and production. The greater knowledge and awareness of the synergistic impact of anthropogenic activities on land and at sea on marine biodiversity and natural resources also need to be effectively addressed.

Technological advancements shed hope in our better understanding of the problems and in the discovery of methods to solve these. However to achieve this throughout the Mediterranean region would need putting in place serious strategies for research and assessment of fisheries status and the implementation of actions to promote recovery, conservation and environmentally sustainable production and consumption. The apparent inadequacy of operation of ICCAT and GFCM, highlighted by the continued depleting marine resources in the Mediterranean, must be addressed through renewed modes of operation and prioritization. The involvement of various other entities operating at national, regional and European level is to be improved to maximize on the increasing wealth of knowledge in various disciplines that are to be integrated for effective sustainable fisheries production and marine conservation in the Mediterranean. This necessity is increasingly being felt with changes due to climate change and other changes caused by anthropogenic activities concurrently affecting marine ecosystems and biodiversity.

The diversity between Mediterranean states which reflects on diversity in the levels of sustainable development in the region, needs to be eliminated through a unified and focused improvement in the fisheries and trading sector. At the same time it is essential to protect, respect and encourage the diversity of cultural and natural heritage that are to be considered within the strategies put in place for sustainable development in each state and in the whole region. Greater participation and consideration of fishers, scientific researchers and NGOs working on marine conservation are required. Fisheries politics and management increasingly need to depend on accurate environmental economic and biological assessments, while strongly putting in place effective governance to increase the responsibilities, duties and rights of those taking up the profession of exploiting Mediterranean marine resources in sustainable manner. Mediterranean fishermen, traders, NGOs, governments and consumers need to be united in their goal to act as Guardians of this Sea for future generations.



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## **Annex 1**

### **List of Contributors to the Mediterranean Fisheries Questionnaire & Report**

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## **Annex 2:**

### **Questionnaire used**

#### **Study on the Fisheries statistics, Seafood Consumer statistics and Measures for Sustainable Use of Marine Resources from the Mediterranean Sea**

1. How is your research/institution involved in fisheries or marine resource sector of your Country or of the Mediterranean? And For how many years has it been involved in this sector?
2. Do you feel enough information is collected by your Country and Mediterranean Countries on the catch statistics of fisheries to assist with suitable management of marine resources?
3. List the references or resources available that officially report catch statistics in the most reliable/accurate manner. Include a list websites or published reports as well.
4. From your experience which fisheries target species or sector may suffer from lack of appropriate management in your Country?
5. Are there possible improvements to the current status of affairs in the fisheries sector in your Country toward increasing the sustainability of fisheries.
6.
  - a) Are artisanal fisheries still encouraged or discouraged in your Country?
  - b) What is your opinion on the future of artisanal fisheries in your Country?
  - c) Do artisanal fisheries allow for more or less sustainable fisheries in the your region?
7. Is seafood highly valued in your country? How can you tell this? Is there any report or assessment of this in your Country?
8. Are local fisheries and the seafood market high in Economic Status/Income in your Country?
9. Is there any way in which the local consumer is given information on the local / Mediterranean seafood it purchases? Such as area of origin, method of capture, date of capture, and whether it is part of sustainable fisheries schemes?
10. Which Fisheries in the Mediterranean seem to be:
  - a) the least problematic (controlled catches and sustainable fishing methods used), explain and
  - b) the most problematic (uncontrolled and unsustainable fishing methods used), explain.
11.
  - a) Is aquaculture a sustainable seafood resource in your Country / Mediterranean Countries? Kindly explain why?
  - b) Which species are used for aquaculture in your Country.
12. Do you know if your Country imports seafood from other Mediterranean regions? If yes:
  - a) from where?
  - b) what types of seafood?
  - c) what amounts?



**Annex 3:****List of websites of interest**

ACCOBAMS	<a href="http://www.accobams.org">www.accobams.org</a>
CBD	<a href="http://www.cbd.int">www.cbd.int</a>
CIESM	<a href="http://www.ciesm.org">www.ciesm.org</a>
CIHEAM	<a href="http://www.ciheam.org">www.ciheam.org</a>
Defra - Marine	<a href="http://www.defra.gov.uk/marine">www.defra.gov.uk/marine</a>
EU fisheries	<a href="http://ec.europa.eu/fisheries/index_en.htm">ec.europa.eu/fisheries/index_en.htm</a>
FAO	<a href="http://www.fao.org">www.fao.org</a>
Forum for the Future'	<a href="http://www.forumforthefuture.org.uk/docs/publications/217/fishgood.pdf">www.forumforthefuture.org.uk/docs/publications/217/fishgood.pdf</a>
Friend of the Sea	<a href="http://www.friendofthesea.org">www.friendofthesea.org</a>
GFCM	<a href="http://www.gfcm.org/gfcm">www.gfcm.org/gfcm</a>
Globefish	<a href="http://www.globefish.org">www.globefish.org</a>
Greenpeace's 'Defending Our Oceans' campaign	<a href="http://oceans.greenpeace.org/en/our-oceans">oceans.greenpeace.org/en/our-oceans</a>
ICCAT	<a href="http://www.iccat.int/en">www.iccat.int/en</a>
IUCN	<a href="http://www.iucn.org">www.iucn.org</a>
MarBEF	<a href="http://www.marbef.org">www.marbef.org</a>
Marine Stewardship Council	<a href="http://www.msc.org">www.msc.org</a>
Marine Stewardship Council	<a href="http://www.msc.org">www.msc.org</a>
Millennium Ecosystem Assessment	<a href="http://www.maweb.org/en/index.aspx">www.maweb.org/en/index.aspx</a>
OCEANA	<a href="http://www.oceana.org">www.oceana.org</a>
One Planet Living: (WWF)	<a href="http://www.oneplanetliving.org">www.oneplanetliving.org</a>
Rac-Spa	<a href="http://www.rac-spa.org">www.rac-spa.org</a>
Regional Activity Centre for Cleaner Production	<a href="http://www.cprac.org">www.cprac.org</a>
Sea Around Us Project	<a href="http://www.seaaroundus.org">www.seaaroundus.org</a>
Seachoice	<a href="http://www.seachoice.org">www.seachoice.org</a>
Seafood Choices	<a href="http://www.seafoodchoices.org">www.seafoodchoices.org</a>
Slowfood	<a href="http://www.slowfood.com">www.slowfood.com</a>
Sustain	<a href="http://www.sustainweb.org">www.sustainweb.org</a>
The Environmental Justice Foundation's	<a href="http://www.ejfoundation.org">www.ejfoundation.org</a>
The Marine Conservation Society	<a href="http://www.fishonline.org">www.fishonline.org</a>
The Seafood Choices Alliance	<a href="http://www.seafoodchoices.com">www.seafoodchoices.com</a>
UNEP	<a href="http://www.unepmap.org">www.unepmap.org</a>
World Wide Fund (WWF)	<a href="http://www.wwf.org.uk/researcher/issues/livingseas/0000000020.asp">www.wwf.org.uk/researcher/issues/livingseas/0000000020.asp</a>
Nature's marine programme: Worldwatch	<a href="http://www.worldwatch.org">www.worldwatch.org</a>



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