



MedFisis

Fishery Statistics and
Information System in
the Mediterranean

Sustainable Fisheries Policies and Strategies in the
Eastern Mediterranean – EastMed Formulation and
Preparatory Phase GCP/INT/989/ITA

Brief introduction to the Eastern Mediterranean fisheries sector

MedFisis Technical Document No. 6

GCP/INT/918/EC - TCP/INT/2904 - GCP/INT/989/ITA



Brief introduction to the Eastern Mediterranean fisheries sector



**F. Martin, M. Barone, C. Bizsel, S. Fayed,
N. Hadjistephanou, I. Krouma, S. Majdalani, A. Özdemir,
A. Salem, L. Vassiliades**

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

F. Marttin, M. Barone, C. Bizsel, S. Fayed, N. Hadjistephanou, I. Krouma, S. Majdalani, A. Özdemir, A. Salem, L. Vassiliades, 2006. Brief introduction to the Eastern Mediterranean fisheries sector. GCP/INT/918/EC - TCP/INT/2904/TD-6. MedFisis Technical Document No. 6

Abstract:

The document describes the status of the Eastern Mediterranean fishery statistics and information systems in Eastern Mediterranean countries participating in the MedFisis TCP project (Cyprus, Egypt, Lebanon, Syria, and Turkey) in November 2003.

A general description of the countries is given, with special emphases on the status of their fisheries sector, the national data collection system and the set-up of fisheries institutions in the countries.

The characteristics of the Mediterranean and specially the Eastern Mediterranean are discussed, including total production figures of the five participating countries. The phenomenon of Lessepsian migration is introduced, and the life history parameters of species identified as priority species by the GFCM are included.

I Glossary

a intercept of ordinary regression

AdriaMed Project: Scientific cooperation to support responsible fisheries in the Adriatic Sea

b slope of ordinary regression

CopeMed Project: Advice, technical support and establishment of cooperation networks to facilitate coordination to support fisheries management in the Western and Central Mediterranean

CPUE Catch Per Unit of Effort is the amount of catch that is taken per unit of fishing effort (e.g., number of fish per long line hook-months). (UN, 2005b)

DFMR Department of Fisheries and Marine Research of the Ministry of Agriculture, Natural Resources, and Environment, Cyprus

DOALOS Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations

EC European Commission

E Instantaneous rate of fishing mortality (time^{-1})

FAO Food and Agriculture Organization of the United Nations

FIDI Fishery Data, Information and Statistics Unit of the Fishery Department of the Food and Agriculture Organization of the United Nations

GAFRD General Authority for Fish Resources Development, Ministry of Agriculture and Land Reclamation, Egypt

GDP Gross Domestic Product at market prices is the sum of the gross values added of all resident producers at market prices, plus taxes less subsidies on imports. (UN, 1993)

GFCM General Fisheries Commission for the Mediterranean is the regional fisheries body for the Mediterranean Sea and the Black Sea.

GFCM Area. Major fishing area 37, consisting of the Mediterranean Sea and the Black Sea, FAO major fishing area map (FAO, 2006).

GNI Gross National Income is GDP less net taxes on production and imports, less compensation of employees and property income payable to the rest of the world, plus the corresponding items receivable from the rest of the world (in other words, GDP less primary incomes payable to non-resident units plus primary incomes receivable from non-resident units); an alternative approach to measuring GNI at market prices is as the aggregate value of the balances of gross primary incomes for all sectors; (note that GNI is identical to gross national product (GNP) as previously used in national accounts generally). (UN, 1993)

ICCAT International Commission for the Conservation of Atlantic Tunas

Income group: World Bank classification of national economies: Economies are divided according to 2003 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, \$765 or less; lower middle income, \$766 -

\$3,035; upper middle income, \$3,036 - \$9,385; and high income, \$9,386 or more (World Bank, 2004a)

LOA Length OverAll (length of vessel)

M Instantaneous rate of natural mortality (time^{-1})

MARA Ministry of Agriculture and Rural Affairs, Turkey

MAAR Ministry of Agriculture and Agrarian Reform, Syria

MedFisis Project: Mediterranean Fishery Statistics and Information System

MedSudMed Project: Assessment and Monitoring of the Fishery Resources and the Ecosystems in the Straits of Sicily

nei not elsewhere included

SAC Scientific Advisory Committee to the General Fisheries Commission for the Mediterranean.

SCSA Sub-Committee for Stock Assessment of the Scientific Advisory Committee of the General Fisheries Commission for the Mediterranean Sea.

TCP Technical Cooperation Programme. The Technical Cooperation Programme supports the FAO Member Nations through small projects which address specific problems in the agriculture, fisheries and forestry sectors making the FAO's specialized competence more readily available to member countries.

UN United Nations

UNCLOS United Nations Convention on the Law of the Sea of 10 December 1982.

VBGF Von Bertalanffy Growth Function, used to describe the growth in length and weight of fish.

Z Instantaneous rate of total mortality (time^{-1})

II Table of Contents

I	Glossary.....	5
II	Table of Contents.....	7
III	Table of Figures	9
IV	Table of Tables	10
1	Introduction	12
2	Rationale for the MedFisis project.....	12
2.1	The General Fisheries Commission for the Mediterranean (GFCM).....	12
2.2	Participation in MedFisis by Eastern Mediterranean countries	13
2.3	Objectives of the MedFisis project.....	13
3	Country overviews.....	14
3.1	The Republic of Cyprus	14
3.1.1	Geography.....	14
3.1.2	Population	14
3.1.3	Fisheries.....	14
3.1.4	Marine fishery sector	17
3.1.5	Fishery administration	20
3.1.6	National data collection and information system	23
3.2	The Arab Republic of Egypt.....	29
3.2.1	Geography.....	29
3.2.2	Population	29
3.2.3	Fisheries.....	29
3.2.4	Fishery administration	32
3.2.5	National data collection and information system	34
3.3	The Lebanese Republic.....	35
3.3.1	Geography.....	35
3.3.2	Population	35
3.3.3	Fisheries.....	35
3.3.4	Fisheries administration	38
3.4	The Syrian Arab Republic.....	40
3.4.1	Geography.....	40
3.4.2	Population	40
3.4.3	Fisheries.....	40
3.4.4	Fishery administration	44
3.4.5	Fishery statistical system.....	45

3.5	The Republic of Turkey.....	46
3.5.1	Geography.....	46
3.5.2	History	46
3.5.3	Population	46
3.5.4	Fisheries.....	46
3.5.5	Fisheries administration	53
4	The Eastern Mediterranean Sea	56
4.1	Description.....	56
4.2	Fisheries	58
4.3	Fishery products consumption.....	63
4.4	Fishery statistics indicators.....	64
4.5	Life history parameters of GFCM priority species in the Eastern Mediterranean.....	65
4.6	Lessepsian migration.....	72
4.6.1	Definition	72
4.6.2	Description	72
4.6.3	Barriers.....	72
4.6.4	Effects on the fisheries in the Eastern Mediterranean.....	73
4.7	Status of data collection and data processing system	74
5	References.....	75

III Table of Figures

Figure 1	The Republic of Cyprus marine capture fisheries production (Fishstat, 2005)	15
Figure 2	Important species (-groups) the Republic of Cyprus marine capture fisheries (Fishstat, 2005)	17
Figure 3	Organigram Cypriot Department of Fisheries and Marine Research	22
Figure 4	Egypt marine capture fisheries production.....	30
Figure 5	Important species (-groups) Egypt marine capture fisheries.....	31
Figure 6	Organigram Egyptian Ministry of Agriculture and Land Reclamation, GAFRD	33
Figure 7	Staffing in GAFRD offices in Cairo and in the field	33
Figure 8	Lebanon marine capture fisheries production (GFCM area).....	36
Figure 9	Important species (-groups) Lebanon marine capture fisheries	37
Figure 10	Organigram Lebanese Ministry of Agriculture dealing with marine capture fisheries	38
Figure 11	Syrian marine capture fisheries production (GFCM area).....	42
Figure 12	Important species (-groups) Syria marine capture fisheries.....	43
Figure 13	Organigram Syrian Ministry of Agriculture and Agrarian Reform dealing with marine capture fisheries	44
Figure 14	Turkey marine capture fisheries production (GFCM area) distribution.....	47
Figure 15	Turkey marine capture fisheries production (GFCM area).....	48
Figure 16	Important species (-groups) Turkey marine capture fisheries production (GFCM area).....	49
Figure 17	Turkey marine capture fisheries production (GFCM area) (excluding Black Sea)	49
Figure 18	Important species (-groups) Turkey (excluding Black Sea)	50
Figure 19	Administration Turkish fisheries	55
Figure 20	Areas having similar numbers of species (Garibaldi and Caddy, 1998)....	56
Figure 21	Nine major faunal provinces suggested by examination of richness in species and dissimilarity indices (Garibaldi and Caddy, 1998)	57
Figure 22	Total marine capture production GFCM area (except Black Sea) (Fishstat, 2005)	58
Figure 23	Important species (-groups) in the Eastern Mediterranean Sea 1	59
Figure 24	Important species (-groups) in the Eastern Mediterranean Sea 2	60
Figure 25	Capture production distribution Eastern Mediterranean (except Black Sea)	62

IV Table of Tables

Table 1	The Republic of Cyprus marine capture fisheries production 2003, GFCM area (Fishstat, 2005).....	15
Table 2	Inshore fishery production and fishing effort (1994 - 2003) (Hadjistephanou and Vassiladis, 2004)	18
Table 3	Trawl fishery production and fishing effort in Cypriot waters (1994 - 2003) (Hadjistephanou and Vassiladis, 2004)	19
Table 4	Trawl fishery production and fishing effort in international waters (1994 - 2003) (Hadjistephanou and Vassiladis, 2004)	19
Table 5	Multipurpose fishery production and fishing effort (1994 - 2003) (Hadjistephanou and Vassiladis, 2004)	20
Table 6	List of tables in Annual Statistics Report of the DFMR (Hadjistephanou and Vassiliades, 2004)	24
Table 7	Egypt marine capture production 2003, GFCM area (Fishstat, GFCM capture production dataset)	31
Table 8	Lebanon marine capture production 2003, GFCM area (Fishstat, GFCM capture production dataset)	37
Table 9	Centres of the local Rural Development Department in four governorates dealing with fisheries	39
Table 10	Centres managed and supported by the Department of Fisheries and Wildlife in Beirut	39
Table 11	Syria marine capture production 2003, GFCM area (Fishstat, GFCM capture production dataset)	42
Table 12	Turkey marine capture production 2003, GFCM area (Fishstat, GFCM capture production dataset)	51
Table 13	Distribution of the Turkish fishing fleet	52
Table 14	Fisheries characteristics Eastern Mediterranean countries	57
Table 15	Socio-economic indicators for the countries in the Eastern Mediterranean	58
Table 16	Mediterranean capture production in 2002 by Cyprus, Egypt, Lebanon, Syria, and Turkey from the GFCM area, except the Black Sea (Fishstat, GFCM capture production dataset).....	60
Table 17	Percentages of landings identified to species level.....	63
Table 18	Fishery products usage overview	64
Table 19	Eastern Mediterranean fishery statistics indicators.....	64
Table 20	Tentative list of GFCM priority species	65
Table 21	Length-Weight relationships of GFCM priority species in countries participating in the MedFisis TCP-project	67
Table 22	Von Betalanffy Growth Function parameters for GFCM priority species in countries participating in the MedFisis TCP-project.....	68

Table 23	Mortality and yield per recruit values for four commercial species in Cyprus for the period 1986-1989 (Hadjistephanou, 1992)	68
Table 24	Total (Z), natural (M) and fishing (F) mortality rates of <i>Pagellus erythrinus</i> in Cyprus (Livadas, 1988a)	69
Table 25	Total (Z), natural (M) and fishing (F) mortality rates of <i>Pagellus erythrinus</i> in the Edremit Bay (Turkey) (Hossucu and Turker Cakir, 2003)	69
Table 26	Von Betalanffy Growth Function parameters (L_{inf} , k , ϕ') from Fishbase ..	70
Table 27	Length–Weight relationships from Fishbase (median records)	71
Table 28	Dimension of the Suez Canal through the years (Halim, 1990)	72
Table 29	Lessepsian species commercially important in Levantine fisheries (CIESM, 2005)	73

1 Introduction

This document describes the status of the Eastern Mediterranean fishery statistics and information systems in Eastern Mediterranean countries participating in the MedFisis project (Cyprus, Egypt, Lebanon, Syria, and Turkey) before the start of the project (November 2003). The document will serve as a baseline document for the MedFisis project in the Eastern Mediterranean area. A general description of the countries will be given, including the status of the national Mediterranean capture fisheries monitoring system, the institutional set-up of administration dealing with Mediterranean capture fisheries, and the status of the national Mediterranean capture fisheries.

The document is based on reports prepared for the MedFisis project by experts on the countries involved (Mr. S. Majdalani (Lebanon), Mr. N. Hadjistephanou and L. Vassiliades (the Republic of Cyprus), Ms F.A. Seham and Mr. A.M. Salem (Egypt), Mr C. Bizsel (Turkey), and Mr I. Krouma (Syria), plus data available from international agencies and data collected by the authors in the countries involved.

The authors are grateful for suggestions and critical reading of the manuscript by Mr P. Mannini (FAO, Marine Resources Service) and Mr M. Bariche (American University of Beirut).

2 Rationale for the MedFisis project

The Mediterranean fisheries are at risk of over-fishing, which may result in irreversible damage to the environment and the natural resources in the Mediterranean Sea. To effectively safeguard and conserve the interacting wealth of continental shelves and offshore grounds, regional management measures need to be taken. The countries bordering the Mediterranean, through the General Fisheries Commission for the Mediterranean (GFCM), have identified the need for a regional fishery statistics and information system (Mediterranean Fishery Statistics and Information System, or MedFisis) as a vital instrument for the GFCM and other international bodies to monitor the state of the Mediterranean fisheries and the well-being of the whole eco-system in the basin. The European Commission has responded to this by supporting the regional FAO MedFisis project to develop such a system.

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

The General Fisheries Commission for the Mediterranean (GFCM) is a regional fisheries body. Its purpose is to promote the development, conservation, rational management and best utilization of living marine resources. The GFCM has 24 members, being the countries around the Mediterranean and Black Sea (except Bosnia and Herzegovina, Georgia, The Russian Federation, and Ukraine), Japan, and the European Community. The GFCM can establish management measures, if it sees the need to do so. In fact, several management measures are currently in effect in the Mediterranean Sea established through the GFCM. A few examples of these management measures are:

- Minimum mesh size of 40 mm in cod-ends for demersal trawling.
- Banning of towed dredges and trawls below 1000 m depth.
- Establishment of a vessel registry of fishing vessels over 15 m length.

2.2 *Participation in MedFisis by Eastern Mediterranean countries*

For the Mediterranean countries to effectively participate in the MedFisis project and for the system to be of effective regional use, all countries should have a national system that collects, processes, stores and disseminates an agreed common set of data, with the same data standards and definitions. A standardized methodology is already being introduced in countries around the Western Mediterranean and the Adriatic Sea, through the activities of two donor-supported projects, namely CopeMed and AdriaMed. The countries of the Eastern Mediterranean, which are not benefiting from the aforementioned assistance, have participated in a regional Technical Cooperation Programme (Enabling Participation in the fishery statistics and information system in the Mediterranean [TCP/INT/2904]) in order to be in a position to upgrade their national systems and enable their affiliation in the regional network.

2.3 *Objectives of the MedFisis project*

The MedFisis project is expected to create a Mediterranean Fishery Statistics and Information System, which will contribute to the sound management of living marine resources of the large marine ecosystem of the Mediterranean. It will be based on national fishery statistics systems, which will be enhanced and standardised within the MedFisis framework in such a way as to meet obligations associated with the countries' respective governments, as well as those of international organisations and fishery bodies.

The MedFisis-Technical Cooperation Programme aims to achieve the above-mentioned goals through the following immediate project objectives:

- To promote the introduction of agreements on standardization of statistical and information parameters and of the necessary intergovernmental arrangements according to the FAO and the GFCM mandatory conformity;
- To strengthen the capacity of the fisheries institutions of the Eastern Mediterranean countries in marine fishery statistics and information systems, with a view to meeting the relevant national needs and requirements for participation in and complementing in its entirety the Mediterranean Fishery Statistics and Information System - MedFisis

As a main result, the national marine fisheries statistics systems will be qualified to meet both the national and regional statistical requirements, which would enable the Eastern Mediterranean countries' participation in the MedFisis regional project. This would enhance the common monitoring of the Mediterranean fisheries resources and the decision-making process for the management and preservation of the Mediterranean marine ecosystem. The MedFisis project is supported by the EC and the FAO.

3 Country overviews

3.1 *The Republic of Cyprus*

3.1.1 Geography

The Republic of Cyprus is situated in the Eastern part of the Mediterranean basin and is the third largest island in the Mediterranean, with an area of 9 251 km² (of which 3 245 km², on the Northern part of the island are not under government control). The coastline is mostly indented and rocky in the North and West, with sandy beaches in numerous coves mainly in the South and East. The coastline perimeter is 796 km, of which 409 km are not under government control. The continental shelf (846 sq. nautical miles) is narrow in the North and wider in the South. In the North and West, very limited trawlable grounds exist. Although the seabed is mostly muddy and/or sandy in the South and East, there are extensive rocky grounds and patches in shallow waters, which are good for stationary fishing gear.

The Republic of Cyprus joined the European Union in May 2004.

3.1.2 Population

The population of the Republic of Cyprus at the end of 2002 was calculated to be 793 100 of which 639 400 (80.7 percent) are Greek Cypriots, 87 600 (11 percent) are Turkish Cypriots, and 66 100 (8.3 percent) are foreign residents and workers. The population density of the Republic of Cyprus is 86 persons/km². There are four districts in the government-controlled area: Nicosia (capital), Limassol, Larnaka and Paphos. The biggest part of the districts of Nicosia and Famagusta and the whole area of Kyrenia district are not under government control (Hadjistephanou & Vassiliades, 2004).

3.1.3 Fisheries

Since its independence in 1960, the Republic of Cyprus included fisheries in the Governmental development policies. Consequently, the sector started improving. However, for thirty years now, the most important fishing grounds are not under the control of the Republic of Cyprus Government. This has significantly affected the fisheries industry. The Government of the Republic of Cyprus has control over 60 percent of the continental shelf and 45 percent of the coastline (Hadjistephanou & Vassiliades, 2004).

Today approximately 1 400 individuals are directly involved in the fisheries sector as fishermen, aquaculturists, or in the processing sector. Approximately 1 000 individuals are occupied indirectly in ancillary professions, such as boat builders, retail fish sellers, importers of fishing items, maintenance of fishing gear and equipment (Hadjistephanou & Vassiliades, 2004).

Cyprus marine capture production in the GFCM area

GFCM capture production dataset, Fishstat

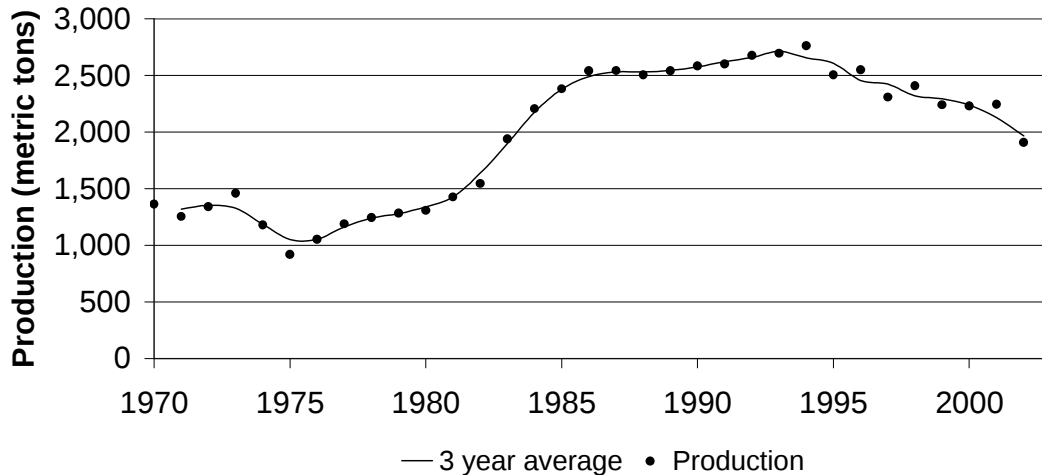


Figure 1 The Republic of Cyprus marine capture fisheries production (Fishstat, 2005)

Despite its relatively small contribution to the Gross National Income (GNI), which does not exceed 0.3 percent, the fisheries sector is an important activity for the economy of several coastal areas, since it generates income and work opportunities, contributing to the social and economic welfare of the residents of these areas.

The graph above shows a clear decline of production in 1974 and 1975, which might be related to the political unrest during that time and to the lack of control by the Cypriot government over some fishing grounds.

From 1976 onwards there has been a steady increase of the national marine capture fisheries production. From 1986 until 1996, the national fisheries production of the Republic of Cyprus from the GFCM area rose to above 2 500 metric tonne per year. However, since 1994 there has been a steady decline of the fisheries production, resulting in a production of less than 1 750 tonne in 2003.

The five most important species (in landed weight) for the Republic of Cyprus were in 2003 (see Table 1): Bogue (*Boops boops*, 151 tonne), Surmullet (*Mullus surmuletus*, 130 tonne), Common cuttlefish (*Sepia officinalis*, 85 tonne), Red Mullet (*Mullus barbatus*, 84 tonne), and Atlantic bluefin tuna (*Thunnus thynnus*, 79 tonne). Some important species groups which need to be mentioned are Picarels (*Spicara spp*, 580 tonne), and Octopuses (*Octopodidae*, 93 tonne). Almost half (44 percent) of the landed Cypriot catch is classified by species, the rest of the catch is grouped at family or higher level.

Table 1 The Republic of Cyprus marine capture fisheries production 2003, GFCM area (Fishstat, 2005)

Species (-groups)	Scientific name	Tonne
Picarels nei	<i>Spicara spp</i>	580
Bogue	<i>Boops boops</i>	151
Surmullet	<i>Mullus surmuletus</i>	130
Marine fishes nei	<i>Osteichthyes</i>	129

Species (-groups)	Scientific name	Tonne
Octopuses, etc. nei	<i>Octopodidae</i>	93
Common cuttlefish	<i>Sepia officinalis</i>	85
Red mullet	<i>Mullus barbatus</i>	84
Atlantic bluefin tuna	<i>Thunnus thynnus</i>	79
Swordfish	<i>Xiphias gladius</i>	47
Porgies, seabreams nei	<i>Sparidae</i>	44
Spinefeet(=Rabbitfishes) nei	<i>Siganus spp</i>	44
Albacore	<i>Thunnus alalunga</i>	30
Parrotfishes nei	<i>Scaridae</i>	26
Axillary seabream	<i>Pagellus acarne</i>	25
Common pandora	<i>Pagellus erythrinus</i>	21
Common dentex	<i>Dentex dentex</i>	16
Red porgy	<i>Pagrus pagrus</i>	16
Groupers nei	<i>Epinephelus spp</i>	15
Greater amberjack	<i>Seriola dumerili</i>	13
Sharks, rays, skates, etc. nei	<i>Elasmobranchii</i>	13
Groupers, seabasses nei	<i>Serranidae</i>	12
European hake	<i>Merluccius merluccius</i>	11
Saddled seabream	<i>Oblada melanura</i>	11
Scorpionfishes nei	<i>Scorpaenidae</i>	11
Little tunny(=Atl.black skipj)	<i>Euthynnus alletteratus</i>	10
European pilchard(=Sardine)	<i>Sardina pilchardus</i>	7
Total		1 741

Figure 2 shows the species (-groups) which represent more than 50 percent of the catch. ***Spicara spp*** clearly has been the most important species group through the years. In this group, the most important species (and consequently in the Republic of Cyprus' catches) is ***Spicara smaris***.

Since 1976 catches of ***Boops boops*** were increasing until 1986, after which the catches have been declining. From 1971 until 1980, the catches of ***Mullus surmuletus*** have been stable, just under 100 tonne. From 1981 until 1996 catches of this species have been increasing from around 100 tonne to more than 200 tonne. From 1996 onwards a steady decline can be observed of around 20 tonne per year. The catches of un-identified marine fish (***Osteichthyes***) remained stable at around 100 tonne until 1982, after which the catch increased to around 400 tonne in 1993. Since then the catches of this species-group have been declining.

Important species (-groups) **Cypriot marine GFCM capture fisheries** 3 year average, GFCM capture production dataset, Fishstat

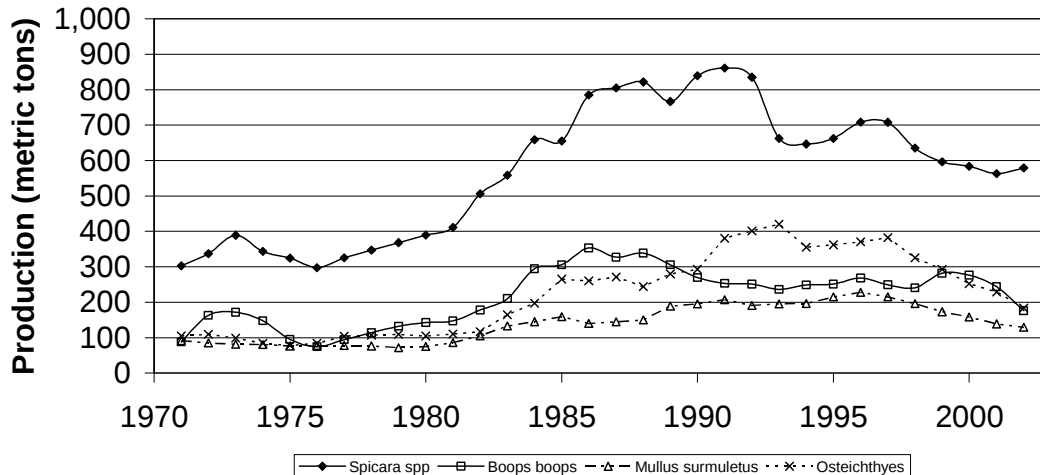


Figure 2 Important species (-groups) the Republic of Cyprus marine capture fisheries (Fishstat, 2005)

3.1.4 Marine fishery sector

The marine fisheries sector in the Republic of Cyprus comprises three sub-sectors: the capture sector, the aquaculture sector and the processing/marketing sector. The Republic of Cyprus capture fishery consists of the inshore fishery, the trawl fishery and the multipurpose fishery. There is also one purse seiner operating in the waters of the Republic of Cyprus. Sport fishery is also included in the capture fishery, but is not reflected in the fishery statistics.

Inshore fishery

The inshore fishery is practiced with small wooden boats of 6 to 12m length overall (LOA), which mainly operate with bottom set nets and long lines (passive gears). In 2003, there were 677 persons were occupied as full time fishermen in 500 licensed boats.

Total production of the inshore fishery, numbers of working days and boats, total fleet size and Hp as well as production per working day for the years 1994 to 2003 are given in Table 2.

Table 2 Inshore fishery production and fishing effort (1994 - 2003) (Hadjistephanou and Vassiladis, 2004)

Year	Production (Metric Tonne)	Working days	Number of Boats	Fleet, Total Length Overall (meter)	Fleet, total Hp	Production per working day (kg)
1994	1 789.5	104 192	438	3 574.0	18 225.0	17.18
1995	1 587.2	109 379	491	3 978.0	20 237.0	14.51
1996	1 648.5	110 124	500	4 216.0	23 266.0	14.97
1997	1 498.0	96 657	466	3 724.0	20 035.0	15.50
1998	1 520.9	101 289	490	3 945.0	21 539.0	15.02
1999	1 299.6	113 589	498	4 017.3	22 771.5	11.44
2000	1 341.4	111 391	500	4 274.1	26 017.5	12.04
2001	1 168.7	101 098	500	4 420.3	27 841.0	11.56
2002	1 062.8	84 257	500	4 514.7	31 942.5	12.61
2003	972.5	72 588	500	4 033.5	24 090.5	13.40

Trawl fishery

The trawl fishery (active gears) consists of 22 demersal trawlers of 21 to 27m (LOA) with 220-750 Hp diesel engines. All of them are stern trawlers of steel or wooden hull. Eight trawlers are licensed to operate in the waters of the Republic of Cyprus, whereas the others operate exclusively in international waters of the Mediterranean. In 2003, 144 fishermen were fully occupied on these 22 trawlers.

Total production, number of working days, fleet total size and Hp as well as production per working day of the eight trawlers fishing in the waters of the Republic of Cyprus are given in Table 3 for the years 1994 to 2003. The same information on the trawl fishery in international waters is given on Table 4.

Table 3 Trawl fishery production and fishing effort in Cypriot waters (1994 - 2003)
(Hadjistephanou and Vassiladis, 2004)

Year	Production (Metric Tonne)	Working days	Number of Boats	Fleet, Total Length Overall (meter)	Fleet, total Hp	Production per working day (kg)
1994	452.5	1 261	8	187.6	2 290	358.8
1995	427.7	1 314	8	187.6	2 290	325.5
1996	526.7	1 321	8	187.6	2 290	398.7
1997	462.5	1 308	8	187.6	2 290	353.6
1998	451.0	1 305	8	187.6	2 290	345.6
1999	405.8	1 308	8	193.0	3 365	310.2
2000	313.6	1 000	8	193.0	3 365	313.6
2001	415.6	1 305	8	193.2	3 365	318.5
2002	375.3	1 412	8	191.9	3 400	265.8
2003	394.0	1 388	8	191.9	3 400	283.8

Table 4 Trawl fishery production and fishing effort in international waters (1994 - 2003)
(Hadjistephanou and Vassiladis, 2004)

Year	Production (Metric Tonne)	Working days	Number of Boats	Fleet, Total Length Overall (meter)	Fleet, total Hp	Production per working day (kg)
1994	348.4	852	6	96.2	1 785	408.9
1995	400.4	1 001	10	234.2	3 915	400.0
1996	333.9	852	10	235.3	3 815	391.9
1997	275.9	769	11	265.1	4 395	358.8
1998	350.7	1 051	13	258.7	4 135	333.7
1999	420.3	1 155	13	288.6	5 055	363.9
2000	406.8	1 309	12	292.5	5 470	310.8
2001	425.2	2 316	16	387.7	7 573	183.6
2002	236.7	916	22	531.1	9 663	258.4
2003	222.6	1 102	16	381.0	6 598	202.0

Multipurpose fishery

The multipurpose fishery (polyvalent gears) is practiced with boats of about 16m LOA, using long lines in the waters of the Republic of Cyprus and in international waters in the Eastern Mediterranean. In 2003, 105 fishermen were fully occupied in 33 boats licensed for multipurpose fishing.

Table 5 gives the production, number of working days, fleet total size and Hp as well as the production per working day for the years 1994 to 2003 in the multipurpose fishery.

Table 5 Multipurpose fishery production and fishing effort (1994 - 2003) (Hadjistephanou and Vassiladis, 2004)

Year	Production (Metric Tonne)	Working days	Number of Boats	Fleet, Total Length Overall (meter)	Fleet, total Hp	Production per working day (kg)
1994	218.8	1 148	-	-	-	190.6
1995	122.0	899	-	-	-	135.7
1996	74.9	803	-	-	-	93.3
1997	71.3	778	-	-	-	91.6
1998	94.5	679	-	-	-	139.2
1999	139.5	1 146	-	-	-	121.7
2000	157.1	1 286	-	-	-	122.2
2001	237.1	1 615	24	405.3	5 965.0	146.8
2002	211.2	2 006	24	378.9	5 451.0	105.3
2003	132.8	1 446	33	499.9	9 185.0	91.8

Sport fishery

In the Republic of Cyprus about 2 000 individuals are licensed sport fishermen. Many other persons, however, fish with rod and line and spear gun for pleasure, without being licensed. Categories of sport fishing that need license are:

- boats with nets and long lines
- scuba divers
- divers with lights and spear-guns
- fishing with nets-without boats

The sport fishery captures about 15 percent of the total catch of the Republic of Cyprus. Its catch is not yet reflected in the Fishery Statistics, because the attention of the Department of Fisheries and Marine Research (DFMR) has only recently focused on this fishery.

3.1.5 Fishery administration

Administration structure

The authority responsible for fishery matters in the Republic of Cyprus is the Department of Fisheries and Marine Research (DFMR) of the Ministry of Agriculture, Natural Resources and Environment. The DFMR was founded in 1964, with a mandate for the development of fisheries and the rational management of marine resources. The DFMR Head-office is situated in Nicosia. There are four district units located in the four coastal towns of Limassol, Larnaka, Paphos and Paralimni. Two research stations operate at Meneou and Kalopanayotis, specializing in research and development of marine and freshwater aquaculture respectively. The DFMR consists of five divisions: division of fisheries resources, division of aquaculture development and research, environment division, division of fishing shelters and support, and division of fisheries control. (Figure 3)

The activities of the DFMR include many concerns: development and management of fisheries and aquaculture; marine ecology, protection of endangered species and habitats, physical and chemical oceanography; and prevention of marine pollution. Furthermore, the department promotes programmes for the fishermen, including the

construction of fishing shelters. It is also responsible for the enforcement of the relevant legislation.

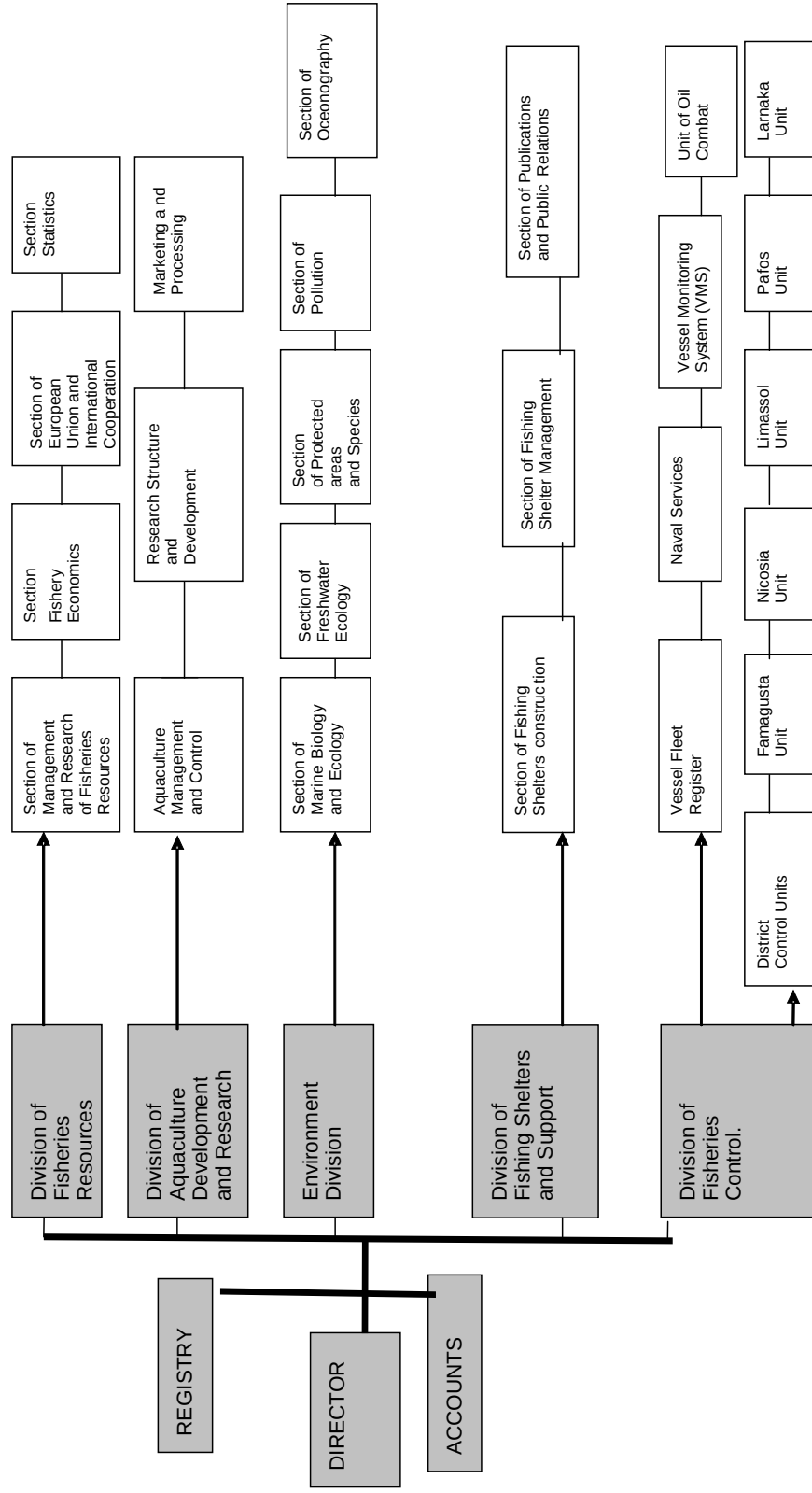


Figure 3 Organigram Cypriot Department of Fisheries and Marine Research

3.1.6 National data collection and information system

Ongoing research activities

For about 20 years now, the stocks of five important demersal marine fish species have been evaluated on a yearly basis. These species are striped red mullet (***Mullus surmuletus***), red mullet (***Mullus barbatus***), picarel (***Spicara smaris***), bogue (***Boops boops***) and pandora (***Pagellus erythrinus***). Stock assessments are based on regular samplings, and on length and age distributions of these species and on statistical data collected through the fishery statistical system. Assessment of stocks are carried out by monitoring the structure of fish populations, age analysis, as well as forecasts with regards to the development of fisheries stocks, the quantities that could be fished and other parameters.

Fishery statistical system

Statistical data reports are collected by fisheries inspectors employed in the district units, which are located at the main fishing ports of the Republic of Cyprus, or by fisheries inspectors based in Nicosia. Four to six fisheries inspectors are employed in each district unit.

The statistical data reports are sent to the statistics section of the DFMR for computer processing and analysis. One staff member is occupied full-time with processing of the data; another person is responsible for the computer programs used in the department, while also being responsible, part-time for, the processing of data.

Every year an Annual Statistics Report is published by the Department around May or June, with a total of 36 tables (see Table 6 for the list with these tables). The collected data are used by the DFMR for management purposes (decision guidelines) and requirements. The data are also sent and presented to international bodies, organizations and agencies (i.e. FAO, GFCM, ICCAT and Eurostat) and are used by scientific personnel for their needs. The FAO receives fisheries data from the director of the DFMR.

Table 6 List of tables in Annual Statistics Report of the DFMR (Hadjistephanou and Vassiliades, 2004)

1	Production by each segment of the fishery
2	Production by source and year comparisons
3	Aquaculture Production by species
4	Monthly fish landings and values
5	Landings by species of each segment of the fisheries
6	Landings by species and yearly comparisons
7	Fishing craft and fishermen
8	Wholesale fish prices by segment of the fishery
9	Monthly trawl landings and effort
10	Monthly trawl landings and effort - the Republic of Cyprus waters
11	Monthly trawl landings and effort - International waters
12	Monthly trawl landings by fish quality with values
13	Monthly trawl landings by species – the Republic of Cyprus waters
14	Monthly trawl landings by species – International waters
15	Monthly trawl landing by species - the Republic of Cyprus and International waters
16	Trawl landings by species and area of the Republic of Cyprus
17	Trawl landings by area – yearly comparisons.
18	Monthly trawl landings with fishing effort by area.
19	Trawl fishery production – the Republic of Cyprus waters - yearly comparisons
20	Trawl fishery production – International waters - yearly comparisons
21	Trawl fishery production – the Republic of Cyprus and International waters - yearly comparisons
22	Inshore fishery landings by species – yearly comparisons
23	Inshore fishery monthly landings with details of fishing effort
24	Inshore fishery landings by area – yearly comparisons
25	Inshore fishery landings by area by species.
26	Monthly inshore fishery landings with fishing effort-by area
27	Monthly inshore fishery landings by species and values
28	Swordfish fishery production and effort
29	The fleet: Inshore and Swordfish fishery Distribution of fishermen
30	The fleet: Inshore fishery – The ages of fishermen
31	The fleet: Inshore fishery – Boats
32	The fleet: Inshore fishery – Engines
33	The fleet: Trawl fishery
34	Imports of fish and fish products for home consumptions
35	Consumption of fish, Fresh, Frozen and Processed by source
36	Fish names

Fishery surveys

The Republic of Cyprus is obliged to conduct commercial biological fishery surveys according to Council Regulation (EC) No 1543/2000 of 29 June 2000 establishing a community framework for the collection and management of the data needed to conduct the common fisheries policy. In this respect, a national programme for the collection of biological fishery data was prepared for 2005.

The DFMR cooperates with the statistical service of the Republic of Cyprus, for carrying out socio-economic surveys of the fishing sector, based on questionnaires at predetermined intervals, such as running costs, and total production value. Economic and socio-economic data are also provided by the fishing vessel register of the Republic of Cyprus that distributes information on the fleet segment characteristics, which can be used for an economic analysis. Furthermore, the DFMR collects economic and socio-economic data from the inshore fishery production reports,

logbooks, the purse seiner production, the fishing licenses and the sales notes from the fishmongers.

The present statistical system

The current statistical system in the Republic of Cyprus is used to fulfil the following objectives:

- To serve as a guide for management purposes, i.e. to direct the DFMR to decide on the introduction of measures and regulations for the fishery.
- To provide statistical information to other bodies: The Republic of Cyprus has the legal obligation to send data to International Organizations and Agencies (FAO, GFCM, ICCAT) and to the European Union.
- To be analysed for scientific purposes: Along with length distributions collected by sampling, the data are used to evaluate the stocks of the five most important commercial demersal fish species.

The system, although operational, is not fully adequate for the present needs of the department, especially in view of the increase in data obligations upon EU accession.

The present information system in the Republic of Cyprus has the following constraints:

- The age of personnel (on pension in one year – new personnel not available)
- The small number of personnel involved
- The structure of the collection system is not well defined
- Some fishermen not well educated, are indifferent to the need to return data sheets and questionnaires on time
- Delays in sending the forms to the Head Office.

Information exchange between offices/institutions

Information exchange between the DFMR and other offices, institutions is carried out regularly. Fisheries data obligations of the Government towards for instance ICCAT, GFCM, EU, etc, are the responsibility of the DFMR. The department is also assisted by the statistical office of the Ministry of Commerce for information with regards to fisheries socio-economic data.

Data collection

Fishery statistical data are collected by:

- Direct reports supplied by various segments of the fishery sector
- Interviews

Direct reports

Trawl logbooks

All trawlers are required by law to keep logbooks. Collection of data is carried out by daily return of logbook sheets that all skippers are required to produce, prior to landing their catch. The logbook sheets are handed to the fisheries inspectors, while landed catches are inspected upon landing to ensure that they are weighed and recorded accurately.

Trawl logbooks include Identification of the trawler, place and depth of fishing, number of active fishing days, dates of the trip, port of landing, the total catch of 22 demersal fish species and the breakdown of the catch by species and by quality. The log sheets are collected every day by the fisheries inspectors and sent at intervals of one or two months to the head office of the department for data processing.

Inshore fishery production reports

Production data from the inshore fishery are collected from a sample of this category of fleet. Through a 10 percent random sample of the boat owners in the inshore fishery sector, production reports are collected weekly.

Inshore fishery reports include Identification of the fisherman and the boat, the fishing station, month and the week of the month (fishing equipment/gear are already known from the fishing license). The fishermen report their daily catch and the breakdown of the catch by species summed by week. A total of 40 demersal fish species are reported.

The sheets are collected at irregular intervals of one-two months by the fisheries inspectors and sent to the head office of the department for data processing.

Multipurpose/polyvalent fishery logbooks

Every month all owners of multipurpose/polyvalent vessels have to submit logbooks to the fisheries inspectors. The multipurpose fishery logbooks: Dates of departure and return to port, area of fishing and distance from the Republic of Cyprus, number of hooks, species of the fish, number of fish and weight of each fish captured. Seven pelagic fish species are reported on these forms. Similar, to the other data reports, these logbooks are sent to the head office of the DFMR for data processing.

Purse-seiner production reports

The purse-seiner (one active vessel) is provided with production reports, which are similar to the inshore fishery reports. The catch is reported daily, by species, and summed per week. These reports include 12 pelagic species. The area of fishing, month and week of the month is noted on the reports, which are collected at irregular intervals and sent to the head office of the DFMR for data processing.

Interviews

Interviews are carried out to obtain current market prices. Fishermen and fishmongers are obliged to use sale slips and to present these upon request to the DFMR. According to the current fish trading system in the Republic of Cyprus, the prices of the various species and grades of fish are mostly agreed upon in the beginning of the fishing season. These agreements are made, individually, between fishermen and fishmongers; there is no wholesale market in the Republic of Cyprus. In the Republic of Cyprus, the same species or category of fish are offered (first sale) at the same price by the fishermen to the retail fish shops. There is no system like an auction or any other process that is based on market forces of supply and demand. It is not common for fishermen themselves to be engaged in the marketing of their catch. Interviews with the first hand buyers and the skippers/ fishermen provide the prices of the landings of trawlers and of the inshore fishery.

Fishery census

Fishery censuses are carried out at irregular year intervals by the DFMR in cooperation with the Department Statistics and Research of the Ministry of Finance. The objective of these censuses is to collect data regarding the different segments of the commercial fishery fleet (trawlers, multipurpose, and artisanal vessels). The data are also used to identify areas where DFMR policy may assist fishing communities by identifying their strengths and weaknesses and, thereby, creating measures that may alleviate the immediate problems. The last fishery census questionnaire recorded the following data for all licensed fishing vessels fishing in the Republic of Cyprus territorial waters:

- Fishing station
- Vessel owner/s
- Vessel/engine characteristics
- Crew
- Fishing equipment
- Production by species
- Running costs

Catch and effort survey

The ongoing collection of data by the DFMR covers all segments of the fishery fleet, except sport fishery. The data collection schemes can be considered catch and effort surveys. The immediate objectives of the catch and effort survey are: to collect information on the composition of the landings of the Cypriot fleet, to estimate total landings of the Cypriot fleet, to estimate the fishing effort exerted by the Cypriot fleet, and to collect socio-economic data on the involved population. The collected data can serve as a basis for sustainable management of the fishery and for the formulation of national and (sub-) regional policies related to fisheries management. The following data collection models are applied by the DFMR:

- Fish market monitoring
- Census approach (logbook)
- Landing approach (sampling)

At present, through the fish market monitoring, fish prices (by vessel, at port) per species and quality level are collected. Interviews of fishermen are conducted to calculate the average prices of landings.

With logbooks, the catch of the fishing fleet, as well as the working hours (effort) and fishing units (nets, hooks etc) employed are recorded.

Sampling of the port landings is carried out by fisheries inspectors. Two fisheries inspectors visit landing places randomly, and sample landings. Through this system, all landing places of the Republic of Cyprus are sampled on a random basis.

Data processing

Fisheries data are collected through the collection network as described. This network operates through the District Units (DU) of Famagusta, Limassol, Larnaka and Paphos, where most landings are made, and the head office of the DFMR. All data related to fisheries activities are collected by the DFMR DU's and are sent to the head office of the department for processing. Logbooks are collected by inspectors from the head office. The head office of the DFMR is equipped with computer

software/hardware that records, processes and enables data evaluation. At present, there are no electronic network workstations operating on network levels. Each DU has computer hardware, which, at present, is not used in data processing. There is a lack of infrastructure and technical expertise to provide timely data updates, or to process these data timely. The head office of the DFMR has therefore no real-time data. The DFMR database structure uses the following software packages for statistical electronic data processing:

- Visual FoxPro 6.0
- Microsoft Excel

The outcome of the data processing is the Annual Report of the DFMR.

3.2 *The Arab Republic of Egypt*

3.2.1 Geography

Egypt is situated in the Eastern part of Northern Africa, including the Asian Sinai peninsula. The country has borders with Israel, Libya, the Palestinian Authority, and Sudan. The coastline of Egypt on the Mediterranean Sea is about 1 100 km long, extending from Sallum in the West to Rafah in the East, and contains six Northern coastal lagoons opening to the Mediterranean Sea (Maruit, Edku, Burollus, Manzala, Port Fouad and Bardawil). The main fishing ground used by Egyptian vessels is the continental shelf off the Nile delta, and may extend to the Eastern side of Port Said and rarely to the Western side of Alexandria. The continental shelf is narrow in the East and West comparable to the wider central delta region. The seabed is flat, mostly muddy to sandy along the middle and eastern coast. Limited grounds for trawling are available on the Western coast. Inshore fisheries are widespread, with artisanal fishermen along the coast. There are nine fisheries centres along the coast with four developed fishing ports in Alexandria, Meaddea, Dumyat and Port Said.

3.2.2 Population

The population of Egypt, mid-2003, was estimated to be 71.9 million people (FAOSTAT, 2005), with a yearly growth of 1.77 percent (World Bank, 2004a). Seventeen percent of the population lives below the national poverty line, and 42 percent of the population lives in urban areas (World Bank, 2004a).

3.2.3 Fisheries

The Egyptian fishery sector generates almost one billion US\$ per year (GAFRD, 2003), which equals to approximately 1.1 percent of the Egyptian GDP, which was, in 2002, 82.4 billion US\$ (World Bank, 2004a). Mediterranean capture fisheries contribute about 14 percent to the total Egyptian capture fisheries production (Fishstat, 2005). Despite this relative low number, the importance of the sector cannot be ignored, because it is a very important sector for the economy of coastal areas, generating income and work opportunities in areas with little other options for livelihood sustenance.

The General Authority for Fish Resources Development (GAFRD) estimates that an equal number of people is working in the sector without licenses, either fishing or working in the supporting industry. The Authority estimates that in Egypt one million people depend on the fisheries sector for their livelihoods (Seham and Salem, 2004).

Fishing communities are organized in 92 cooperatives of which 55 are in the Mediterranean. Out of 101 800 fishermen, 90 055 are cooperative members. The fishermen cooperatives are associated in the Egyptian Union of Fishermen cooperatives (Seham and Salem, 2004).

Egypt marine capture production in the GFCM area

GFCM capture production dataset, Fishstat

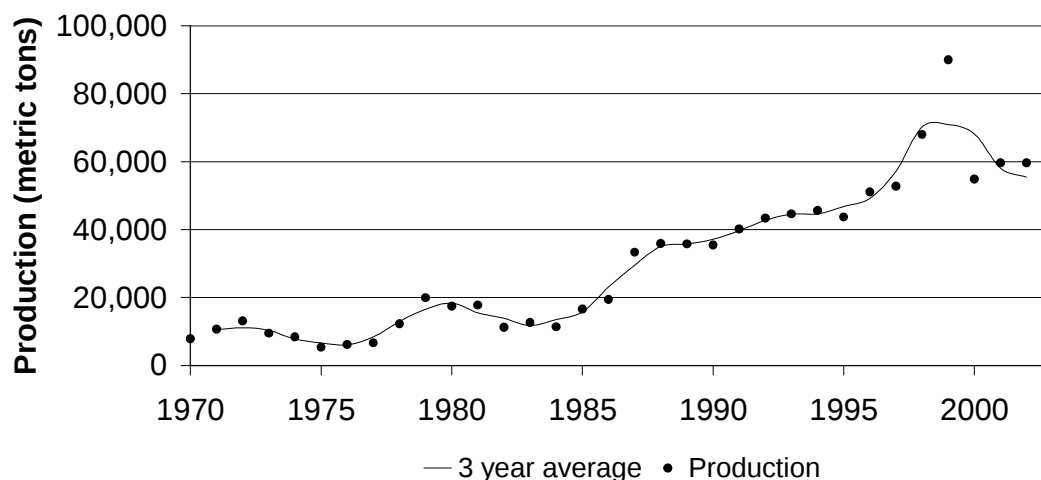


Figure 4 Egypt marine capture fisheries production

The Egyptian capture fisheries production from the Mediterranean has been steadily increasing over the years, with a peak in production in 1999 (see Figure 4). Currently, the production is around 47 000 tonne. Landings from the Mediterranean Sea represent about 11 percent of the total marine catch (Fishstat, 2005). About 40 percent of the landings are from purse seiners operating along the Mediterranean coast. Coastal lagoon fisheries are well developed. The production of the Mediterranean lagoons is estimated by GAFRD at 138 000 tonne, which is considered inland waters production (A. Salem, personal communication, 2005).

About 75 percent of the catch landed is at Dumyat, Port Said and Meaddea, where about 50 percent of the fleet and 60 percent of the total number of fishermen are based. There is no catch record for recreational fishing, although it is widely practised along the Mediterranean coast. Since 1999, sponge catching has been banned, although it was an important economic activity. In part it has been compensated for by snail and clam fisheries, with a production of more than 4 000 tonne.

According to the official statistics, the five most important species for Egypt are (see Table 7): European Seabass (*Dicentrarchus labrax*, 1 404 tonne), Bogue (*Boops boops*, 1 288 tonne), Meagre (*Argyrosomus regius*, 1 252 tonne), Gilthead seabream (*Sparus aurata*, 914 tonne), and Atlantic bonito (*Sarda sarda*, 784 tonne). However, mentioning the important species alone gives a distorted impression, as most (approx. 80 percent) of the landings are not determined at species level but at family or higher level. Groups that need to be mentioned are: Sardinellas (*Sardinella spp*, 10 270 tonne), Mulletts (*Mugilidae*, 4 383 tonne), Silversides (*Atherinidea*, 3 560 tonne), Molluscs (*Mollusca*, 2 738 tonne), Natantian decapods (*Natantia*, 2 473 tonne), Cuttlefish, bobtail squids (*Sepiidae*, *Sepiolidae*, 1 516 tonne), Crabs (*Brachyura*, 1 456 tonne), Sharks, rays, skates, etc (*Elasmobranchii*, 1 395 tonne), Groupers (*Epinephelus spp*, 1 314 tonne), and Surmullets (*Mullus spp*, 1 133 tonne).

The graph below (Figure 5) shows species (-groups) making up more than 50 percent of the Mediterranean catch. The importance of ***Sardinella spp.*** to Egyptian Mediterranean capture fisheries is evident, peaking at almost 30 000 tonne in 1999.

After 1985, the group ***Osteichthyes*** (un-identified marine fishes) increased, which might indicate that the abilities of GAFRD personnel with respect to fish identification decreased. However, from 1988 onwards there is an apparent decline of landings of fishes classified as ***Osteichthyes***

Important species (-groups) Egyptian marine GFCM capture production 3 year avg, GFCM capture production dataset, Fishstat

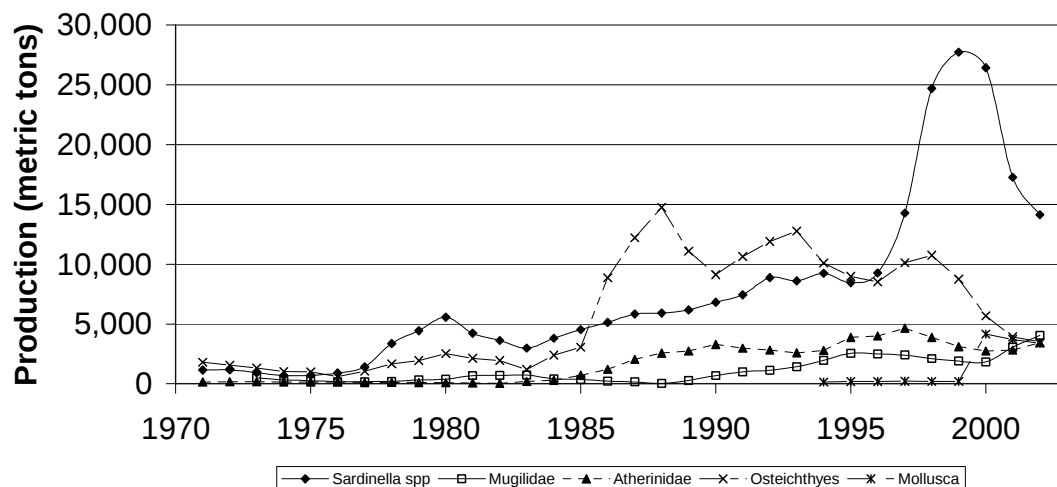


Figure 5 Important species (-groups) Egypt marine capture fisheries

Table 7 Egypt marine capture production 2003, GFCM area (Fishstat, GFCM capture production dataset)

Species (-groups)	Scientific name	Tonne
Sardinellas nei	<i>Sardinella spp</i>	10 270
Mullets nei	<i>Mugilidae</i>	4 383
Silversides(=Sand smelts) nei	<i>Atherinidae</i>	3 560
Marine fishes nei	<i>Osteichthyes</i>	2 871
Marine molluscs nei	<i>Mollusca</i>	2 738
Natantian decapods nei	<i>Natantia</i>	2 473
Cuttlefish,bobtail squids nei	<i>Sepiidae, Sepiolidae</i>	1 516
Marine crabs nei	<i>Brachyura</i>	1 456
European seabass	<i>Dicentrarchus labrax</i>	1 404
Sharks, rays, skates, etc. nei	<i>Elasmobranchii</i>	1 395
Groupers nei	<i>Epinephelus spp</i>	1 314
Bogue	<i>Boops boops</i>	1 288
Meagre	<i>Argyrosomus regius</i>	1 252
Surmullets(=Red mullets) nei	<i>Mullus spp</i>	1 133
Gilthead seabream	<i>Sparus aurata</i>	914
Tuna-like fishes nei	<i>Scombroidei</i>	903
Barracudas nei	<i>Sphyrna spp</i>	889
Jacks, crevalles nei	<i>Caranx spp</i>	823
Atlantic bonito	<i>Sarda sarda</i>	784

Species (-groups)	Scientific name	Tonne
Common sole	<i>Solea solea</i>	758
Red porgy	<i>Pagrus pagrus</i>	758
Spotted seabass	<i>Dicentrarchus punctatus</i>	751
Lizardfishes nei	<i>Synodontidae</i>	732
Spinefeet(=Rabbitfishes) nei	<i>Siganus spp</i>	717
Largehead hairtail	<i>Trichiurus lepturus</i>	694
Sargo breams nei	<i>Diplodus spp</i>	455
Bluefish	<i>Pomatomus saltatrix</i>	420
Grey gurnard	<i>Eutrigla gurnardus</i>	379
Sponges	<i>Spongidae</i>	1
Total		47 031

The Mediterranean fleet in 2003 was composed of 1 161 trawlers, 215 purseiners, 1 044 long-liners and 404 trammel netters. While the number of trawlers and purse seiners was stable in the last five years, the number of long liners has doubled.

3.2.4 Fishery administration

The General Authority for Fish Resources Development (GAFRD) was established in 1983. It was entrusted with management, development and protection of the aquatic resources in the marine and inland waters of Egypt. Under the overall authority of the Ministry of Agriculture and Land Reclamation, GAFRD is responsible for fishing licensing, monitoring of the fish stocks and fishing effort, enforcement of the fishery legislation, and the administration of the fishing harbours. The management and development of aquaculture and inland fisheries is also under the responsibility of the authority. Environment guards and coast guards are in charge, within GAFRD, of the application of the law related to fishing techniques and water pollution. The authority is responsible for the collection, processing and analysis of fishery statistics.

GAFRD prepared a strategy for the development of the fisheries sector for the period 1997 to 2017. The strategy has three main objectives:

1. To increase the fish production, mainly from aquaculture, and to improve the fish marketing system in order to raise the consumption per capita to 14.25 kg in 2017 for an estimated population of 90 million people.
2. To improve the fish quality in order to reach the international standard and to develop new markets for fish export.
3. To increase the efficiency of the use of the natural and human resources.

Administration structure

GAFRD has four central departments for processing and production, projects and developments, commercial, administrative and financial affairs, and chairman office affairs. GAFDR has also departments taking care of seven GAFRD sites: Aswan, Nile valley, Red Sea, Damietta, Sharkia in Port Said, Mid Delta in Kafr el Sheikh, and Gharbia in Alexandria. The central department for chairman office affairs is made up of (among others) the general information department and the central statistical department, which are responsible for the processing of fisheries data (Figure 6 and Figure 7).

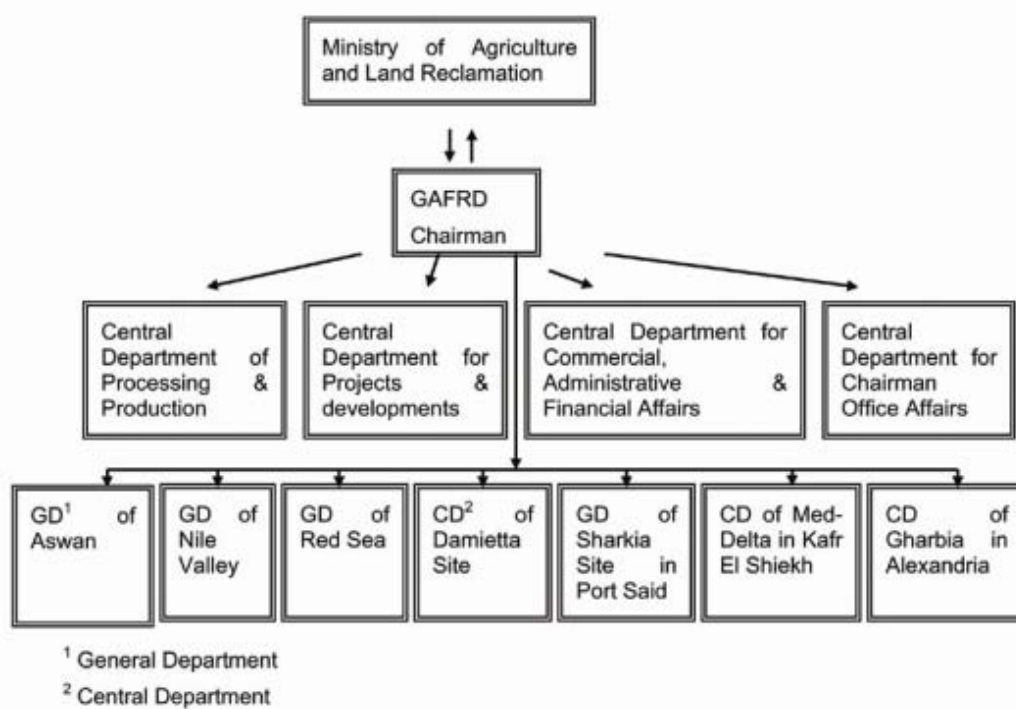


Figure 6 Organigram Egyptian Ministry of Agriculture and Land Reclamation, GAFRD

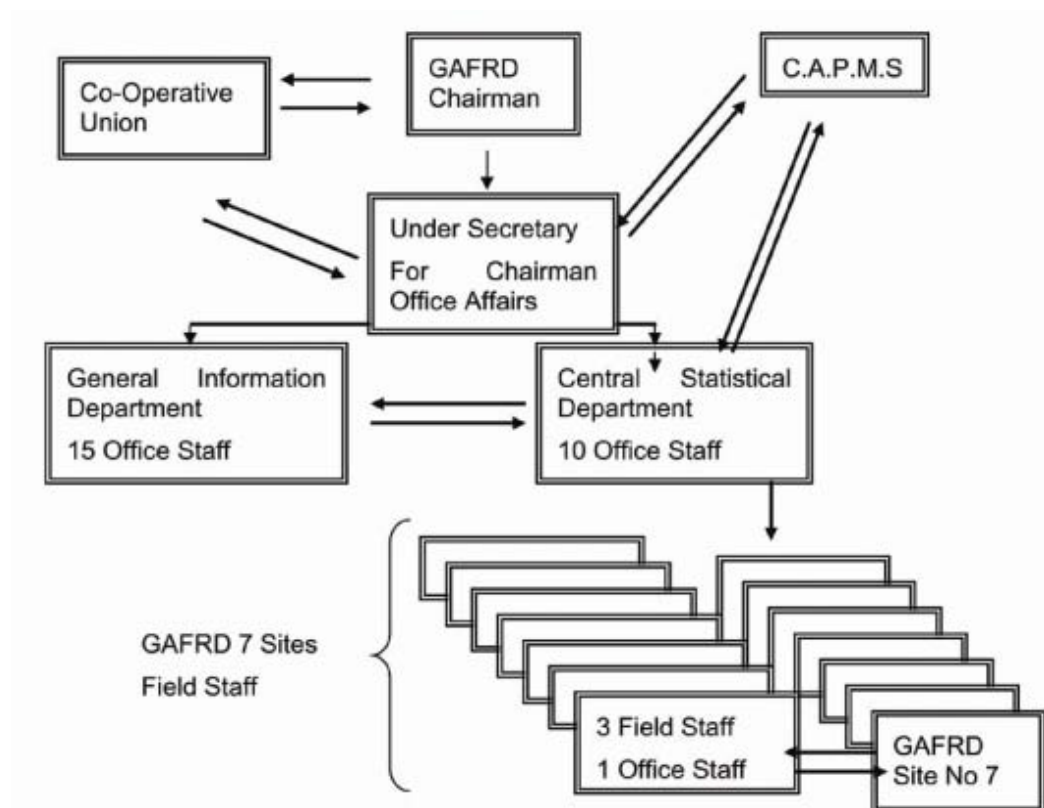


Figure 7 Staffing in GAFRD offices in Cairo and in the field

3.2.5 National data collection and information system

Fishing fleet census

The Western and Damietta GAFRD have performed the fishing fleet census in 2002, which has been updated yearly (A. Salem, personal communication, 2005). Data were compiled per vessel, and data of all vessels were put into one Excel file per port. The Alexandria site covered four ports (Matrouh, Abu Quier, En Fushi, Ma'adeya). The Damietta census covered Esbit El Borg port. The remaining GAFRD sites bordering the Mediterranean (Middle Delta and Eastern, covering the ports Borg El Borrolus, Port Said, and El Arish) still have to conduct this exercise. The existing files will be used as a basis to establish a database that follows the national and regional FAO/GFCM standards.

Catch statistics collection

The GAFRD catch statistics are collected through two systems:

- Landing monitoring takes place at: Abu Quier, En Fushi, Ma'adeya, Damietta, Esbit El Borg port, Port Said and El Arish, where a fisheries officer (two officers, one sunrise to noon, the other noon to sunset) estimates the catch per boat per species, either when the vessels ofload their landings, or at the market. These data are compiled and summarized, after which the summarized data are provided to the GAFRD-site head. This person checks the data and provides the data to the fisheries data collection committee.
- Catch sampling (two days per week, the same officer covering two ports). These data are also supplied to the fisheries data collection committee

Both data groups are validated by the aforementioned fisheries data collection committee. Members of the fisheries data collection committee are appointed by the Minister of Agriculture and Land Reclamation. Currently the Committee consists of a representative from GAFRD, a representative from the Planning Institute, a representative of the Fisheries Union, an aquaculture scientist, and a scientist from the National Institute for Marine Science. The committee reports directly to the GAFRD chairman and from there to the Minister.

After the validation by the fisheries data committee, the data are sent to the GAFRD Statistics Department in Cairo. Here the data are again checked and validated, after which they are sent to the GAFRD Information Department. The validated data are compiled into a yearbook and forwarded to higher officials and to the National Bureau of Statistics. The FAO receives fisheries data from the Director of Foreign Agriculture Relations, International Organization and Conference Department, Ministry of Agriculture and Land Reclamation.

3.3 *The Lebanese Republic*

3.3.1 Geography

Lebanon is a predominantly mountainous country, with an area of 10 452 km². Lebanon is bordered by Israel and Syria. Nearly half of the country's population lives in the Greater Beirut area. The Lebanese coastline is 220 km long. The land rises steeply from the coast in the North, while in the South it forms a very narrow coastal plain. The continental shelf is narrow, especially in the South. Bottom grounds are mainly rough with intensive rocky patches, good for stationary demersal gear.

3.3.2 Population

Lebanon has an estimated population of 3.7 million (mid-2003 figure) (FAOSTAT, 2004). Lebanese are historically ocean-origin people, consuming lots of fish in their diet. Local demand for fish is considerably higher than in the neighbouring Middle Eastern countries. Due to the low local fish production, the Lebanese have been depending on imported fish.

3.3.3 Fisheries

Until the end of the civil war, the marine capture production of Lebanon has been around 1 700 tonne. In 1989 the Ta'if accord was signed, signalling the end of the civil war, after which the production of marine capture fisheries has been increasing and stabilized in 1995 at 3 600 tonne (see Figure 8). Around 4 000 traditional small-scale fishermen are distributed all throughout the Lebanese coast. The active fishing fleet consists of around 1 600 small fishing boats (less than 6 meters) and 400 motorized boats (less than 8 meters), but precise figures are not available. The average annual income of the fishermen, in 1998, was equivalent to US \$800. These fishermen have no access to institutional lending.

The demand for fish in Lebanon is high (15 000 tonne per year in 2000). Imports of fresh, chilled, and frozen fish were reported to be 9 383 tonne in 2002. The estimated potential for fish consumption in Lebanon is 35 000 tonne per year. The average per capita fish supply was estimated at 9.2 kg per year in the period 1999 - 2001 (FAO, 2004). The Lebanese government estimates that the per caput consumption of fish is 4 kg per year.

Lebanon marine production in the GFCM area

GFCM capture production dataset, Fishstat

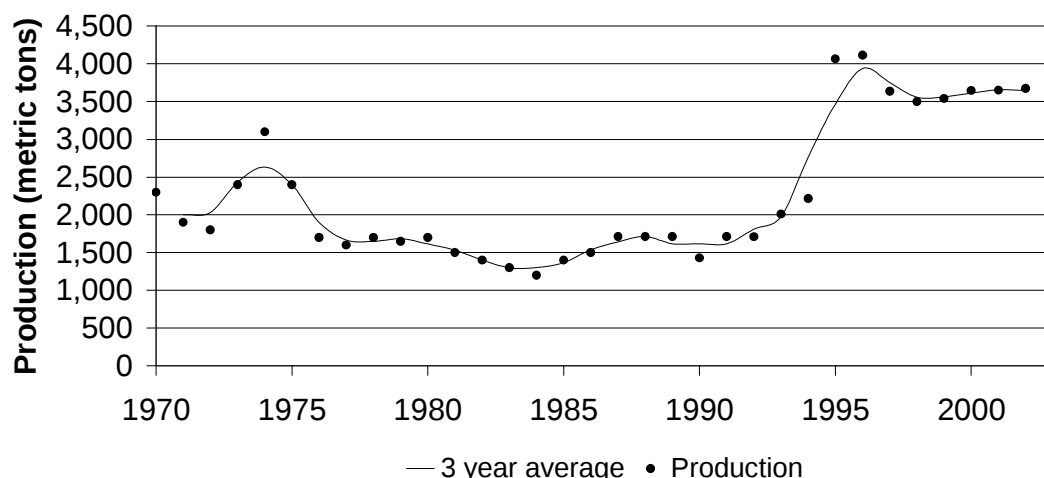


Figure 8 Lebanon marine capture fisheries production (GFCM area)

The fisheries of Lebanon are classified as small-scale, artisanal, and are traditionally based on bottom stationary gear (trammel nets and longlines), purse seine nets (lampara) and beach seines. Fishing operations, with the exception of longlines, are mostly carried out at depths of up to 50 meters. Most of the gillnets, beach-, and purse seines, have small mesh sizes (less than 2x2 cm). Because of the strict control by the military, the extensive fishing with explosives has been significantly reduced during the past few years.

Ninty nine percent of the landings are recorded at family or higher level, leaving only the landings of Common octopus (*Octopus vulgaris*, 25 tonne) and European conger (*Conger conger*, 9 tonne) to be recorded at species level.

The five most important species-groups are: *Clupeidae* (650 tonne), *Carangidae* (400 tonne), *Scombroidei*¹ (400 tonne), *Sparidae* (370 tonne), and *Mugilidae* (365 tonne).

Marketing system

Most landing sites have at least one local cooperative of fishermen, which, among other things, takes care, in part, of the marketing of the fish. At major landing sites, fish are being marketed by auctions. These sales are recorded (species, price, quantity) by the cooperative.

¹ Sub-order (which includes the families *Scombridae* (Scombrids), *Istiophoridae* (Billfish) and *Xiphiidae* (Swordfish))

Lebanon marine production (3 year avg) in the GFCM area

GFCM capture production dataset, Fishstat

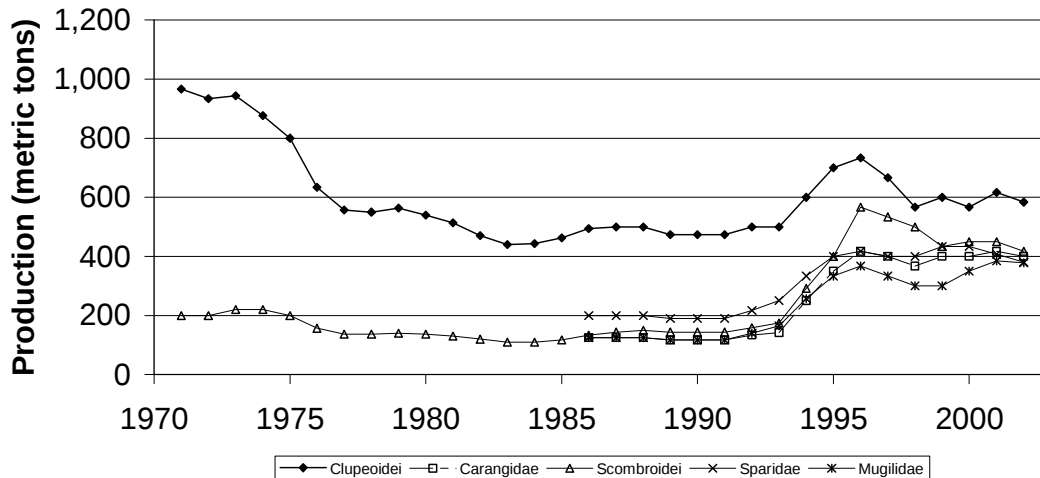


Figure 9 Important species (-groups) Lebanon marine capture fisheries

Figure 9 shows the species-groups that account for at least 50 percent of the catch. Since the early 1970's there had been a steady decline in catches of **Clupeoidei**, until the 1980's when the catches became stable for a period of about ten years. After 1993, a small increase occurred followed by a decrease and an apparent stabilisation of the catches. After 1993, the **Scombroidei** production increased significantly from less than 200 tonne to more than 400 tonne. **Sparidae**, **Mugilidae** and **Carangidae** followed a similar trend.

Table 8 Lebanon marine capture production 2003, GFCM area (Fishstat,GFCM capture production dataset)

Species (-groups)	Scientific name	Tonne
Clupeoids nei	Clupeoidei	600
Carangids nei	Carangidae	400
Tuna-like fishes nei	Scombroidei	400
Porgies, seabreams nei	Sparidae	370
Mulletts nei	Mugilidae	365
Mackerels nei	Scombridae	300
Barracudas nei	Sphyræna spp	250
Groupers, seabasses nei	Serranidae	250
Surmullets(=Red mullets) nei	Mullus spp	200
Scorpionfishes nei	Scorpaenidae	125
Picarels nei	Spicara spp	90
Marine crustaceans nei	Crustacea	60
Sharks, rays, skates, etc. nei	Elasmobranchii	60
Silversides(=Sand smelts) nei	Atherinidae	50
Gadiformes nei	Gadiformes	27
Common octopus	Octopus vulgaris	25
Cuttlefish,bobtail squids nei	Sepiidae, Sepiolidae	25
European conger	Conger conger	8
Flatfishes nei	Pleuronectiformes	8
Total		3 613

3.3.4 Fisheries administration

The administrative structure of entities dealing with fisheries within the Ministry of Agriculture is given in Figure 10. The part on the left shows the structure of central administration in Beirut, while the right-hand side shows the organisational structure in the governorates. The four agriculture services deal not only with fisheries, but with all issues related to the Ministry of Agriculture. These services cover four Lebanese governorates: North Lebanon, Mount Lebanon, South Lebanon, and Beqa'a. Each agriculture service has a rural development department, that manages the forest and fish centres (see Table 9).

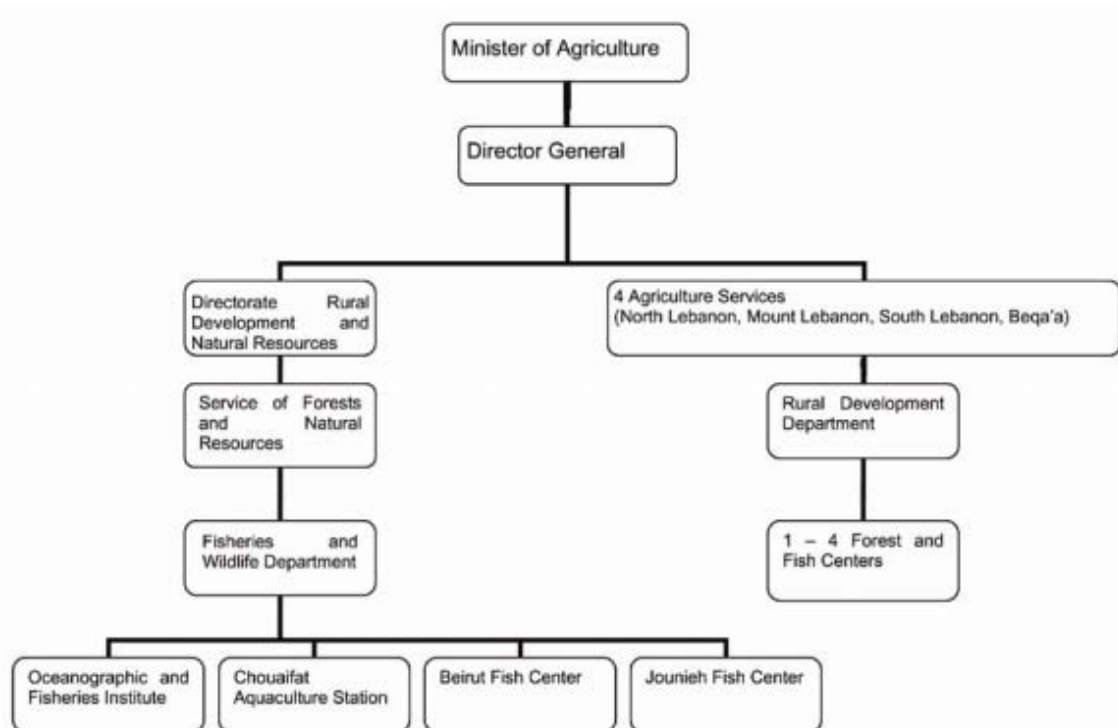


Figure 10 Organigram Lebanese Ministry of Agriculture dealing with marine capture fisheries

The Directorate of Rural Development and Natural Resources deals with fisheries in the ministry of agriculture in Beirut. The Service of Forests and Natural Resources is part of this directorate, and controls the Fisheries and Wildlife Department (besides the Forestry Department and Pastures and Public Gardens Department). The department (one chief, one agricultural engineer, and one ranger) manages and supports four designated centres (see Table 10). The FAO receives fisheries data from the Chief/Head of the Fisheries & Wildlife Department, Directorate of Rural Development and Natural Resources, Ministry of Agriculture.

Table 9 Centres of the local Rural Development Department in four governorates dealing with fisheries

Governorate	Centre	Personnel
North Lebanon	Mina Forest and Fish Centre	1 centre chief 3 rangers
	Batroun Forest and Fish Centre	1 centre chief 2 rangers
Mount Lebanon	Jbeil Forest Centre	1 centre chief 6 rangers 1 clerk
South Lebanon	Saida Forest and Fish Centre	1 centre chief 11 rangers
	Sour Forest and Fish Centre	1 centre chief 9 rangers
Beqa'a	Saghbin Forest and Fish Centre	1 centre chief 4 rangers
	Hermel Forest and Fish Centre	1 centre chief 7 rangers
	Anjar Aquaculture Station	1 head 2 rangers
	Hermel Aquaculture Station	under construction

Table 10 Centres managed and supported by the Department of Fisheries and Wildlife in Beirut

Centre	Personnel
Oceanographic and Fisheries Institute	1 director 1 agricultural engineer 1 clerk
Chouaifat Aquaculture Station	1 head 1 ranger
Beirut Fish Centre	1 centre chief 3 rangers 1 servant
Jounieh Fish Centre	1 centre chief 2 rangers

3.4 *The Syrian Arab Republic*

3.4.1 Geography

Following the break-up of the Ottoman Empire during World War I, Syria was administered by the French until independence in 1946. In 1973, the Syrian Arab Republic was constituted as a democratic, populist socialist state. The country has an area of 185 180 km² and is bordered by Iraq, Israel, Jordan, Lebanon, and Turkey. Administratively the Syrian Arab Republic is divided into 14 provinces, or muhafazat. The provinces Lattakia and Tartous border the Mediterranean Sea.

The Syrian coastline measures 183 km. The narrow continental shelf projects from 1km to 10km from the shore, with an average of 5km, reaching depths of 400-600m before falling steeply into the North Levantine Basin. The marine topography consists of a narrow rocky shelf stretching from Syria's southern border with Lebanon to north of Banias. Extending northwards from south of Jable past Lattakia, a trawable area of the shelf increases across the bays of Iskenderun and Mersin.

3.4.2 Population

Syria has a population of 17.8 million (2003, FAOSTAT, 2004) with a growth rate of 2.4 percent (World Bank, 2005c). The capital city is Damascus (population around 4.1 million), other major cities include Aleppo (population around 4 million), Hims (population around 1.6 million) and Syria's main Mediterranean port Lattakia (population 0.9 million) (Syrian statistical abstract, 2004). Urbanisation is high with a population of around 50 percent living in urban centres (World Bank, 2005c, and Kelleher, 1996). Per capita fish consumption is low, reported (for 2003) to be 0.9, compared to a level of 20.7 kg for meat products (Krouma, 2005). Almost all fish produced is used for human consumption.

3.4.3 Fisheries

The current (2003) marine fleet is estimated to be 1 850 vessels (of which 6 trawlers and 4 vessels target the small pelagics) operating on the narrow continental shelf. Twenty six fishing vessels (12 - 40 meter, 120 - 1500 Hp engines) fish beyond the territorial limits of 12 miles. The majority of the fleet, however, consists of vessels between 3 – 15 meters, with the greatest concentrations in Lattakia and Arowad Island. Most of the vessels are built on Arowad island, are made of wood, and are fitted with either non-marine diesel engines (80 percent of the vessels) or with second-hand marine engines. The engines are mostly between 5 – 15 hp. Per boat, 2 to 6 fishermen are present. An estimated 20 percent of the vessels operate seasonally, concentrating efforts on the more productive summer season. The artisanal fishery is a multi-species fishery with multipurpose/polyvalent vessels operating a wide variety of gears in different seasons. Some fishermen specialise in certain gears. In general, the better fishermen have moderate, if erratic returns, while a large number of less dynamic fishermen earn a subsistence living, are held in a permanent state of debt to the fish buyers, and undertake seasonal employment outside of the fisheries sector (Krouma, personal communication).

The Syrian trawable area is estimated to be 225 km², or approximately one quarter of the total estimated 900 km² of shelf area. There are two components to the trawl fleet. The fishery in Syrian waters is exploited by 6 trawlers, of which the owners are the parastatal GEF, (a workers' cooperative in Lattakia) and private investors from Lattakia. A total of 23 additional Syrian-registered trawlers are licensed for fishing in distant waters, meaning that they are allowed to fish outside the 12 mile zone of

Syria. Some distant water vessels fish illegally in territorial waters, during the closed season. Both the GEF and the cooperatives keep landing records, but there are no data available on catch, nor on effort of the private vessels, and operators are reluctant to impart any relevant information. No logbooks or catch records are maintained by the operators.

The trawl fishery and the artisanal fishery are in competition for the same resources on the same or proximal fishing grounds. All species, with the possible exception of deep-water shrimp and some species of minor commercial importance, appear to be harvested by both fisheries. In this regard it should be noted that European hake (*Merluccius merluccius*) and *Mullidae* (goatfishes) contribute 45 percent by weight and 33 percent by value of the estimated artisanal catch. The trawlers at times also destroy artisanal nets and are the subject of complaints of the artisanal fishermen.

Based on the low catches, the large proportion of small size and juvenile fish in the landings and the marginal returns to fishermen, the fishery is considered overexploited. Fishing remains economically viable due to extremely high local market fish prices maintained by a restriction on all fresh and frozen fish imports.

The annual catch per unit effort (CPUE – $\text{tonne.boat}^{-1}.\text{fishing day}^{-1}$) has been reported as showing an erratic but steady decline since 1986, and dropped markedly in 1995 and 2003 (Kelleher, 1996, Krouma, 2005). The steadily rising price of the catch has, to date, offset potential losses. Beginning in 1986 a steady rise in effort to maintain a similar level of catch has been reported (Kelleher, 1996). It is difficult to be precise about the composition of the trawl catch, because the catch is classified by size and commercial group, rather than by species. However, based on examination of the sales records, approximately 50 percent of the fish are of smaller size categories. Juvenile *Mullidae* and *Sparidae* form a significant proportion of the catch. In particular the valuable *Mullus barbatus*, *Mullus surmuletus*, and *Upeneus spp.* are all present in important quantities, mostly at sizes smaller than the size at first maturity. The reasons for the declining CPUE are numerous. It is likely that there is a decrease in productivity in the coastal waters of Syria due to the increased damming of the rivers. The closing of the dam at Al Khabir Ash-Shimali coincides with the initial decline in CPUE in 1986. The identification of further off-shore water hake grounds by the trawlers in the early 1990s resulted in a temporary increase in catches. This resource was, before this discovery, moderately exploited by artisanal fishermen. It seems that the trawling has had a negative effect on this stock, which is why the Syrian Authorities have forbidden trawling in national waters.

The Syrian government has recognized the decline of CPUE as an indicator for overfishing of the marine resources, and has taken the following measures to prevent further degradation of the resources:

- Banning new vessels from the fisheries
- Banning of bottom trawling, to prevent apparent modification/damage of the marine environment (i.e. during the last couple of years *Posidonia oceanica* beds disappeared).
- Closed season for sardines
- Banning of beach seines
- Minimum mesh size
- Maximum number of gears per vessel

Syria marine capture production in the GFCM area

GFCM capture production dataset, Fishstat

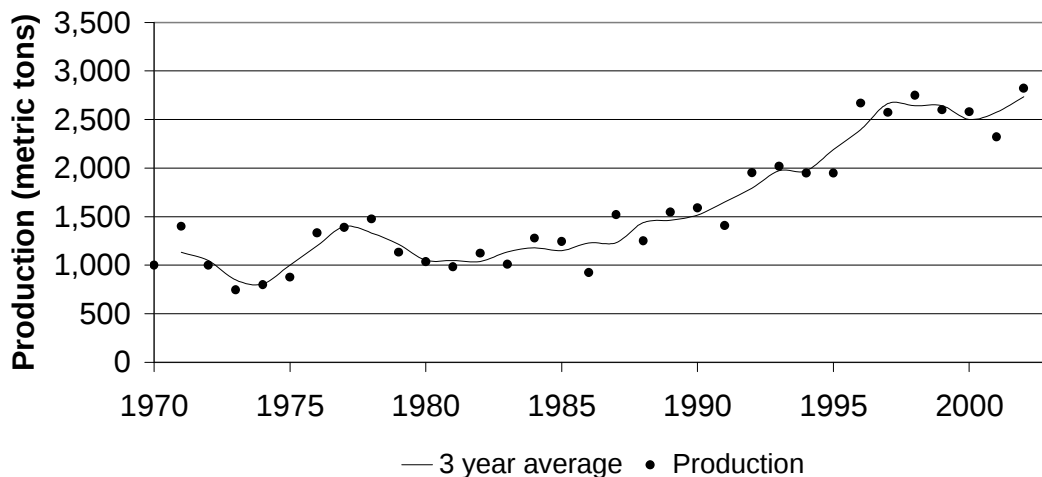


Figure 11 Syrian marine capture fisheries production (GFCM area)

The Syrian Mediterranean catches show a steady increase until 1996, after which it seems as if the catches stabilized at an average catch at around 2 800 tonne (Figure 11).

The five most important species (-groups) (in weight) in the Syrian marine capture fisheries of 2003 are (Table 11): Atlantic mackerel (*Scomber scombrus*, 336 tonne), sardinellas (*Sardinella spp*, 305 tonne), Little tunny (*Euthynnus alletteratus*, 280 tonne), Atlantic bluefin tuna (*Thunnus thynnus*, 225 tonne), and Raja rays (*Raja spp*, 184 tonne).

Table 11 Syria marine capture production 2003, GFCM area (Fishstat, GFCM capture production dataset)

Species (-groups)	Scientific name	Tonne
Atlantic mackerel	<i>Scomber scombrus</i>	336
Sardinellas nei	<i>Sardinella spp</i>	305
Little tunny(=Atl.black skipj)	<i>Euthynnus alletteratus</i>	280
Atlantic bluefin tuna	<i>Thunnus thynnus</i>	225
Raja rays nei	<i>Raja spp</i>	184
Bogue	<i>Boops boops</i>	137
Marine crustaceans nei	<i>Crustacea</i>	128
Marine molluscs nei	<i>Mollusca</i>	122
Mulletts nei	<i>Mugilidae</i>	122
Spinefeet(=Rabbitfishes) nei	<i>Siganus spp</i>	120
Surmullets(=Red mullets) nei	<i>Mullus spp</i>	105

Species (-groups)	Scientific name	Tonne
White seabream	<i>Diplodus sargus</i>	102
Atlantic horse mackerel	<i>Trachurus trachurus</i>	91
Barracudas nei	<i>Sphyraena spp</i>	91
Pandoras nei	<i>Pagellus spp</i>	91
Greater amberjack	<i>Seriola dumerili</i>	90
Pargo breams nei	<i>Pagrus spp</i>	75
European hake	<i>Merluccius merluccius</i>	70
Lizardfishes nei	<i>Synodontidae</i>	70
Gilthead seabream	<i>Sparus aurata</i>	61
Scomber mackerels nei	<i>Scomber spp</i>	60
Gurnards, searobins nei	<i>Triglidae</i>	42
Scorpionfishes nei	<i>Scorpaenidae</i>	39
Groupers nei	<i>Epinephelus spp</i>	37
Jacks, crevalles nei	<i>Caranx spp</i>	30
Sand steenbras	<i>Lithognathus mormyrus</i>	20
Albacore	<i>Thunnus alalunga</i>	15
Grey triggerfish	<i>Balistes carolinensis</i>	12
Total		3 060

More than 47 percent of the landings are recorded at the species level, while the rest are recorded at family or higher levels. It must be noted that before 2002 only 14 species (-groups) were recorded, and a large part of the catch was reported as ***Osteichthyes*** (marine fish not elsewhere indicated). From 2002, Syria has recorded 22 species (-groups) and has not reported any ***Osteichthyes*** (marine fish not elsewhere indicated) anymore, which can be considered as a significant improvement in fish identification.

Important species (-groups) Syrian marine GFCM capture production 3 year avg, GFCM capture production dataset, Fishstat

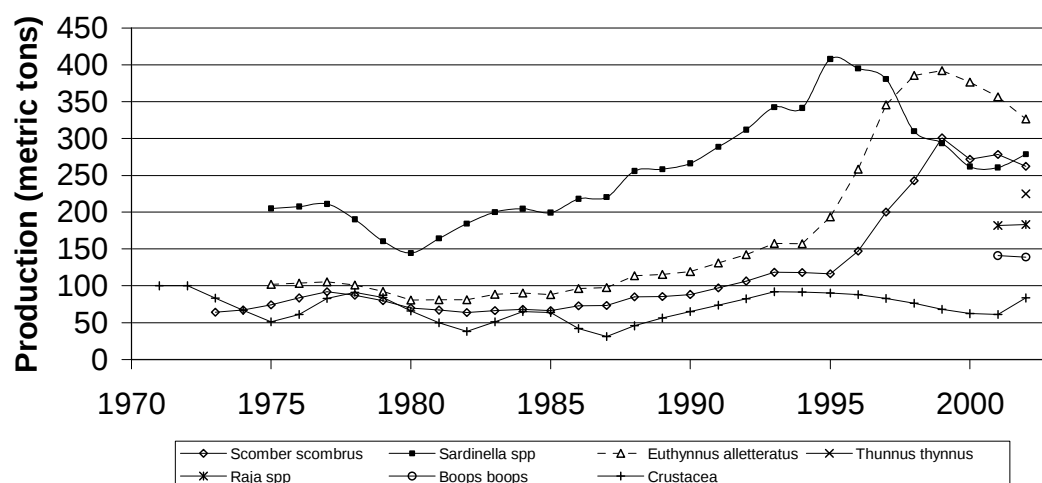


Figure 12 Important species (-groups) Syria marine capture fisheries

Figure 12 shows the species (-groups) which make up at least 50 percent of the Syrian Mediterranean catch over the years 2001 - 2003. The first three important species (by weight) are pelagic species.

Until 1997, Sardinellas has been the most important species group for Syrian marine capture fisheries. The production of Sardinellas peaked in 1995 at 408 tonne, but

there was a significant decline of around 25 percent until 2003. The production of Little tunny, *Euthynnus alletteratus* remained stable (100 – 150 tonne) from 1975 until 1994, when a dramatic increase of production began. The production peaked in 1998, at 417 tonne. Since then the production has been in steady decline (in 2003 production was 280 tonne). Atlantic mackerel (*Scomber scombrus*) production remained stable (around 100 tonne) until 1995 when a sharp increase in production started. The production peaked in 2000, at 284 tonne, after which the production started to fluctuate. The production in 2003 was 336 tonne.

Three species (-groups) have been identified since 2002, which have significant productions. These are: Atlantic bluefin tuna (*Thunnus thynnus*, 225 tonne in 2003), Raja rays nei (Raja spp, 184 tonne in 2003), and Bogue (*Boops boops*, 137 tonne in 2003).

3.4.4 Fishery administration

Ministry of Agriculture and Agrarian Reform (MAAR), Department of Fisheries Resources (DOF)

The coastal zone comprises two mohafazats, or administrative governorates, headquartered in Lattakia and Tartous. Three officers, with qualifications in agricultural engineering, staff each of the DOF offices (Field Services) in Lattakia and Tartous. The DOF concentrates on the control of inland fisheries and aquaculture, and on the collection of market statistics. The Port Directorate issues the marine fishing licences for artisanal vessels. The licensing of the trawlers is executed directly from Damascus.

In Tartous, a monitoring, control and surveillance committee (DOF, Port Directorate, and Police) exists to control the fishery, and there seems to be a close cooperation between the officers from the DOF office and the Port Directorate (Arowad Harbourmaster), while in Lattakia there is some intermittent co-operation with the Ports Directorate.

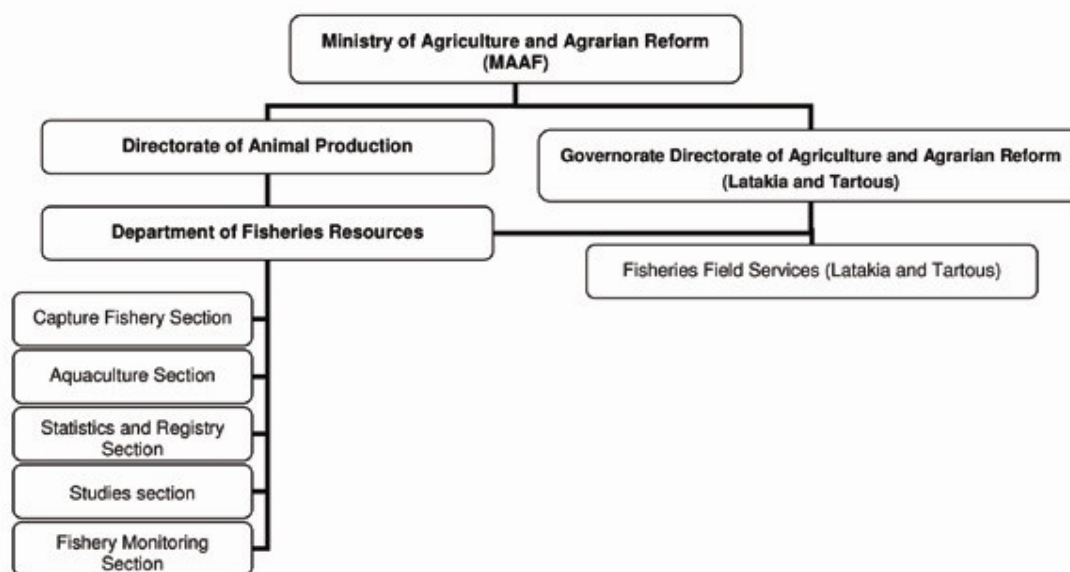


Figure 13 Organigram Syrian Ministry of Agriculture and Agrarian Reform dealing with marine capture fisheries

Port institutions.

The Directorate General for Harbours, located in Lattakia, and belonging to the Ministry of Transport, is the authority responsible for monitoring of marine fisheries. This is carried out by 'Harbourmaster offices' located in Lattakia, Jable, Tartous, Banias, and Arowad.

The Harbourmasters are responsible for the small-boat harbours (fishing ports) and for two patrol boats located at Lattakia and Tartous. The Arowad-based vessel has been used extensively for fishery patrols and has apparently succeeded in reducing the incidence of use of explosives for fishing and the use of illegal nets.

Cooperatives

Fishermen's cooperatives exist in Arowad and Banias. Both are essentially lobby groups addressing fishermen's issues at local levels through the local authorities of local administrations and through the Farmer's Syndicate. Both cooperatives cite explosives, gear costs, lack of VHF radios, lack of slipways, and pollution to be problems. The Arowad cooperatives reports have 250 members, most of whom are boat owners. The cooperative operates the market at the Tartous fishing harbour and has one employee who weighs and auctions member's catches, deducting 5 percent of the value as a service charge. Retailers pay a charge of 0.5 percent of fish purchased for the use of the market stalls.

Fishery Licenses

The Harbour Authority, administering sailing and fishery licensing, also checks fishing vessels for safety criteria/measures and on validity of both licenses. The DOF field offices monitor the fish stock, the marine environment, and the socio-economic issues concerning fishing communities. Fishing licenses issued by the Harbour Authority are based on prior approval from the Department of Fisheries Resources.

3.4.5 Fishery statistical system

The two field offices located in Lattakia and Tartous are responsible for the collection of fishery data. This is done by collecting daily data at whole-fish markets. The data collected are of total weight of the landings, the landings per species, and the prices per species. Monthly reports are sent (in hard copy only) to the Department of Fishery Resources in Damascus for further processing. The FAO receives fisheries data annually from the director of the Department of Fishery Resources.

3.5 *The Republic of Turkey*

3.5.1 Geography

Turkey has a total area of 774 800 km² and is bordered by Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Iran, Iraq, and Syria. The country is divided into seven regions: South-Eastern Anatolia, East Anatolia, Black Sea, Central Anatolia, Mediterranean, Aegean, and Marmara. Eighty one provinces are governed by local governors appointed by the central government in Ankara (capital of Turkey).

Turkey is surrounded by three seas, which are ecologically different: the Black Sea in the north, the Aegean Sea and the Sea of Marmara in the west, and Mediterranean (Levantine) Sea in the south. The Black Sea has an estuarine character, while the Sea of Marmara, as part of the Turkish strait system, has a transitional character between marine and estuarine environments because its water sources are the Mediterranean (through the Aegean Sea) and the Black Sea. The Aegean Sea and the Mediterranean (Levantine) Sea reflect typical Mediterranean properties; however, the influence of Black Sea water mass can be observed in the northern parts of the Aegean Sea.

3.5.2 History

Modern Turkey was founded in 1923 from the Anatolian remnants of the defeated Ottoman Empire by Mustafa Kemal (or Ataturk, meaning father of the Turks). Under his leadership, the country adopted wide-ranging social, legal, and political reforms. After a period of one-party rule, an experiment with multi-party politics led to the 1950 election victory of the opposition Democratic Party and the peaceful transfer of power. Since then, Turkish political parties have multiplied, but democracy has been fractured by periods of instability and intermittent military coups (1960, 1971, 1980), that, in each case, eventually resulted in a return of political power to civilians.

Turkey joined the UN in 1945 and in 1952 became a member of NATO. In 1964, Turkey became an associate member of the European Community; during the past decade, it has undertaken many reforms to strengthen its democracy and economy, which led in December 2004 to the acceptance of Turkey as a candidate country for the European Union. (CIA, 2005)

3.5.3 Population

Turkey has a population of 71 million people (FAOSTAT, 2004). A large part (37.6 percent) of the population is under 25 years of age (UN, 2005a). The fertility rate (births per woman) is 2.4, while the population growth is 1.5 percent (World Bank, 2005e). The highest concentration of people can be found on the European part of Turkey, and in the valleys and lowlands of the Marmara, Aegean, and Black Sea coasts.

3.5.4 Fisheries

The total production of marine capture fisheries of Turkey from the GFCM area in 2003 was 463 074 tonne. Of this production, 72.6 percent was obtained from the Black Sea, while 14.7 percent was produced from the Marmara Sea, 7.7 percent from the Aegean Sea, followed by 3.0 percent from the Mediterranean Sea. The remaining 2.0 percent are Tuna catches (see Figure 14, Fishstat 2005, GFCM database).

Capture fisheries production Turkey, GFCM area

GFCM capture production dataset, Fishstat

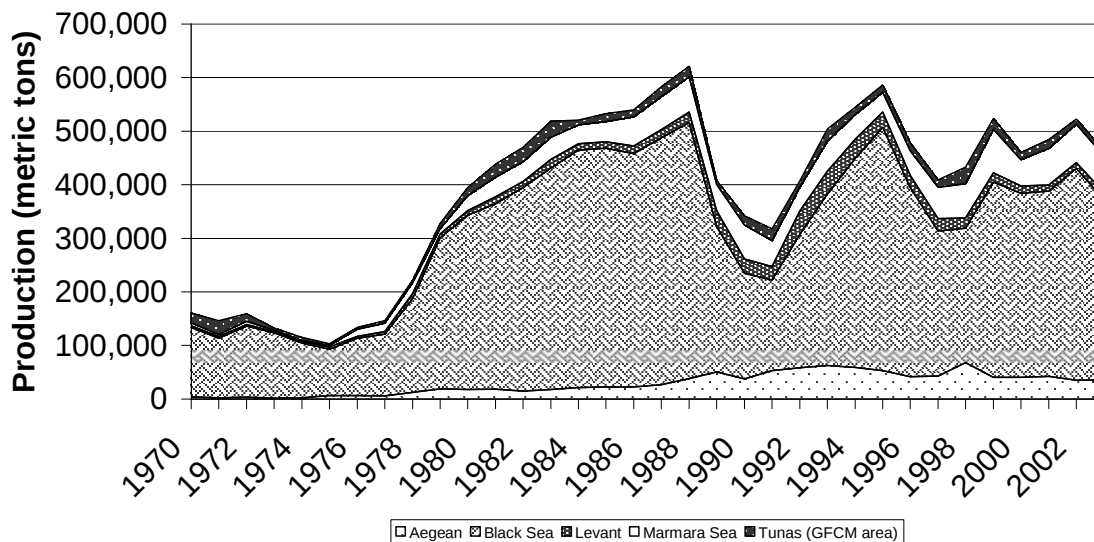


Figure 14 Turkey marine capture fisheries production (GFCM area) distribution

The marine capture fisheries production of Turkey from the GFCM area declined from 1970 until 1975 (around 100 000 tonne). After 1975, the fisheries developed at a remarkable pace, and productions increased, with a peak production in 1988 of 621 406 tonne. Since then production has been oscillating around 500 000 tonne (Fishstat, 2005)(Figure 15).

Turkey marine capture production (and 3 year average) in the GFCM area

GFCM capture production dataset, Fishstat

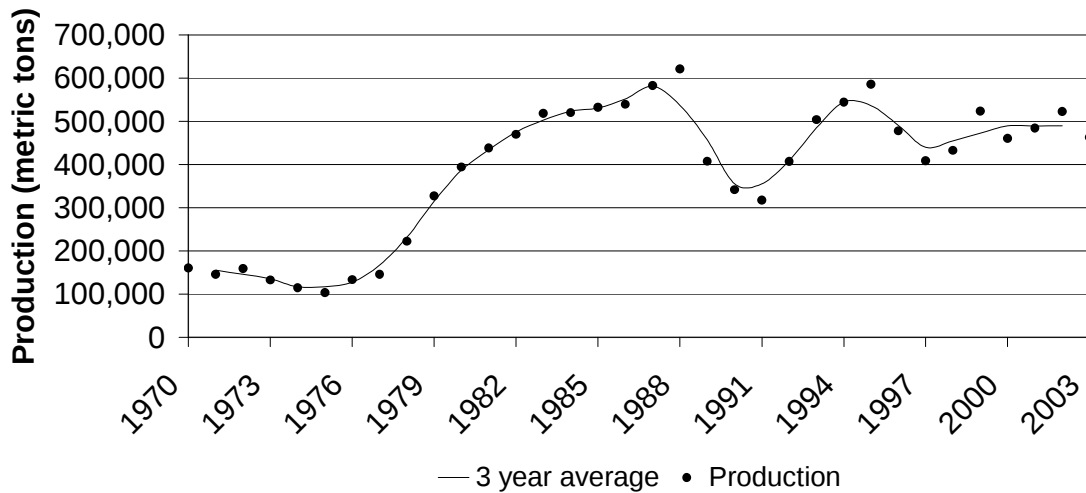


Figure 15 Turkey marine capture fisheries production (GFCM area)

Figure 16 shows the species that accounted for at least 50 percent of the Turkish Mediterranean catch (including the Black Sea). Because of the high catches in the Black Sea, this is for only one species: the European anchovy (*Engraulis encrasicolus*). A significant decline in the catches can be observed in the period 1988 – 1993, which coincided with the invasion of the Black Sea by the non-indigenous Ctenophore (comb jelly) *Mnemiopsis leidyi*. This jellyfish had a major impact on the anchovy fishery in the Black Sea because of its predation on fish eggs and larvae, its feeding on larvae and fish food, and its acceleration of the ecological change process due to eutrophication at that time (GESAMP, 1997). Since 1997, a steady increase of anchovy catches in Turkey can be observed.

Important species (-groups) Turkish marine GFCM capture production 3 year avg, GFCM capture production dataset, Fishstat

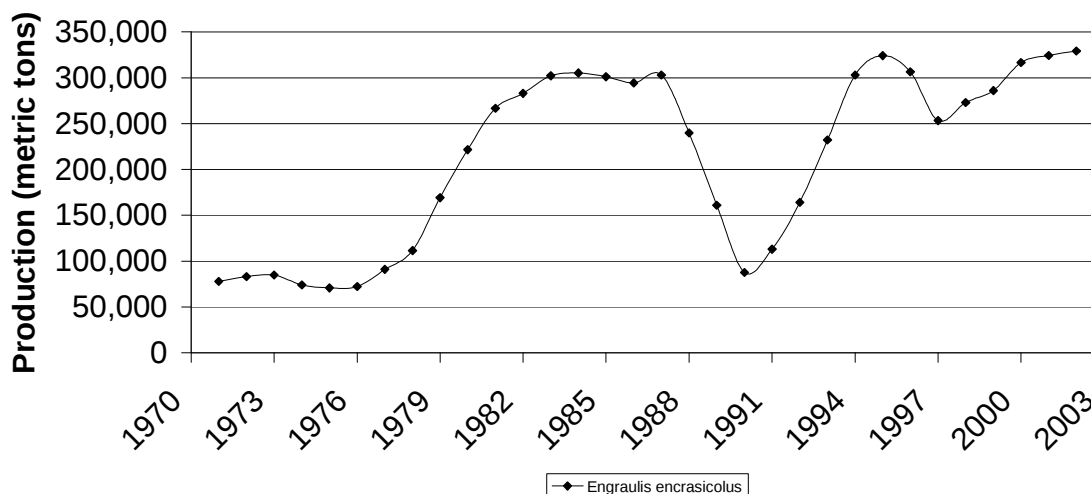


Figure 16 Important species (-groups) Turkey marine capture fisheries production (GFCM area)

The graph below, Figure 17 shows the Turkish marine capture fisheries production from the GFCM area, excluding the Black Sea. From 1974 a steady increase from around 20 000 tonne up to more than 160 000 tonne in 1993 is shown. After 1994, a fluctuation of the capture production occurs with a tendency to decline.

Turkey marine production GFCM area without the Black Sea GFCM capture production dataset, Fishstat

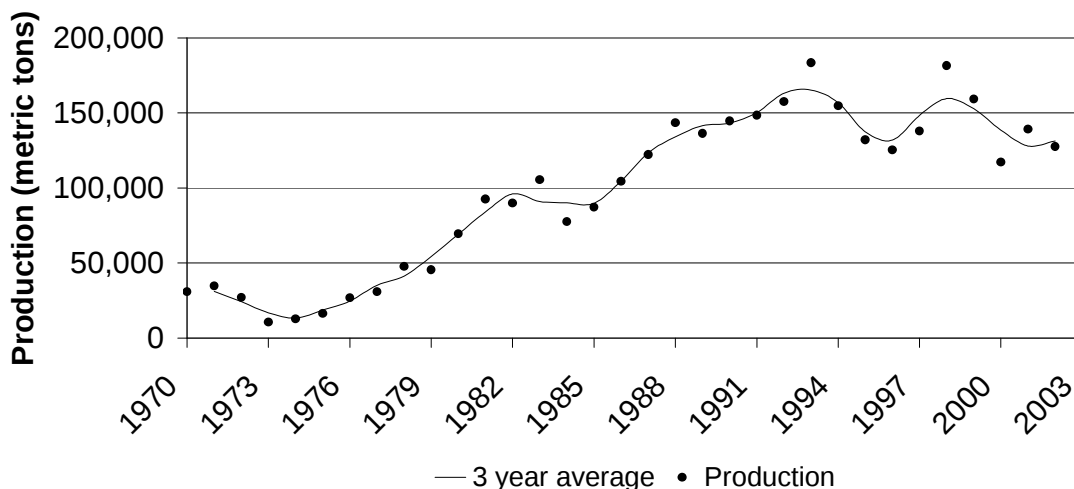


Figure 17 Turkey marine capture fisheries production (GFCM area) (excluding Black Sea)

The most abundant species in the Turkish fishery are, by far, the European anchovy (*Engraulis encrasicolus*), with catches amounted to 295 000 tonne in 2003 – of which

28 931 tonne are from the Mediterranean area (Levantine Sea, Aegean Sea, and the Marmara Sea); the bluefish (*Pomatomus saltatrix*) 22 000 tonne – of which 9 691 tonne are from the Mediterranean, and the clam striped venus (*Chamelea gallina*, 19 700 tonne) (Fishstat, 2005).

In Figure 18 the species (-groups) that make up more than 50 percent of the catch (3-year average, 2000 – 2002) are shown. These are: European anchovy (*Engraulis encrasicolus*), European pilchard (*Sardina pilchardus*), Mediterranean horse mackerel (*Trachurus mediterraneus*), Bluefish (*Pomatomus saltatrix*), and Atlantic horse mackerel (*Trachurus trachurus*).

The production of the European anchovy shows a steady increase from 1974 until 1998. This increase was interrupted in the period 1987 – 1995, when the catches were significantly reduced. This reduction was probably linked to the comb-jelly invasion (*Mnemiopsis leidyi*) in the Black Sea.

Catches of the European pilchard follow the same trend, but seem to be unaffected during the period of decline of the European anchovy. However, a decline of catches can be observed in a later period, namely from 1994 onwards.

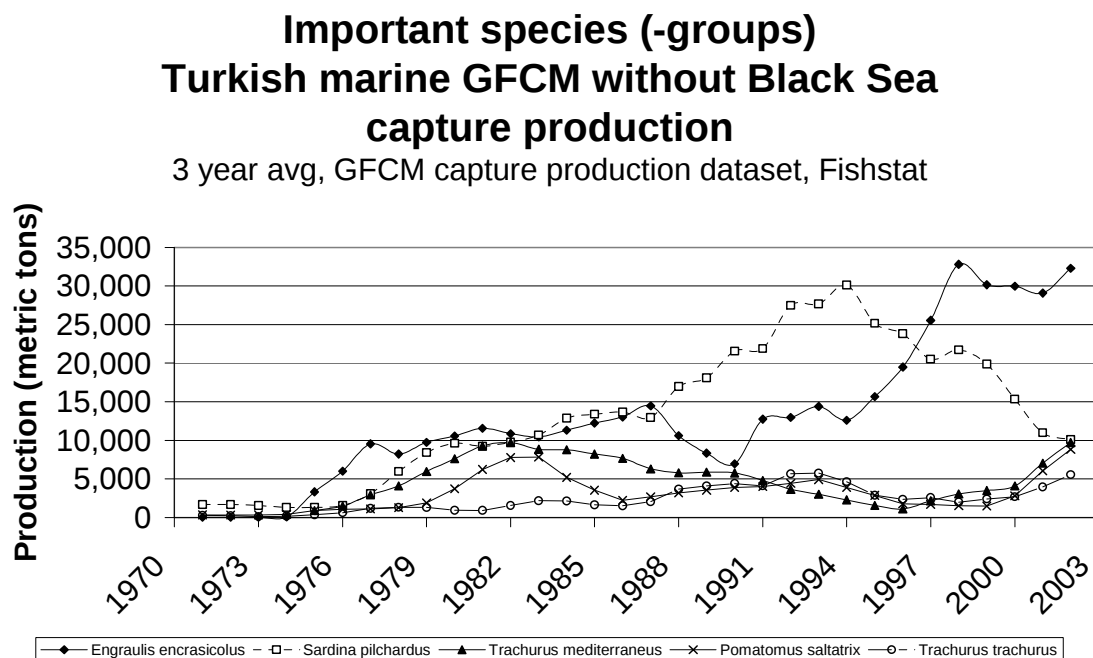


Figure 18 Important species (-groups) Turkey (excluding Black Sea)

From Table 12 it is clear that only a few species are important in the Black Sea fisheries. There are about 500 fish species recorded in the Mediterranean coastal waters, 300 in the Aegean Sea, 200 in the Sea of Marmara and 250 in the Black Sea. Among these species, about 100 species of fish and invertebrates have potential commercial value (Bizsel, 2004). Ninety one percent of the landings are recorded at species level nationally, while, in the Mediterranean area alone, that figure is around 80 percent.

Table 12 Turkey marine capture production 2003, GFCM area (Fishstat, GFCM capture production dataset)

Species (-groups)	Scientific name	Tonne	Without Black Sea
European anchovy	<i>Engraulis encrasicolus</i>	295 000	28 931
Bluefish	<i>Pomatomus saltatrix</i>	22 000	9 691
Striped venus	<i>Chamelea gallina</i>	19 700	8
Mediterranean horse mackerel	<i>Trachurus mediterraneus</i>	16 400	10 681
European pilchard(=Sardine)	<i>Sardina pilchardus</i>	12 000	11 935
Atlantic horse mackerel	<i>Trachurus trachurus</i>	11 600	8 106
Mulletts nei	<i>Mugilidae</i>	11 000	7 289
Mediterranean mussel	<i>Mytilus galloprovincialis</i>	8 100	4 050
Whiting	<i>Merlangius merlangus</i>	8 000	938
Blue whiting(=Poutassou)	<i>Micromesistius poutassou</i>	7 500	7 398
Marine fishes nei	<i>Osteichthyes</i>	6 508	728
Natantian decapods nei	<i>Natantia</i>	6 000	5 982
Atlantic bonito	<i>Sarda sarda</i>	5 999	5 999
Marine molluscs nei	<i>Mollusca</i>	5 534	33
Jellyfishes	<i>Rhopilema spp</i>	4 000	4 000
Atlantic bluefin tuna	<i>Thunnus thynnus</i>	3 300	3 300
Bogue	<i>Boops boops</i>	1 540	1 540
Chub mackerel	<i>Scomber japonicus</i>	1 480	1 443
Red mullet	<i>Mullus barbatus</i>	1 400	894
Great Mediterranean scallop	<i>Pecten jacobaeus</i>	1 300	1 300
Picarels nei	<i>Spicara spp</i>	1 200	913
Shads nei	<i>Alosa spp</i>	1 100	1 034
Surmullet	<i>Mullus surmuletus</i>	1 050	483
Gilthead seabream	<i>Sparus aurata</i>	794	794
Common cuttlefish	<i>Sepia officinalis</i>	785	785
Common octopus	<i>Octopus vulgaris</i>	750	750
Seabasses nei	<i>Dicentrarchus spp</i>	700	683
Silversides(=Sand smelts) nei	<i>Atherinidae</i>	664	664
Sargo breams nei	<i>Diplodus spp</i>	575	509
Red porgy	<i>Pagrus pagrus</i>	550	550
Rays, stingrays, mantas nei	<i>Rajiformes</i>	541	284
Common squids nei	<i>Loligo spp</i>	450	450
Garfish	<i>Belone belone</i>	450	190
Flatfishes nei	<i>Pleuronectiformes</i>	410	409
Gobies nei	<i>Gobiidae</i>	400	366
Smooth-hounds nei	<i>Mustelus spp</i>	400	216
Atlantic mackerel	<i>Scomber scombrus</i>	350	346
Swordfish	<i>Xiphias gladius</i>	350	350
Turbot	<i>Psetta maxima</i>	300	81
European conger	<i>Conger conger</i>	290	290
Scorpionfishes nei	<i>Scorpaenidae</i>	267	158
Leerfish	<i>Lichia amia</i>	262	262
Barracudas nei	<i>Sphyraena spp</i>	250	250
Gurnards, searobins nei	<i>Triglidae</i>	230	224
Salema	<i>Sarpa salpa</i>	230	230
Marine crabs nei	<i>Brachyura</i>	173	173
Lizardfishes nei	<i>Synodontidae</i>	160	160
Saddled seabream	<i>Oblada melanura</i>	150	150
Porgies, seabreams nei	<i>Sparidae</i>	124	124
European flat oyster	<i>Ostrea edulis</i>	120	120
Dusky grouper	<i>Epinephelus marginatus</i>	107	107
Grouper, seabasses nei	<i>Serranidae</i>	94	94

Species (-groups)	Scientific name	Tonne	Without Black Sea
Common dentex	<i>Dentex dentex</i>	90	90
Shi drum	<i>Umbrina cirrosa</i>	77	73
Black seabream	<i>Spondyliosoma cantharus</i>	76	76
Meagre	<i>Argyrosomus regius</i>	75	75
Brown meagre	<i>Sciaena umbra</i>	30	27
Angelsharks, sand devils nei	<i>Squatinae</i>	25	25
European lobster	<i>Homarus gammarus</i>	25	25
John dory	<i>Zeus faber</i>	24	15
Common spiny lobster	<i>Palinurus elephas</i>	11	11
Greater forkbeard	<i>Phycis blennoides</i>	4	4
Total		463 074	126 866

Fishing fleet

Fishing licenses are given according to four gear classes²: purse seine (G), trawl (T), carrier/assistance vessel (Y), and other (D). In addition, combinations of these gears are possible. All small scale/multipurpose vessels are licensed as 'other' (D). The vast majority of the Turkish fishing fleet, almost 90 percent, are licensed as 'other'. Small-scale units typically are worked by two persons; using a vessel of about 8 meters in length, equipped with a 10 – 25 Hp inboard diesel engine. Gear such as trammel nets and long lines are generally used. The other 10 percent of the fleet are vessels registered for trawls or purse seines, or both.

In total, more than 18 500 marine fishing vessels are registered in Turkey. Around 30 percent of all these fishing vessels are registered in the Black Sea, and the same proportion is registered in the Marmara Sea. In the Aegean Sea approximately 20 percent of the vessels are registered. The Mediterranean has the lowest portion, namely 10 percent. The fact that vessels are registered in one province does not mean they cannot migrate to another province or region. In fact, the Turkish fleet (at least the purse seiners and trawlers) is known for its mobility. When the fishing season is closed in the Black Sea, the trawlers and purse seiners move to the Marmara and Aegean Seas to fish. The mobility of the largest part of the fleet (vessels registered with 'other' (D) gear), however, is uncertain, because most of these vessels are too small for transfers.

Gear	Marmara	Black	Aegean	Mediterranean	Total
Other	5 455	5 453	4 042	1 932	16 882
Purse Seine, Trawling	576	256	33	50	915
Purse seine	209	133	58	57	457
Trawler	109	65	37	181	392
Purse seine, Other	18		32	1	51
Trawler, Purse Seine, Other	31	2	1	11	45
Purse Seine, Carrier	2	6	2		10
Trawler, Other	4		7	7	18
Carrier, Trawler				1	1
Total	6 404	5 915	4 212	2 240	18 771

Table 13 **Distribution of the Turkish fishing fleet**

² the letters in brackets give the codes that are part of the fishing vessel license number, which are also printed on the hull of the vessels.

3.5.5 Fisheries administration

Production data

The Fisheries Economics Section (Aquaculture Department, DG Production and Development, Ministry of Agriculture and Rural Affairs (MARA)) keep records of the production data from all fisheries, focusing on inland fisheries and aquaculture. Data were collected on a trial basis for three-month periods in 2004, by provincial MARA staff. Data from small-scale fishermen (vessels smaller than 12 m) are obtained through samples, while data from large vessels are collected through enumeration (logbook) and recall. The data consist of value and quantity landings per vessel per species. These data are aggregated to the provincial level and sent to the Fisheries Economics Section in Ankara.

Fishing vessels

All vessels in Turkey are registered by the Maritime Affairs office of the Prime Ministry. During registration, the owner has to indicate what purpose the vessel will be used for. The office of Maritime Affairs provides the owner with three documents:

- Certificate of registry, given once.
- International Tonnage certificate (1969), given once, or when there are modifications on the vessel
- Certificate of Seaworthiness, given every year

When requested, the office of Maritime Affairs forwards a list of vessels, registered as fishing vessels, to the Fisheries Control Section (Fisheries Department, DG Protection and Control, Ministry of Agriculture and Rural Affairs). To be allowed to go fishing the owner of a vessel has to procure a fishing license for the vessel and fishing licenses for the fishermen. The fishing license for the vessel is awarded when the owner can show the three certificates mentioned above (registry certificate, tonnage certificate, and the certificate of seaworthiness). The vessel has to be registered as a fishing vessel. This license request is made to the provincial directorates, and is handled by the protection and control section of the provincial directorate. This section uses the same software as the fisheries control section (fisheries department, DG protection and control, MARA) in Ankara. This system uses Visual Basic database software and can be updated manually. On request, the provincial directorates supply the fisheries control section in Ankara with data of the new or amended vessels in their database. These data are then processed and put in the central database. Since 2002, no new fishing licenses have been given.

The fisheries control section in Ankara aggregates this data, and supplies the aggregated data to the State Statistical Institute (SSI), which falls under the office of the Prime Ministry. The SSI is the only authority that can publish data. The FAO receives data from the president of the SSI.

Staffing fisheries sector Turkish authorities

MARA Ankara (national)	
DG Production and Development, Fisheries Economics Section	4
DG Protection and Control, Fisheries Control Section	4
MARA Provincial Directorate (in 80 cities, 2 staff per city)	160
MARA future, 3 persons per port in 30 ports	90

A comprehensive overview of the Turkish fisheries administration is given in Figure 19. Worth mentioning is that at present the Ministry of Agriculture and Rural Affairs is undergoing a reorganization, through which a new Directorate General Fisheries and Aquaculture will be formed.

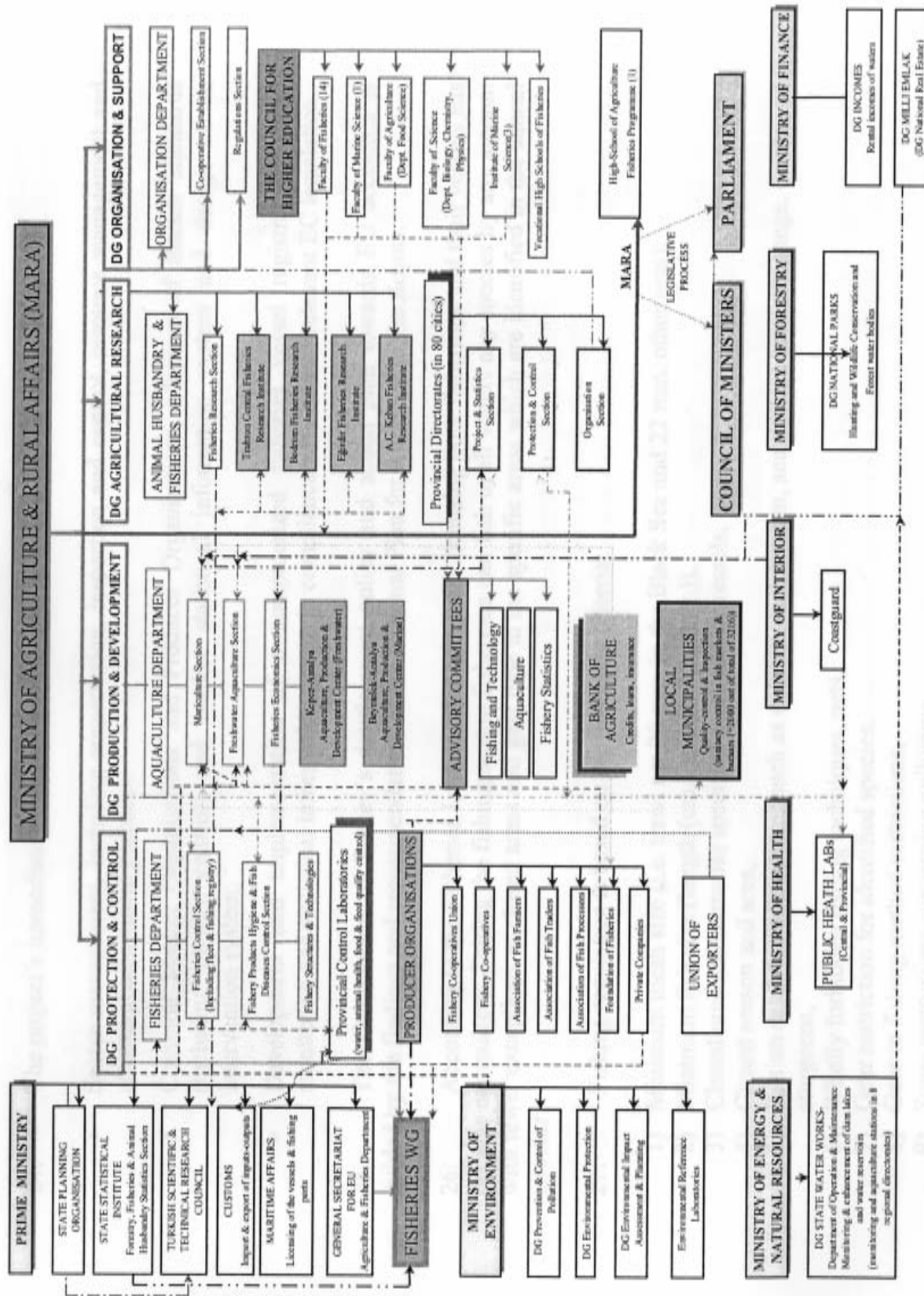


Figure 19 Administration Turkish fisheries

4 The Eastern Mediterranean Sea

4.1 Description

The Mediterranean Sea is a semi-enclosed water body, subject to strong impacts from surrounding catchment basins, with only limited points of exchange with other marine areas: The Strait of Gibraltar to the west, and the man-made Suez Canal to the southeast. There is also a connection between the Black Sea and the Mediterranean Sea through narrow straits: the Dardanelles and the Bosphorus, both opening in the Marmara Sea (Garibaldi and Caddy, 1998). The Mediterranean Sea is considered by many ichthyologists as one of the less productive seas of the world. Due to geophysical and arid climatic conditions, the Eastern Mediterranean is the most oligotrophic part of the sea. (Azov, 1991)

The Eastern Mediterranean area described in this report consists of the Mediterranean and Aegean Seas, and the Sea of Marmara. Compared to the Western Mediterranean, the Eastern Mediterranean is poorer with regards to species diversity, and nutrients. Interesting to note is the apparently different zones in the Eastern Mediterranean with regards to nutrients and species diversity. The Eastern part, or Levant basin, has a lower species diversity than the Aegean and Southern Eastern Mediterranean. Figure 20, indicates species richness distribution over the Mediterranean and the Black Seas, from the richer areas (dark dots) in the West to poorer areas (open dots) in the East and the in Black Sea (Garibaldi and Caddy, 1998)

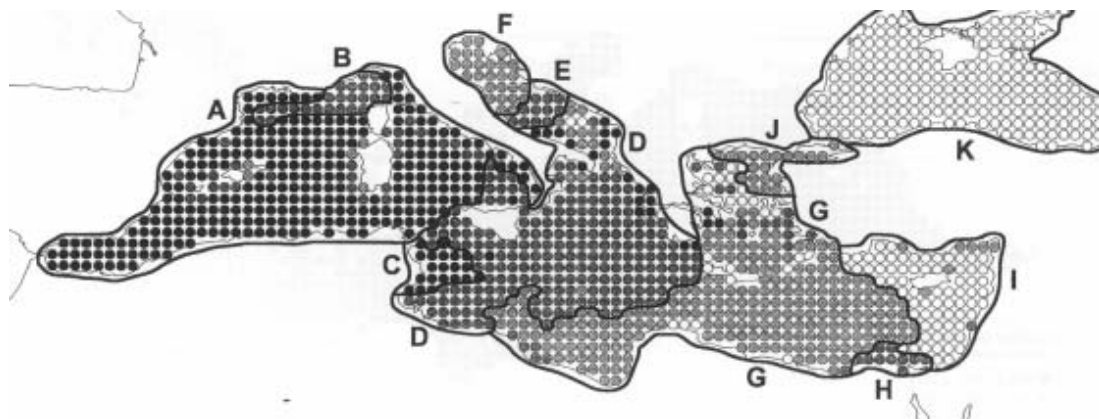


Figure 20 Areas having similar numbers of species (Garibaldi and Caddy, 1998)

This distribution prompted Garibaldi and Caddy (1998) to formulate nine faunal provinces in the Mediterranean and Black Sea (see Figure 21). Garibaldi and Caddy (1998) noted that species richness shows the same negative gradient eastwards as has been observed for nutrients. In this respect, Azov (1991) describes the Eastern Mediterranean as a marine desert. The production part of this observation is supported by the differences in landing records from Turkey, where the production from the Marmara and Aegean Seas is higher than the production from the Mediterranean Sea.

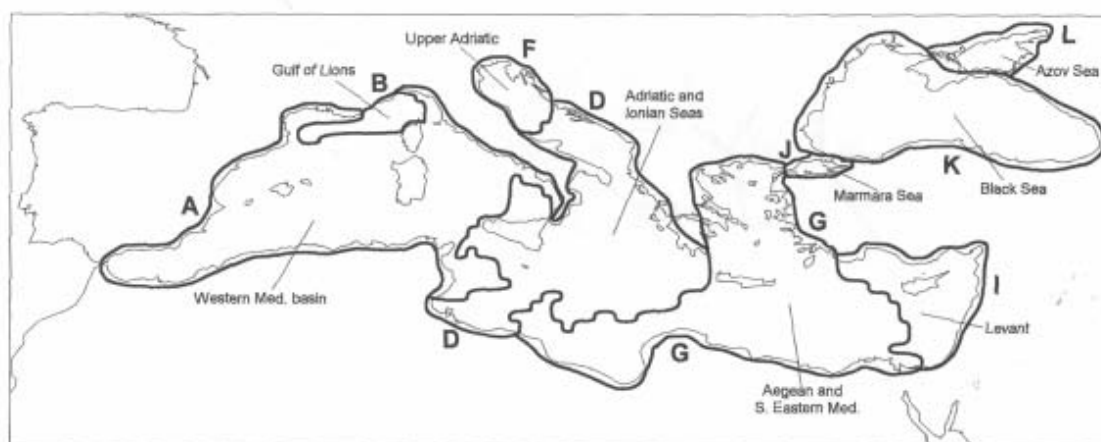


Figure 21 Nine major faunal provinces suggested by examination of richness in species and dissimilarity indices (Garibaldi and Caddy, 1998)

The above figure shows the nine faunal provinces proposed by Garibaldi and Caddy (1998) for the Mediterranean. Worth noting in this respect is that three of the countries (Lebanon, Syria and the Republic of Cyprus) are situated in the poorest province Levant, while two others countries (Egypt and Turkey) fish in this province (Levant) as well as in the Aegean and south Eastern Mediterranean. Apart from the fact that these latter countries have a much longer coastline, their production per km coastline is higher.

Table 14 Fisheries characteristics Eastern Mediterranean countries

	Capture production ¹ (Metric tonne)	Production per km coastline (Metric tonne/km)
Cyprus	1 741	2.2
Egypt	47 031	42.8
Lebanon	3 613	16.4
Syria	3 060	16.7
Turkey	126 866	23.9

¹ 2003 catches in the GFCM area, except Black Sea (Fishstat, GFCM capture production, 2005)

Additional information about these five countries can be found in Table 15, below:

Table 15 Socio-economic indicators for the countries in the Eastern Mediterranean

	Population ¹ * 1 000	Population growth ² (annual %)	Infant mortality rate ^{2, A}	GDP (1 000 US\$) ²	Inflation ¹ (annual %) ²	GNI per capita ^{II} (US\$) ²
Cyprus	802	0.65	4	11 384 560	4.50	12 320
Egypt	71 931	1.77	33	82 427 130	3.77	1 390
Lebanon	3 653	1.26	27	19 000 170	1.30	4 040
Syria	17 800	2.32	16	21 499 030	5.13	1 160
Turkey	71 318	1.55	33	240 375 800	21.29	2 800

¹ (FAOSTAT, 2004)

² (World Bank, 2004a)

^A per 1 000 live births

^I GDP deflator

^{II} Atlas method

4.2 Fisheries

**Total marine capture production
(3-year average) GFCM area (except Black Sea)
Cyprus, Egypt, Lebanon, Syria, Turkey**

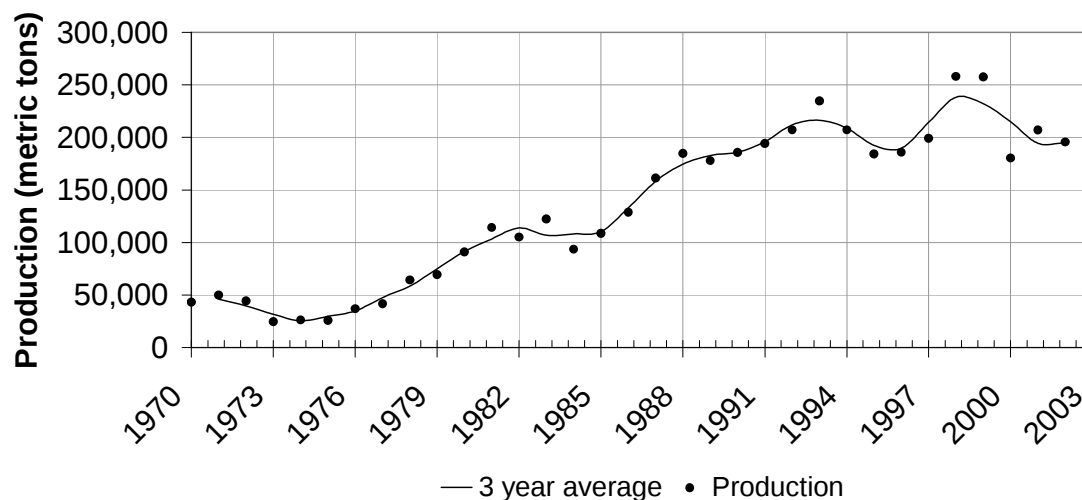


Figure 22 Total marine capture production GFCM area (except Black Sea) (Fishstat, 2005)

The total marine capture production (GFCM area, except the Black Sea) of the Republic of Cyprus, Egypt, Lebanon, Syria, and Turkey was 182 311 tonne in 2003 (see Figure 22).

The marine capture production graph starts with a decline, ending in 1974. This decline was probably due to the operation of the Aswan dam, which had a dramatic effect on *Sardinella spp.* fisheries (Azov, 1991). For example, Egyptian landings of this species-group went from 10 000 tonne in 1962 and 1963 to an average of approximately 800 tonne for the years 1967 – 1976 (Fishstat, 2005).

From 1974 (at less than 50 000 tonne), a steady increase of total capture fisheries production can be observed until 1993 (at approximately 210 000 tonne), after which

the production fluctuates between 190 000 and 245 000 tonne. The first part of the increase, between 1974 and 1977, can be attributed to increases in European anchovy (*Engraulis encrasicolus*). This period was followed by another increase of production of the Mediterranean horse mackerel (*Trachurus mediterraneus*) in the period 1976 – 1981 and by an increase in the bluefish (*Pomatomus saltatrix*) production in 1979 – 1982. Between 1983 and 1985, the catches were stabilized, due to a decline in bluefish production (1983 – 1986), a decline compensated by an increase of European anchovy (1983 – 1987) and sardinellas. The period of stabilization was followed by a period of increase of production, mainly caused by a significant increase in mullets (*Mugilidae*).

The effects of the *Mnemiopsis leidyi* invasion (Gesamp, 1997) (1988 – 1990) can be especially seen in this graph of aggregated figures outside the Black Sea, namely by the reduced rate of increment of the graph in that period.

Finally, the graph peaks in 1993, after which the amount of production fluctuates around 200 000 tonne per year.

Seven species (-groups) account for more than 50 percent of the Mediterranean catch of the year 2003 (see Table 16): European anchovy (*Engraulis encrasicolus*), in 2003 28 931 tonne, or 15.9 percent of the catch from the five countries, Mulletts (*Mugilidae*), 12 159 tonne, or 6.7 percent, European pilchard (*Sardina pilchardus*), 11 942 tonne, or 6.6 percent, Mediterranean horse mackerel (*Trachurus mediterraneus*), 10 681 tonne, or 5.9 percent, sardinellas (*Sardinella spp*), 10 575, or 5.8 percent bluefish (*Pomatomus saltatrix*), 10 111 tonne, or 5.5 percent and Natantian decapods not elsewhere indicated (*Natantia*) 8 455 tonne, or 4.6 percent.

The following two graphs (Figure 23 and Figure 24) show the average landings (of the countries concerned) from the GFCM area (excluding the Black Sea).

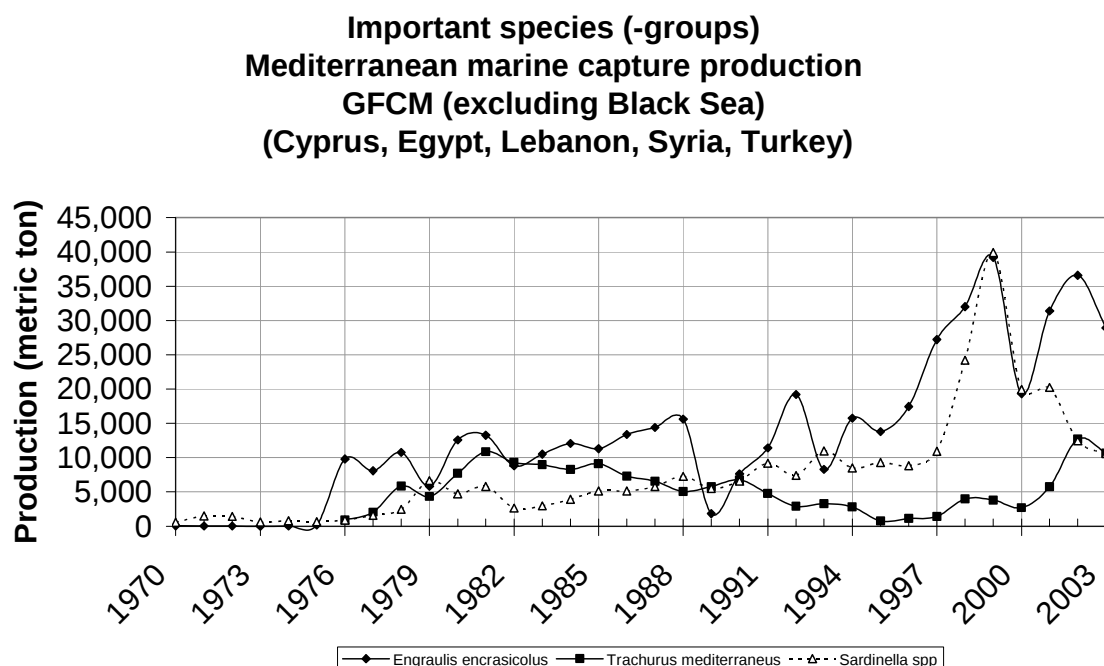


Figure 23 Important species (-groups) in the Eastern Mediterranean Sea 1

**Important species (-groups)
Mediterranean marine capture production
GFCM (excluding Black Sea)
(Cyprus, Egypt, Lebanon, Syria, Turkey)**

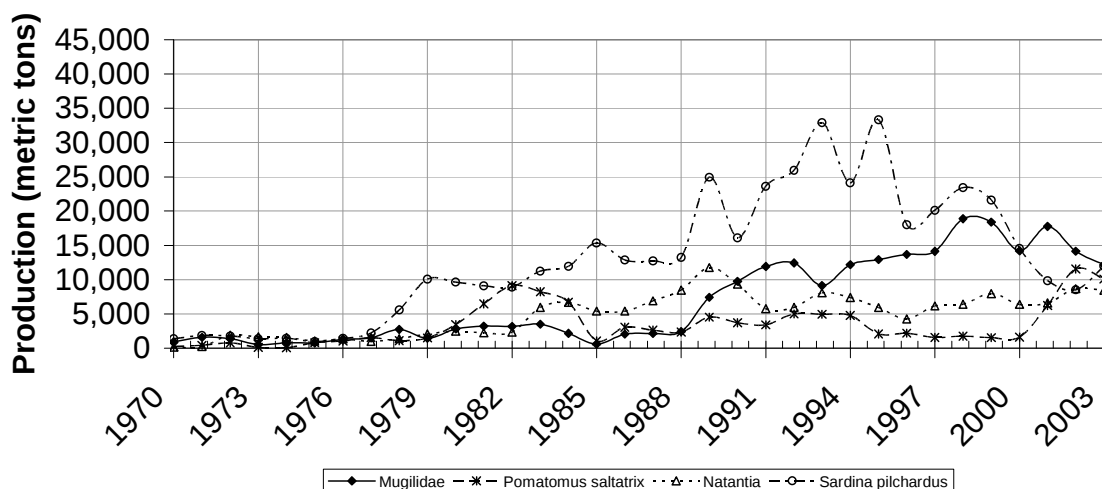


Figure 24 Important species (-groups) in the Eastern Mediterranean Sea 2

Table 16 Mediterranean capture production in 2002 by Cyprus, Egypt, Lebanon, Syria, and Turkey from the GFCM area, except the Black Sea (Fishstat, GFCM capture production dataset)

Species (-groups)	Scientific name	Tonne
European anchovy	<i>Engraulis encrasicolus</i>	28 931
Mulletts nei	<i>Mugilidae</i>	12 159
European pilchard(=Sardine)	<i>Sardina pilchardus</i>	11 942
Mediterranean horse mackerel	<i>Trachurus mediterraneus</i>	10 681
Sardinellas nei	<i>Sardinella spp</i>	10 575
Bluefish	<i>Pomatomus saltatrix</i>	10 111
Natantian decapods nei	<i>Natantia</i>	8 455
Atlantic horse mackerel	<i>Trachurus trachurus</i>	8 197
Blue whiting(=Poutassou)	<i>Micromesistius poutassou</i>	7 398
Atlantic bonito	<i>Sarda sarda</i>	6 783
Silversides(=Sand smelts) nei	<i>Atherinidae</i>	4 274
Mediterranean mussel	<i>Mytilus galloprovincialis</i>	4 050
Jellyfishes	<i>Rhopilema spp</i>	4 000
Marine fishes nei	<i>Osteichthyes</i>	3 728
Atlantic bluefin tuna	<i>Thunnus thynnus</i>	3 604
Bogue	<i>Boops boops</i>	3 116
Marine molluscs nei	<i>Mollusca</i>	2 893
Gilthead seabream	<i>Sparus aurata</i>	1 772
Marine crabs nei	<i>Brachyura</i>	1 629
Picarels nei	<i>Spicara spp</i>	1 583
Cuttlefish,bobtail squids nei	<i>Sepiidae, Sepiolidae</i>	1 541
Barracudas nei	<i>Sphyrnaena spp</i>	1 485
Sharks, rays, skates, etc. nei	<i>Elasmobranchii</i>	1 468

Species (-groups)	Scientific name	Tonne
Chub mackerel	<i>Scomber japonicus</i>	1 444
Surmullets(=Red mullets) nei	<i>Mullus spp</i>	1 438
European seabass	<i>Dicentrarchus labrax</i>	1 404
Groupers nei	<i>Epinephelus spp</i>	1 366
Meagre	<i>Argyrosomus regius</i>	1 327
Red porgy	<i>Pagrus pagrus</i>	1 324
Tuna-like fishes nei	<i>Scombroidei</i>	1 303
Great Mediterranean scallop	<i>Pecten jacobaeus</i>	1 300
Shads nei	<i>Alosa spp</i>	1 034
Red mullet	<i>Mullus barbatus</i>	978
Sargo breams nei	<i>Diplodus spp</i>	964
Lizardfishes nei	<i>Synodontidae</i>	962
Whiting	<i>Merlangius merlangus</i>	938
Spinefeet(=Rabbitfishes) nei	<i>Siganus spp</i>	881
Common cuttlefish	<i>Sepia officinalis</i>	870
Jacks, crevalles nei	<i>Caranx spp</i>	853
Common octopus	<i>Octopus vulgaris</i>	775
Common sole	<i>Solea solea</i>	758
Spotted seabass	<i>Dicentrarchus punctatus</i>	751
Largehead hairtail	<i>Trichiurus lepturus</i>	694
Seabasses nei	<i>Dicentrarchus spp</i>	689
Atlantic mackerel	<i>Scomber scombrus</i>	682
Surmullet	<i>Mullus surmuletus</i>	613
Clupeoids nei	<i>Clupeoidei</i>	600
Porgies, seabreams nei	<i>Sparidae</i>	538
Common squids nei	<i>Loligo spp</i>	450
Flatfishes nei	<i>Pleuronectiformes</i>	417
Carangids nei	<i>Carangidae</i>	400
Swordfish	<i>Xiphias gladius</i>	397
Grey gurnard	<i>Eutrigla gurnardus</i>	379
Gobies nei	<i>Gobiidae</i>	366
Groupers, seabasses nei	<i>Serranidae</i>	356
Scorpionfishes nei	<i>Scorpaenidae</i>	333
Mackerels nei	<i>Scombridae</i>	300
European conger	<i>Conger conger</i>	298
Little tunny(=Atl.black skipj)	<i>Euthynnus alletteratus</i>	290
Rays, stingrays, mantas nei	<i>Rajiformes</i>	284
Gurnards, searobins nei	<i>Triglidae</i>	266
Leerfish	<i>Lichia amia</i>	262
Salema	<i>Sarpa salpa</i>	234
Smooth-hounds nei	<i>Mustelus spp</i>	216
Garfish	<i>Belone belone</i>	190
Marine crustaceans nei	<i>Crustacea</i>	188
Raja rays nei	<i>Raja spp</i>	184
Saddled seabream	<i>Oblada melanura</i>	161
European flat oyster	<i>Ostrea edulis</i>	120
Dusky grouper	<i>Epinephelus marginatus</i>	107
Common dentex	<i>Dentex dentex</i>	106
Greater amberjack	<i>Seriola dumerili</i>	103
White seabream	<i>Diplodus sargus</i>	102
Octopuses, etc. nei	<i>Octopodidae</i>	93
Pandoras nei	<i>Pagellus spp</i>	91
European hake	<i>Merluccius merluccius</i>	81

Species (-groups)	Scientific name	Tonne
Turbot	<i>Psetta maxima</i>	81
Black seabream	<i>Spondyliosoma cantharus</i>	76
Pargo breams nei	<i>Pagrus spp</i>	75
Shi drum	<i>Umbrina cirrosa</i>	73
Scomber mackerels nei	<i>Scomber spp</i>	60
Albacore	<i>Thunnus alalunga</i>	45
Brown meagre	<i>Sciaena umbra</i>	27
Gadiformes nei	<i>Gadiformes</i>	27
Parrotfishes nei	<i>Scaridae</i>	26
Angelsharks, sand devils nei	<i>Squatinae</i>	25
Axillary seabream	<i>Pagellus acarne</i>	25
European lobster	<i>Homarus gammarus</i>	25
Common pandora	<i>Pagellus erythrinus</i>	21
Sand steenbras	<i>Lithognathus mormyrus</i>	20
John dory	<i>Zeus faber</i>	15
Grey triggerfish	<i>Balistes carolinensis</i>	12
Common spiny lobster	<i>Palinurus elephas</i>	11
Striped venus	<i>Chamelea gallina</i>	8
European eel	<i>Anguilla anguilla</i>	6
Flathead grey mullet	<i>Mugil cephalus</i>	6
Deepwater rose shrimp	<i>Parapenaeus longirostris</i>	4
Greater forkbeard	<i>Phycis blennoides</i>	4
Lobsters nei	<i>Reptantia</i>	3
Sponges	<i>Spongidae</i>	1
Total		182 311

Marine capture production GFCM area (except Black Sea) 2003

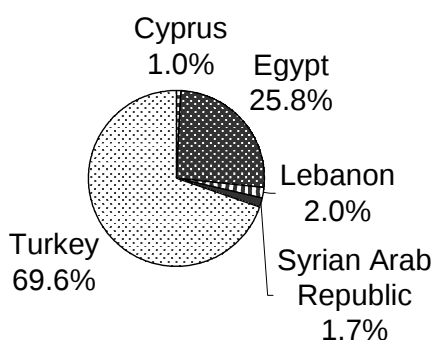


Figure 25 Capture production distribution Eastern Mediterranean (except Black Sea)

Total marine capture fisheries production in 2003 by the five countries reported from the GFCM area (except the Black Sea) was 182 311 tonne. Of this production Turkey was responsible for 126 866 tonne, or 69.6 percent. Egypt produced 46 031 tonne, 25.8 percent followed by Lebanon (3 613 tonne, 2.0 percent), Syria (3 060, 1.7 percent), and the Republic of Cyprus (1 741, 1.0 percent) (Figure 25).

As stated previously in this chapter, the Eastern Mediterranean can be divided into two parts: an Eastern part called Levant, bordered by Lebanon and Syria, with the Republic of Cyprus in the middle and a Western part called Aegean and South Eastern Mediterranean (Garibaldi and Caddy, 1998). The Levant is clearly the area with the lowest production, while the Aegean and South Eastern Mediterranean produce the highest landings (the production of Turkey and Egypt). The low production per km of coastline of Turkey might be explained by the fact that only a small part of the Turkish coast borders the more productive Aegean (and Marmara) Sea, while the largest part of the coast borders the less productive Levant. Nevertheless, Egypt and Turkey (with productions of 54.2 and 23.9 tonne per km coastline) clearly have higher productions, compared to the other three countries. One remark has to be made with respect to the very low value for the Republic of Cyprus, which is not only related to the Republic of Cyprus' position in the poor Levant, but also by the fact that 55 percent of the coastline is not under government control. The result of this is that landings from the related areas are not included in the national statistics.

Table 17 gives the species identification percentage for the countries reported on, and the other countries in the Mediterranean area. The average landings identification listed for the countries not covered by the TCP project is 63.1 percent or, if this is calculated by including the size of the landings (weighted average) 69.6 percent. The overall Mediterranean weighted average (including the countries of the Eastern Mediterranean) is 68.3 percent.

Table 17 Percentages of landings identified to species level

	Percentage of landings identified to species level ¹	Capture production ¹ (Metric tonne)
Cyprus	44	1 741
Egypt	20	47 031
Lebanon	1	3 613
Syria	47	3 060
Turkey	81	126 866
Albania	71	1 537
Algeria	65	141 530
Bosnia and Herzegovina	0	-
Croatia	90	19 938
France	79	48 011
Greece	70	85 472
Israel	31	2 961
Italy	78	273 268
Libya	20	33 005
Malta	87	1 138
Morocco	75	33 250
Serbia and Montenegro	59	489
Slovenia	93	1 087
Spain	63	92 180
Tunisia	65	89 518

¹ 2003 catches in the GFCM area, except Black Sea (Fishstat, GFCM capture production dataset, 2005)

4.3 Fishery products consumption

Table 18, below, gives an overview of the use of fishery products in the Eastern Mediterranean. The production figures are not the same as the figures reported previously, because these figures are total production by the country (including aquaculture, inland capture fisheries, marine capture fisheries outside the

Mediterranean, etc). This might distort the per caput supply of fish somewhat. For instance, if the Cypriot supply is taken as 3 891 tonne, which was the average fish production in 1999 – 2001 from the Mediterranean, and the assumption is made that all fish are being used for consumption, per caput supply would then be around 16 kg/year. These figures can, therefore, be taken only as indicators for the order of magnitude of consumption levels.

Table 18 Fishery products usage overview

Fish and fishery products	Apparent consumption					Average 1999 - 2001	
	Production	Non-food uses	Imports	Exports	Food supply	Population	Per caput supply
	Tonne in live weight.....					thousands	kg/year
Cyprus	62 702	56 945	14 367	771	19 353	783	24.7
Egypt	700 901	63	255 954	1 375	988 462	67 799	14.1
Lebanon	3 965	9	28 138	120	31 974	3 478	9.2
Syria	13 852	0	16 727	16	30 563	16 562	1.8
Turkey	604 725	101 852	33 961	51 746	485 087	68 279	7.1

(FAO, 2004)

4.4 Fishery statistics indicators

Indicators serve to measure the effectiveness of certain actions to achieve objectives. One of the objectives of the MedFisis project in the Eastern Mediterranean is to enable the Eastern Mediterranean countries to participate in the regional fisheries statistics and information system of the GFCM. The first indicator for achieving this is the establishment of a computerized fishing vessel fleet register. The next step would be the establishment of a catch and effort assessment survey. These two indicators can be easily measured, and are, therefore, proposed as indicators for the success of efforts that enable the Eastern Mediterranean countries to participate in the regional fisheries statistics and information system of the GFCM.

Data for fisheries management need to be detailed up to the species level, for at least the commercially important species and for species that serve as environmental indicators. Therefore, the ability of inspectors/data collectors to identify landings at species level is important. In the Mediterranean the average of this percentage is above 60 percent.

Table 19 Eastern Mediterranean fishery statistics indicators

	Computerized vessel registry	fishing	Computerized Catch and effort survey programme	% catch identified to species level
Cyprus	Yes		No	44
Egypt	No		No	20
Lebanon	No		No	1
Syria	No		No	47
Turkey	Yes		No	81

4.5 Life history parameters of GFCM priority species in the Eastern Mediterranean

The Sub-Committee for Stock Assessment (SCSA) of the Scientific Advisory Committee (SAC) of the General Fisheries Commission for the Mediterranean Sea (GFCM) has proposed, for the GFCM, a priority list of species that have economic, ecological and socio-economic importance in the Mediterranean area (see Table 20).

Table 20 Tentative list of GFCM priority species

Scientific name	English Name (ASFIS)
<i>Acipenser gueldenstaedtii</i>	Danube sturgeon(=Osetr)
<i>Acipenser stellatus</i>	Starry sturgeon
<i>Acipenser sturio</i>	Sturgeon
<i>Anguilla anguilla</i>	European eel
<i>Aristaeomorpha foliacea</i>	Giant red shrimp
<i>Aristeus antennatus</i>	Blue and red shrimp
<i>Boops boops</i>	Bogue
<i>Coryphaena hippurus</i>	Common dolphinfish
<i>Eledone cirrosa</i>	Horned octopus
<i>Eledone moschata</i>	Musky octopus
<i>Engraulis encrasicolus</i>	European anchovy
<i>Huso huso</i>	Beluga
<i>Isurus oxyrinchus</i>	Shortfin mako
<i>Lamna nasus</i>	Porbeagle
<i>Loligo vulgaris</i>	European squid
<i>Lophius budegassa</i>	Blackbellied angler
<i>Lophius piscatorius</i>	Angler(=Monk)
<i>Merlangius merlangus</i>	Whiting
<i>Merluccius merluccius</i>	European hake
<i>Micromesistius poutassou</i>	Blue whiting(=Poutassou)
<i>Mullus barbatus</i>	Red mullet
<i>Mullus surmuletus</i>	Surmullet
<i>Nephrops norvegicus</i>	Norway lobster
<i>Pagellus bogaraveo</i>	Blackspot(=red) seabream
<i>Pagellus erythrinus</i>	Common pandora
<i>Palinurus elephas</i>	Common spiny lobster
<i>Palinurus mauritanicus</i>	Pink spiny lobster
<i>Parapenaeus longirostris</i>	Deepwater rose shrimp
<i>Pomatomus saltatrix</i>	Bluefish
<i>Prionace glauca</i>	Blue shark
<i>Psetta maxima</i>	Turbot
<i>Sardina pilchardus</i>	European pilchard(=Sardine)
<i>Sardinella aurita</i>	Round sardinella
<i>Scomber scombrus</i>	Atlantic mackerel
<i>Sepia officinalis</i>	Common cuttlefish
<i>Solea solea</i>	Common sole
<i>Sprattus sprattus</i>	European sprat
<i>Thunnus alalunga</i>	Albacore
<i>Thunnus thynnus</i>	Atlantic bluefin tuna
<i>Trachurus mediterraneus</i>	Mediterranean horse mackerel
<i>Trachurus trachurus</i>	Atlantic horse mackerel
<i>Xiphias gladius</i>	Swordfish

Furthermore, the SCSA has recommended collecting information available for assessment of these species by using standard forms. For each assessment form, data on biological parameters (growth model, length-weight relationship, mortality)

and general information on fishery (catch per gear and associated fleet) are considered indispensable (GFCM, 2000).

Since 2000, the SCSA has noted with concern the scarcity of information on stocks from the eastern part (with the exception of Greece) of the Mediterranean (GFCM, 2000,) and the poor representation of scientists from this area during its meetings (GFCM, 2001). The SCSA recommended updating and improving the quality and coverage of fishery data and statistics to increase the number of assessments in the eastern areas, and to insure that all the assessments will be carried out on a regular basis (GFCM, 2002).

A brief revision of the biological parameters for the priority species (VBGF and length-weight relationship) available in the catch of the countries participating in the MedFisis TCP-project (Cyprus, Egypt, Lebanon, Syria, and Turkey) is summarized in Table 21 and Table 22.

The majority of contributions from Cyprus and Egypt were presented, respectively, by Livadas (1989a; 1989b; 1989c) and Ettewa (1989) during the FAO technical consultation on stock assessment in the eastern Mediterranean, held in Greece in 1988.

Livadas (1989a; 1989b; 1989c) provided some information on reproductive cycles of ***M. barbatus***, ***B. boops*** and ***P. erythrinus*** in the waters of Cyprus. ***M. barbatus*** mature at a length of 9-10 cm, from March to May and the spawning period starts in June and continues in July. ***B. boops*** mature sexually at a length of 12 cm from January to March and the spawning occurs from April to May. At the onset of maturity ***P. erythrinus*** measures about 11 cm, the process of gonad maturity takes place from February to April and spawning is completed by the end of May. For ***P. erythrinus*** Livadas (1989a) also estimated the mortality parameters (Table 24).

Ettewa (1989) evaluated the instantaneous total mortality coefficient of ***M. surmuletus*** for the sexes combined, a total mortality Z value of 0.4 year⁻¹ was obtained.

In Cyprus a tentative assessment of ***M. barbatus***, ***M. surmuletus***, ***B. boops*** and ***P. erythrinus*** was carried out by Hadjistephanou (1992). The author utilized biological parameters estimated by Livadas (1988) for the application of a length cohort analysis and yield per recruit (Table 23). The author highlighted a state of over-exploitation in various degrees for the analyzed species and recommended the adoption of corrective measures.

More recent information on life history parameters comes from Turkey, where Hossuku and Turker Cakir (2003) studied ***P. erythrinus*** in the Edremit bay and estimated rates of mortality (Table 25) suggesting a state of sustainable exploitation of the stock.

Furthermore, in Cyprus in the 1980s one of the few management projects having had some success in the Mediterranean was carried out (Leonart and Mainou, 2003). A ban imposed on fishing during October showed an increase in productivity, whereby catch rates increased by approximately 80 percent, which was called the 'Cyprus-effect' (Garcia and Demetropoulus, 1986).

Table 21 Length-Weight relationships of GFCM priority species in countries participating in the MedFis TCP-project

Country	Species	year	sex	a	b	range	Reference
Cyprus	<i>Boops boops</i>	1980-1984	M+F	0.36521	2.55		Livadas, R. 1988c
		1980-1984	M	0.020180	2.76		Livadas, R. 1988c
		1980-1984	F	0.020730	2.66		Livadas, R. 1988c
	<i>Mullus barbatus</i>	1965-1983	M+F	0.01288	2.94		Livadas, R. 1988b
		1965-1983	M	0.00516145	3.33		Livadas, R. 1988b
		1965-1983	F	0.015789	3.04		Livadas, R. 1988b
	<i>Merluccius merluccius</i>	1970	M+F	0.00587	3.07	15 - 47	Livadas, R. 1989
	<i>Pagellus erythrinus</i>	1985-1986	M+F	0.02355	2.818		Livadas, R. 1988a
		1985-1987	M	0.044874	2.593		Livadas, R. 1988a
		1985-1988	F	0.041975	2.623		Livadas, R. 1988a
Egypt	<i>Engraulis encrasicolus</i>	1998	M+F	0.008	2.86	4.8 - 10.9	Abdallah, M., 2002
		1983	M+F	0.0445198	3.126832		Ettewa, I., 1988
	<i>Mullus barbatus</i>	1998	M+F	0.012	3	3.6 - 15.7	Abdallah, M., 2002
	<i>Mullus surmuletus</i>	1983	M	0.00912	3.04702		Ettewa, I., 1988
		1983	F	0.01215	2.98212		Ettewa, I., 1988
		1998	M+F	0.011	3.03	5.4 - 20.8	Abdallah, M., 2002
	<i>Pagellus erythrinus</i>	1998	M+F	0.016	2.95	2.8 - 19.4	Abdallah, M., 2002
	<i>Sardina pilchardus</i>	1983	M+F	0.004668	3.194819	7.0 - 18.0	Ettewa, I., 1988
	<i>Sardinella aurita</i>	1983	M+F	0.00736	3.0244		Ettewa, I., 1988
		1964-1965	M+F	0.000004315	3.12		Soliman, I.A.M., G.A. Botros, A.M. El-Maghraby, 1970
Turkey	<i>Trachurus trachurus</i>	1998	M+F	0.017	2.8	7.4 - 21.5	Abdallah, M., 2002
	<i>Mullus barbatus</i>		M+F	0.0071	3.29		Kinacigil, H, et al., 2001
		1999-2000	M+F	0.00007	2.738	7.7 - 22.8	Hossucu, B & D.T. Cakir. 2003
	<i>Pagellus erythrinus</i>	1999-2000	M	0.00005	2.7918	7.7 - 22.8	Hossucu, B & D.T. Cakir. 2003
		1999-2000	F	0.0001	2.5804	7.7 - 22.8	Hossucu, B & D.T. Cakir. 2003
	<i>Sardina pilchardus</i>	1993-1996	M+F				Akyol, O, A. Tokac, S. Unsal, 1996
	<i>Xiphias gladius</i>	2001	total				Aliçli, T.Z. & Oray, I.K. 2001

Table 22 Von Betalanffy Growth Function parameters for GFCM priority species in countries participating in the MedFisis TCP-project

Country	Species	year	sex	Linf (cm)	k (yr ⁻¹)	t0 (yr)	φ'	Reference
Cyprus	<i>Boops boops</i>	1980-1984	M+F	24	0.53	-0.45		Livadas, R. 1988c
		1989	M+F	25	0.27	-1.2	2.23	Hadjistephanou, N., 1992
	<i>Mullus barbatus</i>	1965-1983	M+F	25	0.27	-1.2	2.23	Livadas, R. 1988b
		1965-1983	M	22	0.24	-1.2	2.07	Livadas, R. 1988b
		1965-1983	F	28.4	0.18	-1.1	2.16	Livadas, R. 1988b
	<i>Mullus surmuletus</i>	1989	M+F	33.2	0.103	-3.24	2.06	Hadjistephanou, N., 1992
		1989	M+F	30	0.203	-0.62	2.26	Hadjistephanou, N. 1992
	<i>Pagellus erythrinus</i>	1985-1986	M+F	30	0.203	-1.623	2.26	Livadas, R. 1988a
		1985-1987	M	23.45	0.457	-0.843	2.4	Livadas, R. 1988a
		1985-1988	F	27.37	0.197	-2.452	2.17	Livadas, R. 1988a
Egypt	<i>Mullus surmuletus</i>	1983	M	29.8	0.14		2.09	Ettewa, I., 1988
		1983	F	36.9	0.17		2.36	Ettewa, I., 1988
Turkey	<i>Mullus barbatus</i>		M+F	19.036	0.438	-0.777	2.2	Kinacigil, H, et al., 2001
	<i>Pagellus erythrinus</i>	1999-2000	M+F	23.995	0.16	-2.6	1.96	Hossucu, B & D.T. Cakir. 2003
		1999-2000	M	25.278	0.15	-2.77	1.98	Hossucu, B & D.T. Cakir. 2003
		1999-2000	F	19.227	0.3	-0.72	2.04	Hossucu, B & D.T. Cakir. 2003
	<i>Sardina pilchardus</i>	1993-1996	M+F	16.61	0.383	-2.212	2.02	Akyol, O, A. Tokac, S. Unsal, 1996
	<i>Xiphias gladius</i>	2001	total	252.196	0.133	-2.432		Aliçli, T.Z. & Oray, I.K. 2001

Table 23 Mortality and yield per recruit values for four commercial species in Cyprus for the period 1986-1989 (Hadjistephanou, 1992)

	Fishing mortality F (yr ⁻¹)				Total mortality Z (yr ⁻¹)				yield per recruit (g)			
	1986	1987	1988	1989	1986	1987	1988	1989	1986	1987	1988	1989
<i>Mullus barbatus</i>	0.76	0.93	1.65	1.01	1.03	1.20	1.92	1.28	13.62	15.72	13.01	15.32
<i>Mullus surmuletus</i>	0.47	0.57	1.08	0.74	0.82	0.92	1.43	1.09	18.53	18.70	18.34	18.69
<i>Boops boops</i>	0.88	0.60	0.47	0.75	1.13	0.85	0.72	1.00	25.0	27.84	28.90	26.33
<i>Pagellus erythrinus</i>	0.57	1.30	0.48	0.85	1.10	1.83	1.01	1.38	7.71	6.12	9.30	7.10

Table 24 Total (Z), natural (M) and fishing (F) mortality rates of *Pagellus erythrinus* in Cyprus (Livadas, 1988a)

Year	Z (yr ⁻¹)	M (yr ⁻¹)	F (yr ⁻¹)
1965	0.69	0.53	0.16
1966	0.80	0.53	0.27
1967	0.66	0.53	0.13
1968	0.76	0.53	0.23
1969	0.72	0.53	0.19
1970	0.74	0.53	0.21
1971	0.66	0.53	0.13
1972	0.92	0.53	0.39
1973	0.71	0.53	0.18
1980	1.08	0.53	0.55
1985	1.13	0.53	0.60

Table 25 Total (Z), natural (M) and fishing (F) mortality rates of *Pagellus erythrinus* in the Edremit Bay (Turkey) (Hossucu and Turker Cakir, 2003)

	Z (yr ⁻¹)	M (yr ⁻¹)	F (yr ⁻¹)
Males	0.39	0.38	0.02
Females	0.97	0.38	0.60
All	0.76	0.38	0.40

Table 26 Von Betalanffy Growth Function parameters (Linf, k, ϕ') from Fishbase

	Linf (cm)	K (yr ⁻¹)	ϕ'	Number of records	Reference median record
<i>Acipenser gueldenstaedtii</i>	253	0.045	3.46	3	Pauly, D. 1978
<i>Acipenser stellatus</i>	194	0.1	3.28	4	Ceapa, C., Williot, P. and Bacalbasa-Dobrovici, N. 2002
<i>Acipenser sturio</i>					
<i>Anguilla anguilla</i>	72.8	0.3	3.25	25	Rossi, R., Carrieri A., Franzoi P., Cavallini G. and Gnes A., 1988
<i>Boops boops</i>	32	0.3	2.47	5	Mennes, F. 1985
<i>Coryphaena hippurus</i>	153	1.4	4.52	16	Uchiyama, J.H., Burch, R.K. and Kraul, S.A., 1986
<i>Engraulis encrasicolus</i>	17.6	1.3	2.60	30	Samsun, O., Samsun, N. and Karamollaoğlu, A.C. 2004.
<i>Huso huso</i>	468.6	0.019	3.62	7	Belyaeva, V.N., Kazanchev, E.N., and Raspopov V.M. 1989
<i>Isurus oxyrinchus</i>	321	0.1	3.86	3	Claro, R. and García-Arteaga, J.P. 1994
<i>Lamna nasus</i>	280	0.1	3.96	3	Pauly, D. 1980
<i>Lophius budagassa</i>					
<i>Lophius piscatorius</i>	131	0.1	3.35	13	Landa, J. and Pereda, P. 1997
<i>Merlangius merlangus</i>	41.4	0.3	2.63	98	Pauly, D. 1978
					Stergiou, K.I., Christou, E.D., Georgopoulos, D., Zenetos, A. and Souvermezoglou, C. 1997
<i>Merluccius merluccius</i>	63.8	0.1	2.48	38	
<i>Micromesistius poutassou</i>	33.4	0.2	2.41	15	Raitt, D. 1966
<i>Mullus barbatus</i>	24	0.3	2.17	28	Levi, D., Andreoli, M.G. and Rizzo, P. 1992
<i>Mullus surmuletus</i>	27.6	0.3	2.31	10	Djabali, F., Mehailia, A., Koudil, M. and Brahmi, B. 1993
<i>Pagellus bogaraveo</i>					
<i>Pagellus erythrinus</i>	36	0.2	2.46	13	Djabali, F., Mehailia, A., Koudil, M. and Brahmi, B. 1993
<i>Pomatomus saltatrix</i>	94.4	0.2	3.21	5	Barger, L.E. 1990
					Tanaka, S., Cailliet G.M. and Yudin, K.G. 1990
<i>Prionace glauca</i>	350	0.1	4.09	12	
<i>Psetta maxima</i>	54.6	0.307	2.96	17	Robert, F. and Vianet, R. 1988.
<i>Sardina pilchardus</i>	20.3	0.3	2.10	37	Larrañeta, G. 1965
<i>Scomber scomber</i>	40.7	0.3	2.65	17	Erzini, K. 1991
<i>Solea solea</i>	37.4	0.3	2.64	43	Erzini, K. 1991
<i>Sprattus sprattus</i>	14.9	1	2.35	18	Hohendorf, K. 1966
<i>Thunnus alalunga</i>	140	0.1	3.44	28	Beardsley, G.L. 1971
					Djabali, F., Mehailia, A., Koudil, M. and Brahmi, B. 1993
<i>Thunnus thynnus</i>	330	0.1	3.99	18	
<i>Trachurus mediterraneus</i>	26.9	0.7	2.69	4	Djabali, F., Mehailia, A., Koudil, M. and Brahmi, B. 1993
<i>Trachurus trachurus</i>	41.6	0.2	2.53	29	Cubillos, L.S. and Arancibia, H.F. 1994
					Stergiou, K.I., Christou, E.D., Georgopoulos, D., Zenetos, A. and Souvermezoglou, C. 1997
<i>Xiphias gladius</i>	236	0.2	3.98	16	

The parameters reported in Table 26 are the values given in Fishbase, which is the median value of all records. The column 'Number of records' gives the total number of records regarding growth parameters for the species in Fishbase.

Table 27 Length–Weight relationships from Fishbase (median records)

	a	b	Number of records	Reference median record
<i>Acipenser gueldenstaedtii</i>				Chugunov, N.L. and Chugunova, N.I. 1964
<i>Acipenser stellatus</i>	0.0340	2.5843	3	Castelnaud, G., Rochard, E., Jatteau P., and Lepage, M. 1991
<i>Acipenser sturio</i>	0.0095	2.8850	3	De Leo, G.A. and Gatto, M. 1995
<i>Anguilla anguilla</i>	0.0009	3.1800	5	Mennes, F. 1985
<i>Boops boops</i>	0.0145	3.0000	12	Oxenford, H.A. 1985
<i>Coryphaena hippurus</i>	0.0380	2.7800	22	Hémida, F. 1987
<i>Engraulis encrasicolus</i>	0.0040	3.0000	15	Crawford, R. 1993
<i>Huso huso</i>	0.0073	3.0000	3	Ayers, D., Francis, M.P., Griggs L.H. and Baird, S.J. 2004
<i>Isurus oxyrinchus</i>	0.0167	2.8470	5	Ayers, D., Francis, M.P., Griggs L.H. and Baird, S.J. 2004
<i>Lamna nasus</i>	0.0286	2.9240	4	Tsimenides, N. and Ondrias, J.Ch. 1980
<i>Lophius budegassa</i>	0.0130	3.0010	6	Campillo, A. 1992
<i>Lophius piscatorius</i>	0.0240	2.8960	8	Dorel, D. 1986
<i>Merlangius merlangus</i>	0.0062	3.1030	6	Papaconstantinou, C., Petrakis, G. and Fourtouni, A. 1992
<i>Merluccius merluccius</i>	0.0043	3.1590	33	Papaconstantinou, C., Caragitsou, E., Mytilineou, C., Petrakis, G., Vassilopoulou V. and Panou, T. 1988
<i>Micromesistius poutassou</i>	0.0075	3.0270	9	Papaconstantinou, C., Petrakis, G., Mytilineou, C., Politou, C.-Y., Vassilopoulou, V. and Fourtouni, A. 1989
<i>Mullus barbatus</i>	0.0129	3.1100	22	Merella, P., Quetglas, A., Alemany, F., & Carbonell, A. 1997
<i>Mullus surmuletus</i>	0.0082	3.0900	19	Krug, H.M. 1989
<i>Pagellus bogaraveo</i>	0.0124	3.1370	7	Cherabi, O. 1987
<i>Pagellus erythrinus</i>	0.0150	3.0000	35	Haimovici, M. and Velasco, G. 2000
<i>Pomatomus saltatrix</i>	0.0136	2.8990	5	Ayers, D., Francis, M.P., Griggs L.H. and Baird, S.J. 2004
<i>Prionace glauca</i>	0.0030	3.2820	5	Robert, F. and Vianet, R. 1988
<i>Psetta maxima</i>	0.0210	2.9300	9	Voulgaridou, P. & Stergiou, K.I. 1997
<i>Sardina pilchardus</i>	0.0071	3.0600	14	Coull, K.A., Jermyn, A.S., Newton, A.W., Henderson, G.I. & Hall, W.B. 1989
<i>Scomber scomber</i>	0.0038	3.2100	6	Vianet, R., Quignard, J.-P. & Tomasini, J.-A. 1989
<i>Solea solea</i>	0.0062	3.0400	12	Coull, K.A., Jermyn, A.S., Newton, A.W., Henderson, G.I. & Hall, W.B. 1989
<i>Sprattus sprattus</i>	0.0021	3.4750	5	De Metrio, G., Megalofonou, P. & Tsimenides, N. 1989
<i>Thunnus alalunga</i>	0.0418	2.8000	15	Hsu, C.-C., Liu, H.-C., Wu, C.-L., Huang, S.-T. & Liao, H.-K. 2000
<i>Thunnus thynnus</i>	0.0231	2.9340	10	Koutrakis, E.T. & Tsikliras, A.C. 2003
<i>Trachurus mediterraneus</i>	0.0122	2.9080	9	CECAF. 1979
<i>Trachurus trachurus</i>	0.0100	3.0300	16	Griggs, L.H. and Richardson, K. 2005
<i>Xiphias gladius</i>	0.0078	3.2100	14	

4.6 *Lessepsian migration*

4.6.1 Definition

A phenomenon that has a definite effect on eastern Mediterranean fisheries and which can not be ignored is the so-called Lessepsian migration, which is defined as the unidirectional movement of Indo-Pacific organisms into the Mediterranean Sea via the Suez Canal. The term 'Lessepsian' was first used by Por (1964), and is derived from Ferdinand De Lesseps who designed and led the team that built the Suez Canal, thus linking the Red Sea with the Mediterranean. A proposed alternative to the name Lessepsian migration is Erythrean migration, referring to ancient name of the Red Sea.

4.6.2 Description

The opening of the Suez Canal in 1869 allowed entry into the eastern Mediterranean of Indo-Pacific biota, having a significant effect on the community structure and function of the Levantine littoral and infra-littoral zones (Goren & Galil, 2005). Since its opening, at least 300 Indo-Pacific marine species have entered through the Suez Canal into the eastern Mediterranean basin and have established populations. These organisms are known as Lessepsian migrants (Por 1978, Boudouresque 1999, Galil 2000, Bariche et al. 2004). These introductions have produced important changes in the species composition of eastern Mediterranean communities and have resulted in mixed Red–Mediterranean sea communities (Fishelson 2000, Galil 2000). More than 60 fish species of Indo-Pacific origin are reported from the eastern Mediterranean (Golani 2002, Golani et al. 2002, Bariche & Saad, 2005).

4.6.3 Barriers

The low flow rate of water through the Suez Canal just after its opening and the salt deposits on the bottom of what became the Bitter Lakes (from south to north, Little Bitter Lake and Great Bitter Lake) resulted in a salinity that was considerably higher than that of the connected seas at both ends. The salinity was estimated to be between 68 g l^{-1} (Wuest, 1934 in Bariche, 2002) to 75 g l^{-1} (Tillier, 1902 in Bariche, 2002) after the opening of the Canal. These hyper saline conditions acted as a barrier for organisms migrating through the Suez Canal. The Suez Canal was deepened and widened several times, and now has a navigational depth of 14.5 meters and is 365 meters wide (Halim, 1990, see Table 28)

Table 28 **Dimension of the Suez Canal through the years (Halim, 1990)**

	1869	1956	1981
Width at sea surface	52	160	365
Width of navigable channel (m)	44	110	190
Total depth (m)	7.8	12	14.5
Cross-sectional area (m^2)	304	1200	3600

This enlargement of the canal increased its water circulation and salinity gradually decreased in the Bitter Lakes. This has resulted in the disappearance of the salinity barrier. The salinity in the Bitter Lakes would be, nowadays, between 43 and 48 g l^{-1} , which is similar to that of the Gulf of Suez (Miller & Munns, 1974).

In 1964 the Aswan Dam was put into operation, which considerably reduced the water flow of the Nile. Before the construction of the Aswan Dam, the average flow of the Nile was $62 \text{ km}^3 \text{ year}^{-1}$ (minimum $48 \text{ km}^3 \text{ year}^{-1}$, maximum $150 \text{ km}^3 \text{ year}^{-1}$). After 1964, the Nile water flow was reduced to $4 \text{ km}^3 \text{ year}^{-1}$. The high flow of the Nile, before the construction of the dam, had a significant effect on the salinity of the Mediterranean Sea at its outflow. Salinity levels at Port Said fluctuated between 30 and 33.5 g l^{-1} in the period from August to December in the years before the Aswan Dam (Morcos, 1967). The Suez Canal was penetrated from the Mediterranean side by a flow of fresh water during summer (when the Nile floods were at their peak) at that time. This formed an additional barrier for the tropical fauna and flora. It seems however, that the increased salinity in the Eastern Mediterranean (as a consequence of the reduced water flow from the Nile) in itself supports the Lessepsian migration (Por, 1978).

Other barriers of the Suez Canal were high water temperature and turbidity in the Canal. These factors were significantly reduced with the enlargement of the Canal.

4.6.4 Effects on the fisheries in the Eastern Mediterranean

Data on the life histories and ecological relationship of native and invasive species are scarce. However, changes have occurred in the exploitation of fish stocks; the abundance of some native species has declined and there has been an increased abundance of Lessepsian species. Competition within the same ecological niche and direct interference are among the possible explanations for the successful colonization (Golen and Galil, 2005).

Since the early 20th century, various authors witnessed the increase of non-native species along the Levantine shores and in fish markets. By the mid-1990s, Lessepsian species had become an important part of Levantine fisheries. Nearly half of the trawl catches along the Israeli coast consist of Lessepsian fish (Golani and Ben Tuvia, 1995), as well as a significant portion of the trawl catch in the Bay of Mersin, on the south-eastern Turkish coast (Gücü, 1993). Furthermore, it has been reported that the increasing exploitation of non-native species caused a shift of the trawl fishing ground towards shallower waters where their biomass density is highest (i.e. at bottom depth up to 50 m), and a consequent increase of the ratio of non-native to native species in Levantine trawl landings (Pisanti and Grofit, 1991).

Some of the species successfully established and commercially important in Levantine fisheries are listed in Table 29.

Table 29 Lessepsian species commercially important in Levantine fisheries (CIESM, 2005)

Fishes	Crustaceans
<i>Sargocentron rubrum</i> (Forsskål, 1775)	<i>Metapenaeus monoceros</i> (Fabricius, 1798)
<i>Scomberomorus commerson</i> (Lacepède, 1800)	<i>Penaeus japonicus</i> (Monod, 1930)
<i>Siganus luridus</i> (Rüppell, 1828)	<i>Portunus pelagicus</i> (Linnaeus, 1758)
<i>Sillago sihama</i> (Forsskål, 1775)	
<i>Sphyræna chrysotaenia</i> (Klunzinger, 1884)	
<i>Upeneus moluccensis</i> (Bleeker, 1855)	
<i>Upeneus pori</i> (Ben-Tuvia and Golani, 1989)	

4.7 *Status of data collection and data processing system*

Landing statistics from the GFCM area are collected by the Fishery Data, Information and Statistics Unit (FIDI) of the Fishery department of the FAO using the STATLANT37A form. Countries are requested to report on landings (except for tuna landings, which are reported separately) per division or subarea of the Mediterranean Sea. The STATLANT37A form can be downloaded from: <ftp://ftp.fao.org/fi/STAT/e-questionnaires/STATLANT/>. The STATLANT37A form also contains a map depicting the different divisions and sub-areas.

5 References

- Abdallah, M.** 2002. Length-Weight Relationship of Fishes Caught by Trawl off Alexandria, Egypt. **NAGA, The ICLARM Quarterly** (Vol. 25, No. 1) January - March 2002
- Akyol, O. Tokac, A. & Unsal, S.** 1996. An investigation on the growth and reproduction characteristics of the sardine (*Sardina pilchardus* Walbaum, 1792) in the bay of Izmir (Aegean Sea). **Su Urun.Derg./J.Fish. Aquat. Sci.** Vol 13, no 3-4, 383-394.
- Aliçli, T.Z. & Oray, I.K.** 2001. Age and growth of swordfish (*Xiphias gladius* L., 1758) in the eastern Mediterranean Sea. **Col. Vol. Sci. Pap. ICCAT** 52:698-707
- Anonymous,** 2004. Fisheries Sector Review of Turkey. Preparatory report for EU Acquis of Turkey project. 27 pp.
- Ayers, D., Francis, M.P., Griggs L.H. & Baird, S.J.** 2004. Fish bycatch in New Zealand tuna longline fisheries, 2001-01 and 2001-02. **New Zealand Fisheries Assessment Report 2004/46**, 47 p
- Azov, Y.** 1991. Eastern Mediterranean – a Marine Desert? **Marine Pollution Bulletin**, Vol. 23, 225 - 232
- Barger, L.E.** 1990. Age and growth of bluefish *Pomatomus saltatrix* from the northern Gulf of Mexico and U.S. south Atlantic coast. **Fish. Bull.** 88:805-809
- Bariche, M.** 2002. Biologie et écologie de deux espèces lessepsiennes (*Siganus rivulatus* et *Siganus luridus*, Téléostéens, Siganidae) sur les côtes du Liban. Thèse de doctorat, Université de la Méditerranée (Aix-en-Marseille II), 223pp.
- Bariche, M. Letourneur Y. & Harmelin-Vivien M.** 2004. Temporal Fluctuations and Settlement Patterns of Native and Lessepsian Herbivorous Fishes on the Lebanese Coast (Eastern Mediterranean) **Environmental Biology of Fishes**, Volume 70, Number 1, May 2004, 81-90
- Bariche, M. & Saad, M.** 2005. Settlement of the Lessepsian blue-barred parrotfish *Scarus ghobban* (Scaridae) in the Mediterranean. **JMBA2 – Biodiversity records**, online publication (available at: www.mba.ac.uk/jmba/pdf/5049.pdf)
- Beardsley, G.L.** 1971. Contribution to the population dynamics of Atlantic albacore with comments on potential yields. **Fish. Bull.** 69:845-857
- Belyaeva, V.N., Kazanchev, E.N., & Raspopov V.M.** 1989. The Caspian Sea: Ichthyofauna and commercial resources. Moscow, Nauka, 236 p.
- Bizsel, K.C.** 2004. The present status of fishery and information system in Turkey. TCP/INT/2904/TD-4.4. MedFisis Technical Document No. 4.4. Rome.
- Boudouresque, C.F.** 1999. The Red Sea–Mediterranean link: Unwanted effects of canals. pp. 213–228. *In*: O.T. Sandlund, P.J. Schei & Å. Viken (ed.) **Invasive Species and Biodiversity Management**, Kluwer Academic Publishers, Dordrecht.

- Campillo, A. 1992. **Les pêcheries françaises de Méditerranée: synthèse des connaissances**. Institut Français de Recherche pour l'Exploitation de la Mer, France. 206 p
- Castelnaud, G., Rochard, E., Jatteau P., & Lepage, M. 1991. Données actuelles sur la biologie d'*Acipenser sturio* dans l'estuaire de la Gironde. p. 251-275. *In*: P. Williot (ed.) **Acipenser, Actes du Premier colloque international sur l'esturgeon**, Bordeaux, 3-6 Octobre 1989. CEMAGREF Publ
- Ceapa, C., Williot, P. & Bacalbasa-Dobrovici, N. 2002. Present state and perspectives of stellate sturgeon brood fish in the Romanian part of the Danube.. **Internat. Rev. Hydrobiol.** 87(5-6):507-513.
- CECAF. 1979. Report of the ad hoc working group on west African coastal pelagic fish from Mauritania to Liberia (26°N to 5°N). **CECAF/ECAF Ser. 78/10**, 161 p. FAO, UNDP, Rome
- Cherabi, O. 1987. **Contribution à l'étude de la biologie du pageot commun *Pagellus erythrinus* (Linné, 1758) et à l'écologie de la famille des Sparidés de la baie d'Alger**. Université des Sciences et de la Technologie Houari Boumedinne, Algeria, 203 p. Thèse de Magister.
- Chugunov, N.L. & Chugunova, N.I. 1964. Comparative commercial and biological characteristics of sturgeons of the Azov Sea. **Trudy VNIRO** 52: 87-182
- CIA. 2005. The world factbook. Available at:
<http://www.cia.gov/cia/publications/factbook/index.html>
- CIESM, 2005. Atlas of exotic species in the Mediterranean. Available at:
<http://www.ciesm.org/atlas>.
- Claro, R. & García-Arteaga, J.P. 1994. Crecimiento. p.321-402. *In*: R. Claro (ed.) **Ecología de los peces marinos de Cuba. Instituto de Oceanología Academia de Ciencias de Cuba and Centro de Investigaciones de Quintana Roo (CIQRO), México**
- Coull, K.A., Jermyn, A.S., Newton, A.W., Henderson, G.I. & Hall, W.B. 1989. Length/weight relationships for 88 species of fish encountered in the North Atlantic. **Scottish Fish. Res. Rep.** (43):80 p.
- Crawford, R. 1993. **World record game fishes** 1993. The International Game Fish Association, Pompano Beach, Florida
- Cubillos, L.S. & Arancibia, H.F. 1994. Comparative growth performance of jack mackerels of the genus *Trachurus*, with emphasis on *T. symmetricus murphyi* in Chile. **Naga ICLARM Q.** 17(2):32-35
- De Leo, G.A. & Gatto, M. 1995. A size and age-structured model of the European eel (*Anguilla anguilla* L.). **Can. J. Fish. Aquat. Sci.** 52:1351-1367
- De Metrio, G., Megalofonou, P. & Tsimenides, N. 1989. Fisheries for large scombrids in Greek waters: catches of *Thunnus alalunga* (Bonn 1788). **FAO Fish. Rep.** 412:146-152.

Djabali, F., Mehailia, A., Koudil, M. & Brahmi, B. 1993. Empirical equations for the estimation of natural mortality in Mediterranean teleosts. **Naga ICLARM Q.** 16(1):35-37

DOALOS. 2005. Table of claims to maritime jurisdiction (as at 31 March 2004) Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations, New York, USA. Available at:
<http://www.un.org/Depts/los/LEGISLATIONANDTREATIES/asia.htm>

Dorel, D. 1986. **Poissons de l'Atlantique nord-est relations taille-poids**. Institut Francais de Recherche pour l'Exploitation de la Mer

Erzini, K. 1991. A compilation of data on variability in length-age in marine fishes. **Fisheries Stock Assessment, Title XII**, Collaborative Research Support Program, University of Rhode Island. Working paper 77, 36p

Ettewa, I. 1989. Report on the Egyptian fisheries focussing on the Mediterranean. **In:** FAO Fisheries report, no. 412, pp 164-172. General Fisheries Council for the Mediterranean. **Report of the second technical consultation on stock assessment in the Eastern Mediterranean, Athens Greece, 28 March - 1 April 1988**, Savini, M., Caddy, J.F. (eds)

FAO. 2004. FAO Yearbook. Fishery statistics. Commodities/Annuaire FAO. Vol. 95. Rome, FAO. 2004. 224 pp.

FAO. 2006. Map of Major Fishing Areas. Available at:
ftp://ftp.fao.org/fi/maps/world_2003.gif

FAOSTAT. 2004. Available at:
<http://faostat.fao.org/faostat/servlet/XteServlet3?Areas=50&Areas=59&Areas=121&Areas=212&Areas=223&Items=3008&Elements=511&Years=2004&Years=2003&Years=2002&Years=2001&Years=2000&Format=Table&Xaxis=Years&Yaxis=Countries&Aggregate=&Calculate=&Domain=SUA&ItemTypes=Population&language=EN¯oDomain=SUA+data¯oData=Population+data> (last updated February 2004)

Fishelson, L. 2000. Marine animal assemblages along the littoral of the Israeli Mediterranean seashore: The Red-Mediterranean Seas communities of species. **Ital. J. Zool.** 67: 393–415.

Fishstat. 2005. FAO Fishery department, Fishery Information, Data and Statistics Unit. Fishstat Plus: Universal software for fishery statistical time series. Version 2.3 2000. GFCM capture production 1970 – 2002

GAFRD. 2003. Annual statistical report 2002, General Authority for Fish Resources Development, Ministry of Agriculture and Land Reclamation, Cairo

Galil, B.S. 2000. A sea under siege – alien species in the Mediterranean. **Biol. Inv.** 2: 177–186.

Garcia, S. & Demetropoulos, A. 1986. Management of Cyprus fisheries. FAO Fisheries Technical Paper. No.250. Rome. FAO. 41p

Garibaldi, L. & Caddy, J.F. 1998. Biogeographic characterization of Mediterranean and Black Seas faunal provinces using GIS procedures. ***Ocean Coast. Manage.*** Vol. 39, no. 3, pp. 211-227.

GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). 1997. Opportunistic settlers and the problem of the ctenophore ***Mnemiopsis leidyi*** invasion in the Black Sea. ***Rep.Stud.GESAMP***, (58):84 p

GFCM. 2000. General Fisheries Commission for the Mediterranean (GFCM). Report of the Second Stock Assessment Sub-Committee (SCSA) meeting, Madrid, Spain, 26-28 April 2000

GFCM. 2001. General Fisheries Commission for the Mediterranean (GFCM). Report of the Third Stock Assessment Sub-Committee (SCSA) meeting, FAO Headquarters, Rome, 15 – 18 May 2001.

GFCM. 2002. General Fisheries Commission for the Mediterranean (GFCM). Report of the Fourth Stock Assessment Sub-Committee (SCSA) meeting, Barcelona, Spain, 6-9 May 2002.

Golani, D. 2002. The Indo-Pacific striped eel catfish, ***Plotosus lineatus*** (Thunberg, 1787), (Osteichthyes: Siluriformes) a new record from the Mediterranean. ***Sci. Mar.*** 66: 321–323.

Golani, D. 1998. Impact of Red Sea Fish Migrants through the Suez Canal on the Aquatic Environment of the Eastern Mediterranean. ***In:*** Jeff Albert, Magnus Bernhardsson, and Roger Kenna (editors), ***Transformations of Middle Eastern Natural Environments: Legacies and Lessons***, Yale School of Forestry & Environmental Studies. Bulletin Number 103. 498 pp.

Golani, D. & Ben Tuvia, A. 1995. Lessepsian migration and the Mediterranean fisheries of Israel. ***In:*** Armantrout, N.B. (ed.) ***Condition of the world's aquatic habitats. Proc. World Fisheries Congress. Theme 1.*** Science Publishers, Lebanon, New Hampshire, pp. 279-289.

Golani, D., Orsi-Relini, L. Massutí, E. & Quignard, J.-P. 2002. ***CIESM Atlas of Exotic Species in the Mediterranean. Vol. 1. Fishes.*** Monaco: CIESM Publishers. 256 pp.

Goren, M. & Galil, B. S. 2005 A review of changes in the fish assemblages of Levantine inland and marine ecosystems following the introduction of non-native fishes. ***Journal of Applied Ichthyology*** 21 (4), 364-370.

Griggs, L.H. and Richardson, K. 2005. New Zealand tuna fisheries, 2001 and 2002. ***N.Z. Fish. Assess. Rep.*** 2005/4. 58 p.

Gücü, A., Bingel, F., Avşar, D., Uysal, N. 1993. Distribution and occurrence of Red Sea fish at the Turkish Mediterranean coast-northern Sicilian Basin. ***Acta Adriat.*** 34, pp 103-113.

Hadjistephanou, N. 1992. Assessment of five demersal marine fish stocks of Cyprus for the year 1989. **FAO Fisheries Report**, no 477, pp 23 - 34, General Fisheries Council for the Mediterranean. Report of the 4th session of the Technical Consultation.

Hadjistephanou, N & Vassiliades, L. 2004. The present status of fishery and information system in Cyprus. TCP/INT/2904/TD-4.2. MedFisis Technical Document No. 4.2: 55pp.

Haimovici, M. and Velasco, G. 2000. Length-weight relationships of marine fishes from southern Brazil. **Naga ICLARM Q.** 23(1):19-23

Halim, H. 1990. On the potential of Indo-Pacific plankton through the Suez Canal. **Bulletin de l'Institut Océanographique**, Monaco, Numéro spécial 7. A propos des migrations lessepsiennes, 11 – 27.

Hémida, F. 1987. **Contribution à l'étude de l'anchois: *Engraulis encrasicolus* (Linné, 1758) dans la région d'Alger. Biologie et exploitation.** USTHB. Alger. 138 p. Thèse de Magister

Hohendorf, K. 1966. Eine Diskussion der von Bertalanffy Funktionen und ihre Anwendung zur Charakterisierung des Wachstums von Fischen. **Kieler Meeres.** 22:70-97

Hossucu, B & Cakir, D.T. 2003. Some parameters about population biology of the common pandora (*Pagellus erythrinus* L., 1758)(Sparidae) in the Edremit Bay (Turkey). **Su Urun.Derg./J.Fish. Aquat. Sci.** 20(3-4), pp 329-336. Ege University Press, Izmir, Turkey

Hsu, C.-C., Liu, H.-C., Wu, C.-L., Huang, S.-T. & Liao, H.-K. 2000. New information on age composition and length-weight relationshi of bluefin tuna, *Thunnus thynnus*, in the southwestern North Pacific. **Fish. Sci.** 66(3):485-493.

Kinacigil, H., Ilkyaz, A. Akyol, O. Metin, G. Cira, E. & Ayaz, A. 2001. Growth parameters of red mullet (*Mullus barbatus* L., 1758) and seasonal cod-end selectivity of traditional bottom trawl nets in Izmir bay (Aegean Sea). **Acta Adriatica**, vol. 42, no. 1, pp 113-123

Kelleher, M.K. 1996. Preliminary fisheries sector study with particular reference to policy, planning and management of fisheries. A report prepared for the assistance to artisanal fisheries project. TCP/SYR/4552(A). FAO, Rome, 1996

Koutrakis, E.T. & Tsikliras, A.C. 2003. Length-weight relationships of fishes from three northern Aegean estuarine systems (Greece). **J. Appl. Ichthyol.** 19:258-260.

Krouma, I. 2005. The present status of fishery and information system in Syria. TCP/INT/2904/TD-4.5. MedFisis Technical Document No 4.5. (in preparation)

Krug, H.M. 1989. The Azorean blackspot seabream, *Pagellus bogaraveo* (Brunnich 1768) (Teleostei: Sparidae): age and growth. **Cybiu** 13:347-355

- Landa, J. & Pereda, P.** 1997. Growth of white monkfish (*Lophius piscatorius* L.) in the northern Spanish continental shelf (ICES Divisions VIIIc and IXa). *ICES C.M.* 1997/CC:07
- Larrañeta, G.** 1965. Les constantes de la croissance de la sardine de Castellon.. *Proc. Gen. Fish. Coun. Médit.* 8:273-276.
- Levi, D., Andreoli, M.G. & Rizzo, P.** 1992. Growth curves from representative samples of fish populations as possible hints for the identification of unit stocks. The case study of red mullet from the Sicilian Channel. p. 299-306. *In:* G. Colombo, I. Ferrari, V.U. Ceccherelli and R. Rossi (eds.) **Marine eutrophication and population dynamics**. 25th European Marine Biology Symposium, Inst. Zoology, Univ. Ferrara. Int. Symp. Series.
- Livadas, R.** 1988a. A study of the biology and population dynamics of pandora (*Pagellus erythrinus* L, 1758), Family Sparidae, in the seas of Cyprus. *In:* Savini, M., Caddy, J.F. (eds) **FAO Fisheries report, no 412**, pp 58-76, General Fisheries Council for the Mediterranean. Report of the second technical consultation on stock assessment in the Eastern Mediterranean, Athens Greece, 28 March - 1 April 1988,
- Livadas, R.** 1988b. A study of the growth and maturity of striped mullet (*Mullus barbatus* L.) in waters of Cyprus. *In:* Savini, M., Caddy, J.F. (eds), **FAO Fisheries report, no 412**, pp 44-51, General Fisheries Council for the Mediterranean. Report of the second technical consultation on stock assessment in the Eastern Mediterranean, Athens Greece, 28 March - 1 April 1988
- Livadas, R.** 1988c. The growth and maturity of bogue (*Boops boops* L.) Family Sparidae, in waters of Cyprus. *In:* Savini, M., Caddy, J.F. (eds), **FAO Fisheries report, no 412**, pp 44-51, General Fisheries Council for the Mediterranean. Report of the second technical consultation on stock assessment in the Eastern Mediterranean, Athens Greece, 28 March - 1 April 1988
- Livadas, R.** 1989. Contribution to the knowledge of the biology and population dynamics of Hake (*Merluccius merluccius* L.) Family Gadidae, in Cyprian waters. **Thalassographica**. Volume 11/1 p 65-77.
- Lleonart, J. & Mainou, F.** 2003. Fish stock assessments in the Mediterranean: state of the art. *Sci. Mar.*, 67 (Suppl. 1): 37-49.
- Majdalani, S.** 2004. The present status of fishery and information system in Lebanon. TCP/INT/2904/TD-4.1. MedFis Technical Document No. 4.1: 45pp
- Mennes, F.** 1985. Multispecies assessment of fish stocks off the Western Sahara region with emphasis on the family Sparidae. **Fishbyte** 3(3):5-10.
- Merella, P., Quetglas, A., Alemany, F., & Carbonell, A.** 1997. Length-weight relationship of fishes and cephalopods from the Balearic Islands (western Mediterranean). **Naga ICLARM Q.** 20(3/4):66-68
- Miller, A.R. & Munns, R.G.** 1974. The Bitter Lake salt barrier. **L'Océanographie physique de la Mer Rouge (Physical oceanography of the Red Sea)**. No 2, [publ. CNEXO (Actes Colloq.)]

- Oxenford, H.A. 1985. ***Biology of the dolphinfish Coryphaena hippurus and its implications for the Barbadian fishery***. Ph.D. thesis, University of the West Indies, Cave Hill, Barbados. 366 p
- Pisanty, S. & Grofit, E. 1991. Limiting effort in the Israeli trawl fishery. ***Fish. Fishbreed. Israel***. Vol. 24, no. 2, pp. 100-113.
- Papaconstantinou, C., Petrakis, G. & Fourtouni, A. 1992. A preliminary study on the fishery biology of hake in the Aegean Sea. ***FAO Fish. Rep.*** 477:139-149
- Papaconstantinou, C., Petrakis, G., Mytilineou, C., Politou, C.-Y., Vassilopoulou, V. & Fourtouni, A. 1989. ***Fisheries investigations on the demersal fishes of the Evvoikos and Pagasitikos Gulfs***. National Centre for Marine Research, Athens, Hellas, Technical Report November 1989. (In Hellenic).
- Papaconstantinou, C., Caragitsou, E., Mytilineou, C., Petrakis, G., Vassilopoulou V. & Panou, T. 1988. ***Demersal fish population dynamics in Patraikos and Korinthiakos Gulfs, the Ionian Sea***. National Centre for Marine Research, Athens, Hellas, Special Publications 16. (In Hellenic).
- Pauly, D. 1978. A preliminary compilation of fish length growth parameters. ***Ber. Inst. Meereskd.*** Christian-Albrechts-Univ. Kiel (55):1-200.
- Pauly, D., 1980. On the interrelationships between natural mortality, growth parameters, and mean environmental temperature in 175 fish stocks. ***J. Cons. Int. Explor. Mer.*** 39(2):175-192.
- Por, F.D. 1964 A study of the Levantine and Pontic Harpacticoida (Crustacea, Copepoda). ***Zool. Verh. Rijksmus.*** Nat. Hist. Leiden 64, 1 -128
- Por, F.D. 1978. Lessepsian migration: the influx of Red Sea biota into the Mediterranean by way of the Suez Canal. ***Ecol. Studs.*** no. 23, Springer – Verlag, Berlin Heidelberg. 228 p
- Por, F. D. 1990. Lessepsian migration. An appraisal and new data. ***Bull. Inst. Oceanogr.*** Monaco. Special, 7, 1-10
- Raitt, D. 1966. The biology and commercial potential of the blue whiting (*Micromesistius poutassou*) in the Northeast Atlantic. ***ICES Symp. Ecology of Pelagic Fishes in Arctic Waters***.
- Robert, F. & Vianet, R. 1988. Age and growth of *Psetta maxima* (Linné, 1758) and *Scophthalmus rhombus* (Linné, 1758) in the Gulf of Lion (Mediterranean). ***J. Appl. Ichthyol.*** 4(3):111-120
- Rossi, R., Carrieri A., Franzoi P., Cavallini G. & Gnes A. 1988. A study of eel (*Aguilla anguilla* L.) population dynamics in the Comacchio lagoons (Italy) by mark-recapture method. ***Oebalia XIV***, N.S.: 1-14
- Samsun, O., Samsun, N. & Karamollaoğlu, A.C. 2004. Age, growth, and mortality rates of the European anchovy (*Engraulis encrasicolus* L. 1758) off the Turkish Black Sea coast. ***Turk. J. Vet. Anim. Sci.*** 28:901-910

- Seham, F.A. & Salem, A.M.** 2004. The present status of fishery and information system in Egypt. TCP/INT/2904/TD-4.3. MedFisis Technical Document No. 4.3: 31pp.
- Soliman, I.A.M., Botros, G.A. El-Maghraby, A.M.** 1970. Length-weight relationships and coefficient of condition for *Sardinella maderensis*, Lowe and *Sardinella Aurita* Cuv. & Val. From the Mediterranean Sea at Alexandria (U.A.R.). **Bull. Inst. Oceanogr.** Fish. UAR; Vol 1, pp 27 - 45.
- Stergiou, K.I., Christou, E.D., Georgopoulous, D., Zenetos, A. & Souvermezoglou, C.** 1997. The Hellenic seas: physics, chemistry, biology and fisheries.. p. 415-538. **In:** A.D. Ansell, R.N. Gibson and M. Barnes (eds.) *Oceanography and marine biology: an annual review*. UCL Press
- Tanaka, S., Cailliet G.M. & Yudin, K.G.** 1990. Differences in growth of the blue shark, *Prionace glauca*: technique or population?. p. 177-187. **In:** H.L. Pratt, Jr., S.H. Gruber and T. Taniuchi (eds.) *Elasmobranchs as living resources: advances in the biology, ecology, systematics, and status of the fisheries*. NOAA Tech. Rep. NMFS 90.
- Tsimenides, N. & Ondrias, J.Ch.** 1980. Growth studies on the anglerfishes *Lophius piscatorius* L., 1758 and *Lophius budegassa* Spinola, 1807, in Greek waters. *Thalassographica* 3:63-94
- Uchiyama, J.H., Burch, R.K. & Kraul, S.A.,** 1986. Growth of dolphins, *Coryphaena hippurus* and *C. equiselis* in Hawaiian waters as determined by daily increments on otoliths. **Fish. Bull.** 84(1):186-191
- Vianet, R., Quignard, J.-P. & Tomasini, J.-A.** 1989. Age et croissance de quatre poissons Pleuronectiformes (flet, turbot, barbue, sole) du golfe du Lion. **Cybium** 13(3):247-258
- Voulgaridou, P. & Stergiou, K.I.** 1997. Length-weight relationships and gonadosomatic index for sardine (*Sardina pilchardus*, Walbaum 1792) in the Thermaikos Gulf. **Proc. 19th Meeting of the Hellenic Soc. Biol. Sci.** 19:444-445.
- World Bank.** 2004a. World Development Indicators 2004. Available at: <http://www.worldbank.org/data/wdi2004/>
- World Bank.** 2004b. Egypt Country review, World Bank, September 2004, available at: <http://web.WorldBank.org/WBSITE/EXTERNAL/COUNTRIES/MENAEXT/EGYPTXTN/0,,menuPK:287166~pagePK:141132~piPK:141107~theSitePK:256307,00.html>
- World Bank.** 2005a. Lebanon at a glance, World Bank, September 2004, available at: http://www.WorldBank.org/cgi-bin/sendoff.cgi?page=%2Fdata%2Fcountrydata%2Faag%2Fbn_aag.pdf
- World Bank.** 2005b. Lebanon, country brief. Available at: <http://siteresources.WorldBank.org/INTLEBANON/Overview/20193936/LEBANON-ENG.pdf>

World Bank. 2005c. Syrian Arab Republic at a glance. Available at: http://www.WorldBank.org/cgi-bin/sendoff.cgi?page=%2Fdata%2Fcountrydata%2Faag%2Fsyr_aag.pdf

World Bank. 2005d. Turkey at a Glance. Available at: http://www.WorldBank.org/cgi-bin/sendoff.cgi?page=%2Fdata%2Fcountrydata%2Faag%2Ftur_aag.pdf

World Bank. 2005e. Turkey, country brief. Available at: <http://devdata.WorldBank.org/external/CPPProfile.asp?SelectedCountry=TUR&CCODE=TUR&CNAME=Turkey&PTYPE=CP>

UN. 1993. System of national accounts, 1993. Prepared under the auspices of the Inter-Secretariat Working Group on National Accounts. UN, New York (USA), 1993
Available at: <http://unstats.un.org/unsd/sna1993/introduction.asp>

UN 2005a. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, ***World Population Prospects: The 2004 Revision*** and ***World Urbanization Prospects: The 2003 Revision***, Available at:
<http://esa.un.org/unpp>

UN 2005b. UN atlas of the ocean. Available at: <http://www.oceansatlas.org>

UNCLOS. 1982. United Nations Convention on the Law of the Sea of 10 December 1982. Available at:
http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm

Annex 1 Marine Protected Areas in the Eastern Mediterranean Sea³

Country	MPA Name	MPA type	Date Designated	Area (km ²)	Law governing MPA
Cyprus	Lara-Toxeftra	Nature Reserve	1989	6.5	Fisheries Law CAP 135 and Amendments 2004
Cyprus	Larnaca Saltwater Lake	Permanent Game Reserve	1961	6.68	
Cyprus	Paedagogical Akademi	National Forest Park	1983	0.45	
Cyprus	Potamos Liopetriou	National Forest Park	1984	0.89	
Cyprus	Tripylos	Nature Reserve	1984	8.23	
Egypt	Arish-Rafah (El Ahrish El Shamalia) Coastline PA	Protected Area	1985		
Egypt	Ashtoun El Gamil - Tanee Island	Protected Area	1988	35	Prime Ministerial Decree 2780
Egypt	Ashtum El Gamil	Nature Reserve	1998	171.2	EEAA-NCS Decree no: 2780
Egypt	El Burullus	Protected Area	1998	910.8	EEAA-NCS Decree no: 1444
Egypt	El Omayed	Protected Area	1986	700	Prime Ministerial decree 90
Egypt	Lake Burullus	Protected Area	1998	460	Prime Ministerial decree 1444
Egypt	Mersa Matrouh	Protected Area	1982		
Egypt	Zaranik	Protected Area	1996	250	Prime Ministerial Decree 3379/1996
Lebanon	Palm Island	Nature Reserve	1992	5	Governmental Law No. 121, March 9th, 1992, declaring Palm, Sanani and Remakine islands, offshore Tripoli, as a Marine Nature Reserve
Syria	Fanar Ibn Hani	Protected Area	2000	10	Resolution no. 23/T
Syria	Um Al Touyour	Protected Area	1999	10	Resolution n15/T, on May 13th, 1999, issued by Ministry of Agriculture and Agrarian Reform (for the coast part and the coastal forest of the protected area)
Syria	Ras El Bassit	Protected Area	1999	30	Resolution No. 26/T
Syria	Sabkhat al Jabboul	Protected Area		3.2	
Turkey	Beydaglari coastal	National Park	1972	344.3	

³ <http://www.mpaglobal.org/home.html>

Country	MPA Name	MPA type	Date Designated	Area (km ²)	Law governing MPA
Turkey	Datça-Bozburun	Specially Protected Area	1990	1474	Official Gazette No. 20702, Special decree
Turkey	Dilek Yarimadisi	National Park	1966	109.9	
Turkey	Fethiye-Göcek	Specially Protected Area	1988	613	
Turkey	Foca	Specially Protected Area	1990	27.5	
Turkey	Gelibolu Yarimadisi (Galipoli)	National Park	1973	330	
Turkey	Gokova	Specially Protected Area	1989	521	Council of Ministers Decree No. 90/77
Turkey	Goksu delta	Other Area	1990	112	
Turkey	Göksu Deltasi	Specially Protected Area	1990	236	
Turkey	Gölbasi	Specially Protected Area	1990	245	
Turkey	Kekova	Specially Protected Area	1990	260	
Turkey	Köycegiz-Dalyan	Specially Protected Area	1988	385	
Turkey	Patara	Specially Protected Area	1990	190	