

REVIEW OF AQUACULTURE DEVELOPMENT IN CYPRUS

by

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**MEZE (Herault) , 19 March, 2007
Ecosite du Pays de Thau , France**

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REVIEW OF AQUACULTURE DEVELOPMENT IN CYPRUS

1. Introduction

1.1 The Cyprus profile

Cyprus is the third largest island in the Mediterranean Sea, with an area of 9251 km² and an almost totally exposed coastline of 650 km long. It is found in the Eastern Mediterranean, at 35 N latitude and 33E longitude 380 km to the east of the Greek island, 380 km north of Egypt, 105 km west of Syria and 75km south of Turkey (APPENDIX VI). Its estimated population is 721.000 of which 85% belongs to the Greek Cypriot community and 12% to the Turkish Cypriot community, whilst the remaining 3 percent are foreign residents. In addition to these the flourishing tourist industry accounts for about 2.5 million per year. Cyprus became full member of EU in May, 2004.

The island has no freshwater bodies apart from about 20 reservoirs (capacity around 300million tons) which are used mainly for irrigation and drinking, but also for angling. There are no rivers of perennial flow, only small brooks in the mountain range of Troodos. Draughts are not uncommon.

The sea around the island is poor, like most of the Eastern Mediterranean, oligotrophic, the fishing grounds being almost fully exploited and the fishing stocks depleted by over fishing. The Cyprus government promotes marine aquaculture acknowledging its potentials in increasing the most needed good quality fresh fish for its local population, the tourists and for export.

Since 1974 the northern part of the island is occupied by Turkey and the government has no access to this. So all the cited information refers to the south part of Cyprus.

The prices in this report are quoted in Cyprus pounds (£1 = 1.72 EUROS).

!2. Historical review

Aquaculture in Cyprus started in 1969, with the construction of the Experimental Freshwater Fish Culture Station at Kalopanayiotis by the Department of Fisheries and Marine Research (DFMR) for the development of trout farming in the Troodos mountain range. The Station served as a pilot one and three years later the first private Trout farms started operation.

The first marine aquaculture attempts were made in 1972, when the construction of a Marine Research Station was initiated by the DFMR at Gastria, situated at the east coast of Cyprus, about 15 km northeast of the town of Famagusta. In 1974 the government lost access to the Station, because of the Turkish invasion. Research work in marine aquaculture continued, from 1978-1989, in the Paphos harbour where the DFMR operated successfully a small hatchery for the experimental reproduction of marine fish, mainly sea bass, seabream, white seabream and rabbit fish. The broodstock was reared in small cages in the harbour area. The initial stock of seabass and seabream fry was imported from France.

A new Experimental Marine Aquaculture Station at Meneou, near the Larnaka airport, was built by the DFMR in 1989 and all the research work in Marine Aquaculture research activities was resumed there.

The first private commercial marine fish hatchery started production in 1986 by producing seabream and seabass fry, while the first marine fish fattening unit, which used land based coastal installations, started operations in 1988 for seabream and seabass. During the summer months of 1990-1991 the farm was implicated by the neighboring tourist industry as the root cause for the mass growth of the green

filamentous alga *Cladophora* spp. which caused excessive nuisance along the tourist beaches. A subsequent survey showed that domestic and agriculture runoff was in fact the greatly dominant source for elevated nitrates. Despite that the government reconsidered its policy for land based marine aquaculture, and taking into consideration the high price of coastal land, its extensive exploitation by various users (mainly the tourist industry) and environmental considerations, selected the offshore cage culture for marine aquaculture. According to the new policy only fish hatcheries were to be allowed onshore, while growing would be located offshore in cages. Thus Cyprus became one of the first Mediterranean countries to carry out the commercial culture of seabass and seabream in offshore cages. The first commercial open sea cage farm was established in Cyprus in 1990-1991 for the production of seabream and seabass and by 1997 a total of eight open sea cage farms were in operation on the south coast of the island.

2. The present state of marine Aquaculture

2.1 Culture practices

2.1.1 Physicochemical environment

Currents - waves

The fattening units for marine fish production operate on an intensive basis, using the method of offshore cages. The cages are found in open sea conditions, exposed mainly to south, south east winds. The existing prevailing coastal currents in these areas have an average speed of 0.2m/sec at mid water depth. The maximum significant waves range between 3m (in the only semi protected area) and 5.5m (in exposed areas), while the mean significant waves are about 5m. Aquaculture sites are exposed to long wind fetch distances, as the nearest land to the south is Egypt. In winter waves of 3-4m height are not uncommon. In exceptional cases, during storms, in the areas of Zygi and Paphos waves of 8-9m have been experienced which caused damages to cages and fish losses.

Water quality

The waters are oligotrophic. The low concentrations in nutrients are reflected in the low phytoplankton biomass, with chlorophyll concentrations of 0.01-0.09mg per cubic meter during summer. Salinity is around 39‰ and surface water temperature ranges between 15-30 °C during the year. The thermocline is established during summer months usually at about 18m. Generally the water is clean, without serious pollution problems. No serious fouling problems are experienced on the cage nets.

2.2 Existing farms and their locations

Today there are in operation six private offshore cage farms. Two of them are located in Limassol, three in Zygi area (east of Limassol) and one in Liopetri (east of Larnaca). There exists also a shrimp farm and hatchery at Akrotiri (Episkopi Bay). Two more licenses for tuna ranching and another one for seabream, seabass culture were granted recently, in the framework of the diversification and expansion of marine aquaculture in Zygi area.

The licensed annual production for sea bass and seabream farms ranges between 100-700 tons p.a. As regards the tuna farms, the licensed annual production presently is 1000t per farm.

The farms are located at a distance of 1-3 km (seabass, seabream) and 2.5-4.5 km (tuna) from the shore, at water depths ranging from 20-45 m (seabass, seabream) and 35-75m (tuna) and with a distance of approximately 1-3 km between them.

2.3 Structures

The prevailing type of cages are the round ones, with collars comprising of 2-3 high density polyethylene pipes, have about 15- 20m diameter, nets depth usually 6-12m (for seabass, seabream), and for tuna 50m diameter, with nets depth 20m. The new tuna farms are proceeding in the use of 100m diameter cages. Generally the diameter of the cages increased over the years, with the increase

of the water depth and production. In the past the farmers tried almost all available cage types, including Farm Ocean, Sea Station sinking type, modular Flexfloats, Dunlop hoses etc. Presently most of the cages used are manufactured in situ by the fish farmers, from imported pipes. The farms are gradually employing mechanized systems for feeding and harvesting in an effort to cut down production costs and become more efficient and competitive, at national and international level. The offshore culture system employed is considered as having the least impact on the environment and it provides the best possible conditions for the fish in terms of animal welfare.

2.4 Marine fish hatcheries

There are in operation four private marine fish hatcheries, which are located two in Limassol, one in Paphos and one in Liopetri. The shrimp hatchery/farm is located in Akrotiri (west of Limassol), while the six small trout farms are located in the Troodos mountain range.

The hatcheries operate on an intensive basis in coastal regions. During the last few years they went through technological upgrading and expansion, which resulted to an increased efficiency, fry production and quality. They are using a flow through system. The water used is pumped into the units usually from coastal wells, which is already well filtered, has mostly steady temperature and is of high quality. The outflow water goes through filtration and settling ponds before it is released back into the sea.

The shrimp farm is unique in its kind in the Mediterranean regarding the biotechnology that it developed. Shrimps are produced at a land based system by using lined earthen ponds. Its hatchery operation is similar to that of the other marine hatcheries.

2.5 Cultured species

The main species of marine fish cultured /fattened (tuna ranching) on a commercial basis are the Gilthead Seabream, Seabass and Blue Fin Tuna (*Thunnus thynnus*). Regarding seabream and seabass, not including tuna , the ratio was 66% and 33% of their total production respectively. As regards tuna ranching, which utilizes fishery production and produces an added value product, the production reached 39% of the total aquaculture production.

During 2005 the following species were also produced: sharp snout bream (*Puntazzo puntazzo*), Pandora fish (*Pagellus erythrinus*), rabbit fish or marbled spinefoot (*Siganus rivulatus*), and the Indian white shrimp (*Penaeus indicus*).

Most of the species that are being cultured are native (endemic) in the Mediterranean Sea, with the exception of the rabbit fish or marbled spinefoot (*Siganus rivulatus*) which is lesepsian migrant, and can be found in sustainable numbers in the sea area around Cyprus and the Indian shrimp.

Fish fattening duration is usually about 12-16 months for seabass and seabream (depending on the season of stocking the cages with fry, the market requirements, the size of the final product etc.), and about 6 months for tuna, which is usually harvested from middle October- to middle November, exceptionally up to March.

2.6 Fry supply and fish food

Cyprus is self sufficient in marine fish fry for fattening. As regards tuna, the fish are caught in international waters by special fishing vessels, usually between Cyprus and the opposite coast of Syria and off Egypt and towed to the fish farms for fattening. All relevant ICCAT (International Commission for the Conservation of Atlantic Tuna) regulations are strictly respected. The weight of the tuna caught is subtracted from the quota of the French and Spanish tuna fishing vessels. The new tuna quotas of ICCAT for EU countries, which were approved by EU recently, are given in APPENDIX II.

There exists a fish food local factory that covers about 60% of the local fish fattening needs. Fish conversion ratio is around 1,8-2. Fish food for hatcheries and early fish stages is imported from EU countries.

The tuna is fed at 1-6% of its body weight daily with imported fresh frozen small pelagic fish, mainly mackerel, sardines herrings and squids. The body weight increase during the fattening cycle ranges between 15-20%.

2.7 Ownership

All seabream and seabass farms and hatcheries belong to Cypriot companies, with Greek Cypriots being the majority shareholders. From the commencement of Aquaculture the private sector played a decisive role the developments, by investing own funds in a new, high risk operation. The financial contribution of the Government was limited, although it was substantial on technological and other matters. Two marine fish aquaculture companies are public.

The tuna farms belong to Cyprus companies as well and are the result of joint ventures between Greek Cypriots and one French and one Spanish company.

2.8 Freshwater culture

The only freshwater species cultured on a commercial basis for human consumption is the rainbow trout (*Oncorhynchus mykiss*). The existing four trout farms are found on the Troodos mountain range. Additionally there are two small farms for the culture of ornamental freshwater fish (Koi-carps and varieties of gold fish) in the lowlands.

Trout is produced in land based intensive systems (raceways) using a flow through system, by utilizing ground pumped water or the water of small brooks.

2.9 Inland waters management

Cyprus did not have any endemic freshwater species, with the exception of eels (*Anguila anguila*) due to the limited freshwater resources .All the freshwater species, about 20 species, including the ones that are being cultured, have been introduced during the 1960s and 1970s, after the construction of reservoirs by the government, and are on the island since then. Their stocks are managed by the DFMR, which issues the relevant angling permits (about 2000 annually). Within the framework for the promotion and development of recreational angling, 26.000 trout and a small number of other fish were released in several reservoirs during 2005.

3. Production

3.1 Production in 2005

Aquaculture production of fish cultured in open sea cages increased dramatically the last 3 years as a result of tuna ranching. In 2005 the production of table fish reached 2095 tons of sea bass and sea bream and 1480 tons of blue fin tuna. Additionally 4 tons of rabbitfish and 18 tons marine shrimp were produced.

Total Production	3600 tons	= 3523 tons
Total Production / km of coastline		= 5.4 tons / Km
Conventional aquaculture		= 2095 tons
Conventional aquaculture / km of coastline		=3.2 tons / km
Tuna fattening		=1480 tons
Tuna fattening / km of coastline		=2.3 tons / Km

*Note: approx. 50% of the 650 km coastline is occupied by Turkey.

Aquaculture production by species for 2005 (table size fish and fry)

Species	Table size (tons)	Marine fish Fry / Larvae No.
Blue Fin Tuna	1,480	---
Seabream	1,470	8,100,000
Seabass	625	3,500,000
Sharpsnout Bream	---	300,000
Pandora farms	---	50,000
Rabbit Fish	4	60,000
Indian Shrimp	18	1,000,000
Trout	70	500,000
Ornamental fish		40,000
TOTAL	3,667	12,750,000

The production of Rabbit Fish and Pandora was performed on an experimental basis.

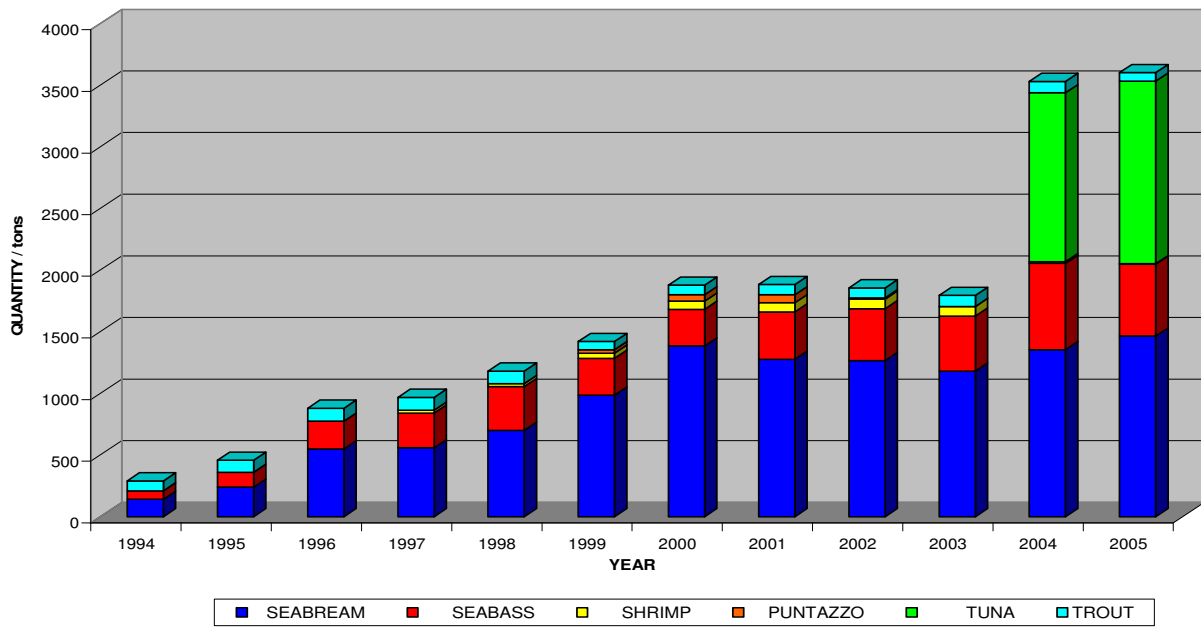
Aquaculture production for 2005 (Quantity and Value)

KIND OF CULTURE	QUANTITY (tons)	VALUE C£
MARINE AQUACULTURE TABLE FISH SOLD LOCALLY	1,225	4,000,000
MARINE AQUACULTURE EXPORTED TABLE FISH	2,350	13,500,000
SHRIMP CULTURE	18	135,000
TROUT CULTURE SOLD LOCALLY	70	280,000
TOTAL FISH	3,663	17,915,000
MARINE AQUACULTURE FRY EXPORTED	4,500,000 fry	500,000
MARINE AQUACULTURE FRY USED LOCALLY	7,500,000 fry	600,000
SHRIMP LARVAE USED LOCALLY	1,000,000 larvae	*
FRESH WATER AQUACULTURE FRY USED LOCALLY	500,000 fry**	10,000
ORNAMENTAL FISH	40,000 fish	15,500
TOTAL FRY /LARVAE/ ORNAMENTAL		1,110,500
GRAND TOTAL VALUE		19,025,500

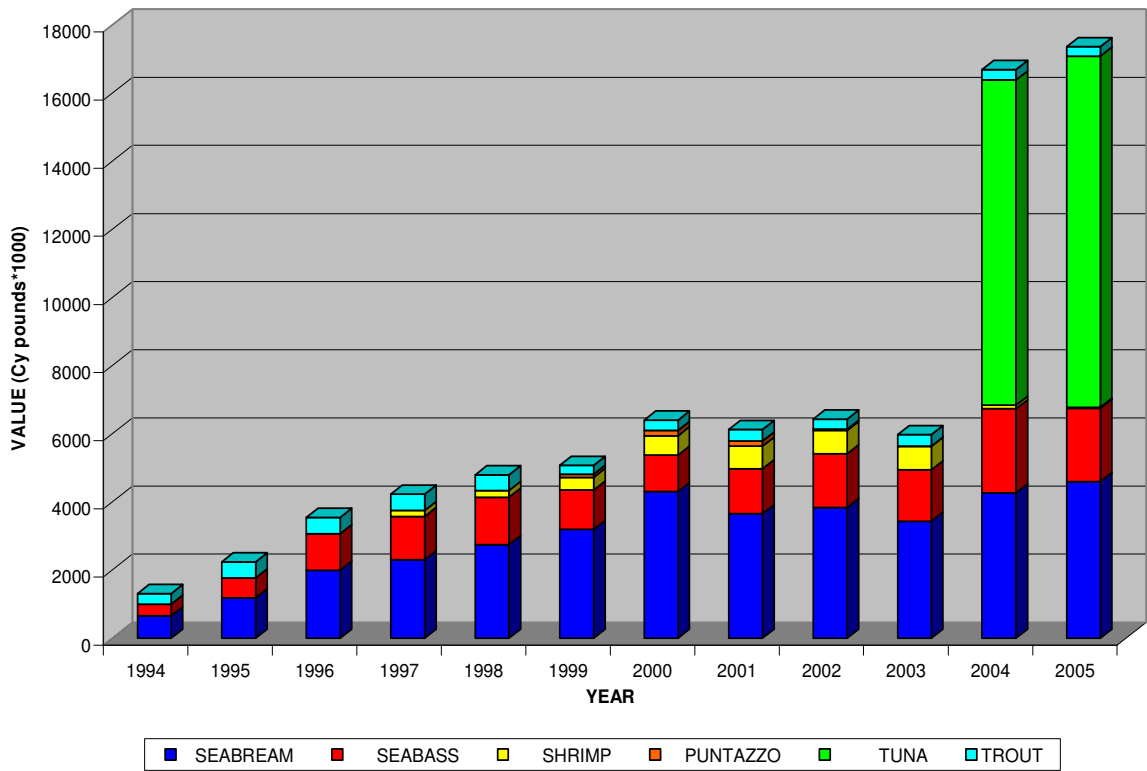
* The shrimp larvae produced are used for fattening in the same farm.

** Out of the 500,000 about 26,000 fingerlings were released to the wild (irrigation reservoirs and dams) by the DFMR for recreational angling purposes.

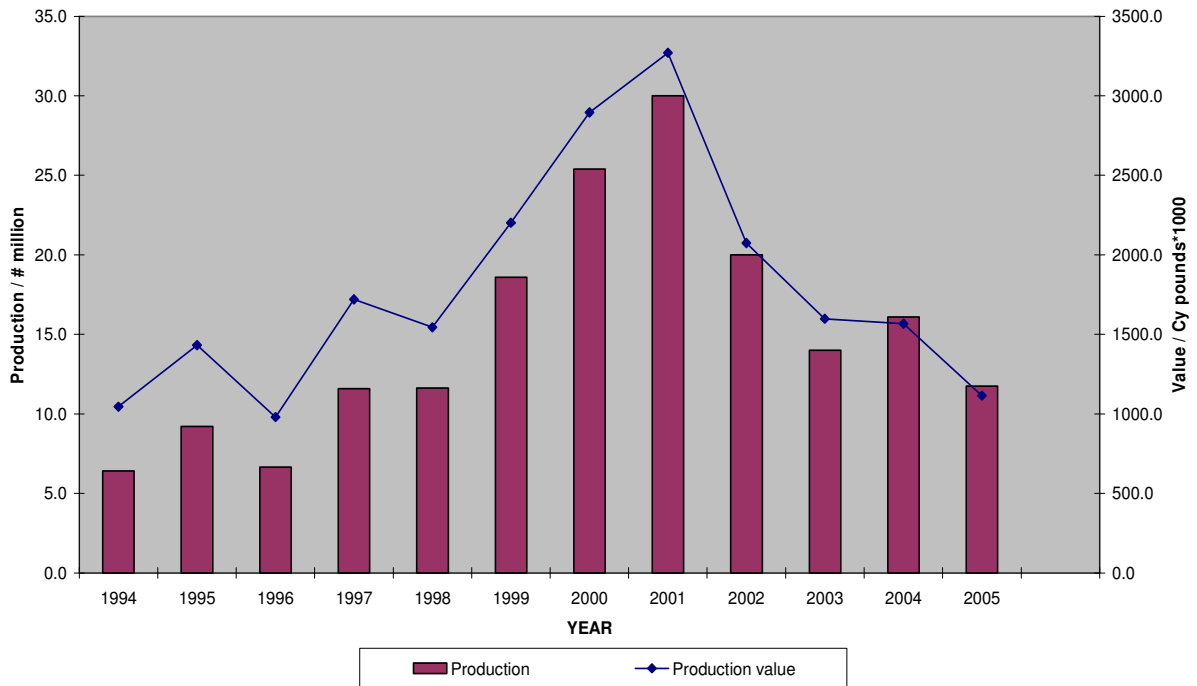
AQUACULTURE PRODUCTION PER SPECIES



AQUACULTURE PRODUCTION VALUE PER SPECIES



Cyprus Aquaculture Fry Production



4. Human resources

The total direct employment in the Aquaculture sector in 2005 was 213 persons. The majority were employed in marine aquaculture operations (196 persons : Administration and Management: 30 ,fish production : 109, out of which 30 in fish hatcheries, and Fish Marketing :57 persons) and 17 in freshwater aquaculture , as per the following Tables.

EMPLOYMENT IN MARINE AQUACULTURE IN 2005	MEN		WOMEN	
	FULL TIME	PART TIME	FULL TIME	PART TIME
PRODUCTION	91	13	2	3
ADMINISTRATION	15	1	14	0
MARKETING	50	0	6	1
Total	156	14	22	4
Grand Total	170		26	

EMPLOYMENT IN AQUACULTURE IN 2005	FULL TIME		PART TIME	
	MEN	WOMEN	MEN	WOMEN
Personnel with Cypriot Nationality	111	20	15	8
Personnel from other EU countries	11	3	3	1
Personnel from Third countries	40		1
Total	162	23	19	9
Grand Total	213			

Marine aquaculture employs specialized scientific staff that has completed relevant studies in tertiary educational institutions as well as technical personnel of various specialties. On the contrary the trout farms employ a small number of individuals with empirical technical knowledge and usually operate as small family businesses. Two out of the six trout farms operate in conjunction with adjacent restaurants.

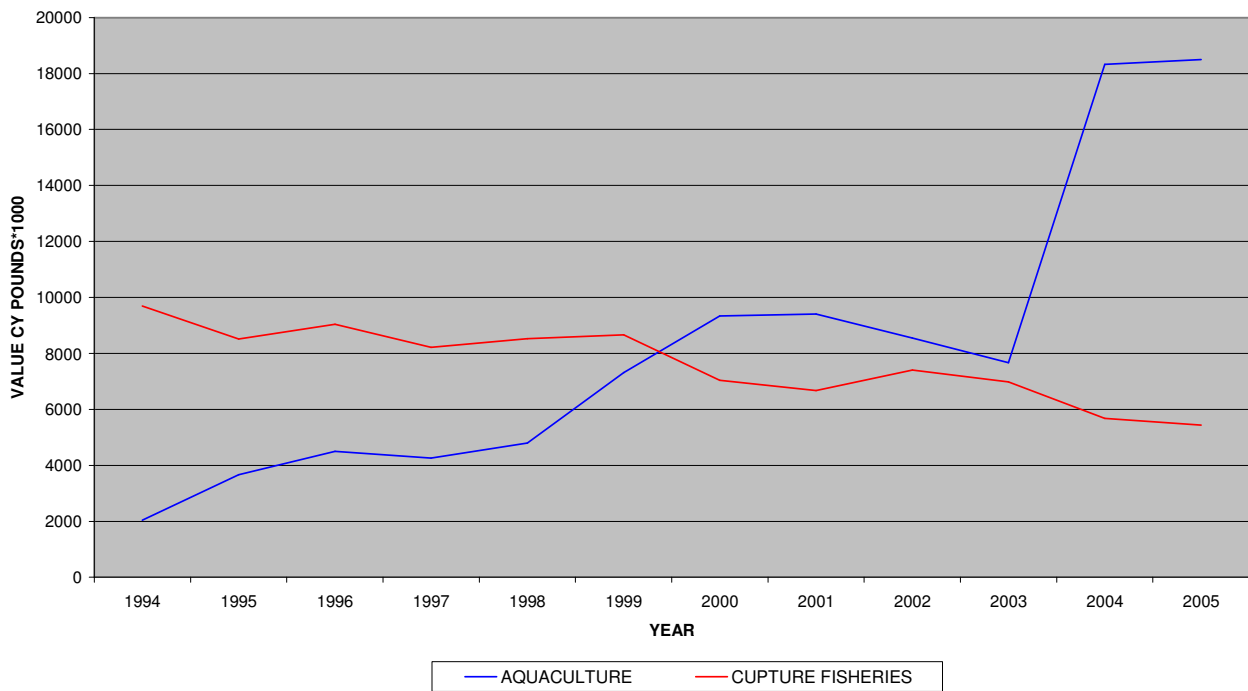
Trout farming creates employment opportunities in the mountainous areas and thus contributes to the creation of economic activities and the encouragement of residents to stay in these isolated rural regions.

5. Cyprus Aquaculture in the context of Fisheries.

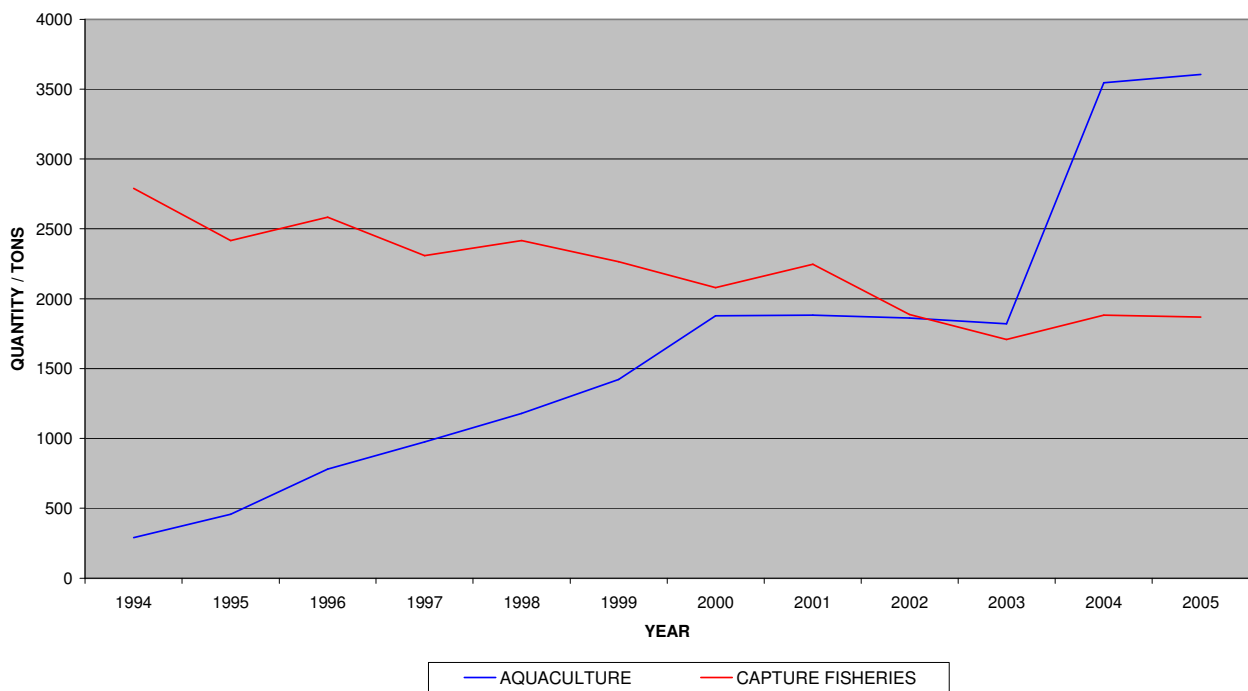
Cyprus aquaculture production is small, when compared to that of the rest Mediterranean EU producer countries (APPENDIX I). Nevertheless it is considered important for the economy of the island.

Cyprus Fisheries produced 5,663 tons of table size fish during 2005 valued at C£ **25.2** million. Fisheries production was derived mainly from aquaculture as well as the inshore and the trawl fisheries (1900t from sea fisheries). Aquaculture accounted, in terms of volume, for approximately 66% of Cyprus fisheries production, while in terms of value, it was 72%.

CYPRUS FISHERIES PRODUCTION VALUE



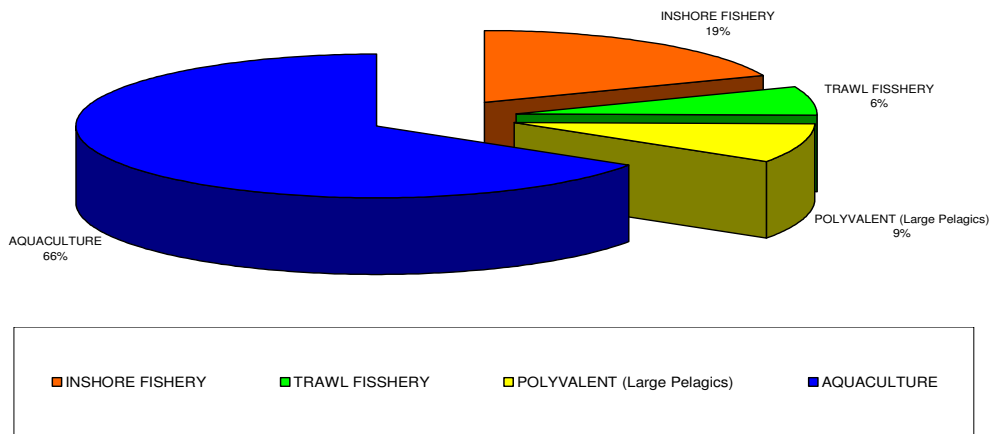
CYPRUS FISHERIES PRODUCTION (QUANTITY)



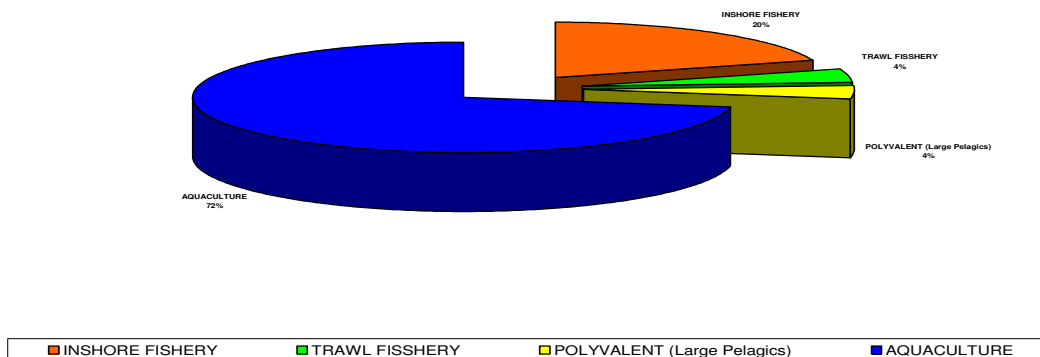
Cyprus Fisheries 2005. Production by source.

KIND OF FISHERIES	2005	
	QUANTITY (tons)	VALUE C€
INSHORE FISHERY	1,050	5,300,000
BOTTOM TRAWLING IN CYPRUS WATERS	200	500,000
BOTTOM TRAWLING IN INTERNATIONAL WATERS	150	500,000
TOTAL TRAWL FISHERY	350	1,000,000
MULTIPURPOSE VESSELS FISHERY	500	1,000,000
MARINE AQUACULTURE TABLE FISH SOLD LOCALLY	1,225	4,000,000
SHRIMPS AQUACULTURE	18	135,000
MARINE AQUACULTURE TABLE FISH EXPORTED	2,350	13,500,000
TROUT CULTURE	70	280,000
TOTAL FISH	5,663	25,215,000
MARINE AQUACULTURE FRY	12,000,000	1,100,000
FRESH WATER AQUACULTURE FRY	500,000	10,000
ORNAMENTAL FISH No.	40,000 fish	15,500
GRAND TOTAL		26,340,500

**CYPRUS FISHERIES PRODUCTION 2005
(QUANTITY %)**



**CYPRUS FISHERIES PRODUCTION 2005
(VALUE %)**



6. Market and marketing of aquaculture products

6.1 Fish packing and processing

In 2004 all the farms were obliged to harmonize their harvesting, packing and distribution systems according to the EU Directives as regards to hygiene conditions, by constructing suitable, high technology packing facilities. The upgrading of the processing units and the marketing) facilities (fish retailing was also undertaken.

In 2007 about 18 units for the processing of fish, including filleting and smoking of mainly imported fish (including salmon and trout), but also small quantities of albacore (Thunnus alalunga) as well as of blue fin tuna , caught on longlines by Cypriot fishermen as a byproduct of swordfish fisheries. The evisceration, filleting and the quick freezing of tuna for the Japanese market is done on

board a special factory ship which visits Cyprus and anchors near the area of the tuna farm during the harvesting period.

The aquaculture companies own 4 fish packing facilities for aquaculture products, which are registered by EU, while 2 more are under construction.

6.2 Local fish market and marketing systems

More than 80% of the local marketing of marine aquaculture production was, until the last few years, carried out via the traditional circles / networks (producer - fish retailers). Marine aquaculture fish is marketed fresh, ungutted and unscaled. Fish farmers delivered their fish, (packed in 10 kg, in one use, polystyrene boxes) to fishmongers who sold them either directly to the consumers or through smaller fish mongers. Due to the above system, the intermediary maximized his profit, at the expense of both the consumer and the producer, while various special interests constrained the rational promotion of aquaculture products and generally of the fisheries sector and created certain problems in the market promotion of aquaculture products. Even though the prices of products of fish farms are differentiated (lower) than the prices of species of comparable quality caught by the capture fisheries sector, the application of the above system increased their retail price, with negative impacts on their consumption.

During the last 5 years the vertical integration of marine fish farming units started, with the purchase and upgrading of fish retail shops by fish farming companies. This development is contributing to the improvement of the fish distribution and marketing system as well as in the increase of the quantity of aquaculture products that are locally consumed. Today about half of the fish retail shops belong to aquaculture companies. The fish farming companies are gaining control over the marketing and fish processing sector and are reforming and upgrading the fisheries sector in general. An increasing percentage of the local aquaculture fish and generally products are sold also through the supermarket chains.

Overall the local market for seabream and seabass has expanded considerably since 1991 when fish farms started production and especially over the last 3 – 4 years. Both species, especially seabass, were rather unknown to the Cypriot consumers a few years ago, because of the negligible quantities caught from the wild.

Presently there are no Producers Organizations for fish marketing either in Aquaculture or in the Capture Fisheries Sector.

Trout is marketed, mostly, directly by the trout farmers, fresh (usually gutted) or smoked or in association with restaurants. Due to the small production per farm, the cost of production is high, resulting in high selling prices, compared to the prices in other European countries.

PRICES OF SEABASS AND SEABREAM IN THE LOCAL AND EXPORT MARKET						
	WHOLESALE		RETAIL		EXPORTS	
CATEGORY	SEABREAM (£)	SEABASS (£)	SEABREAM (£)	SEABASS (£)	SEABREAM (£)	SEABASS (£)
A+	5.00	5,50			SAME AS LOCAL INCLUDING FREIGHT COST (ABOUT £0.50)	
A	3.00-3.50	4.00-4.50	4.00-6.00	5.00-7.00		
B	2.50	3.00				

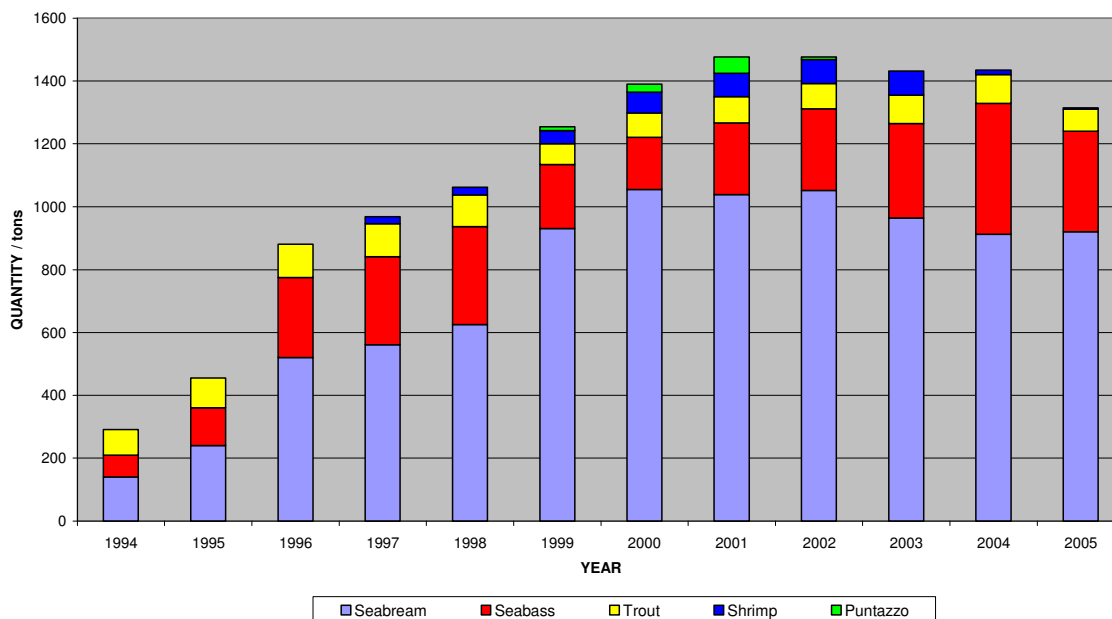
The FOB export market for seabream and seabass is generally over £3 per kg. The cost of production and marketing is estimated to be around £ 2.3-£2.5 per kg of fish.

The FOB export price of whole tuna in 2005 was around £ 8 per kg.

6.3 Consumption trends

The local consumption of cultured seabream and seabass is rather stable the last 3 years after a period of substantial increase. In 2005 out of the 18 kg of fish, which was the per capita consumption in Cyprus, about 2.5 kg were aquaculture fish, replacing imports of fresh fish. More than 70% of the fish and fish products being consumed locally by the local population and the tourist industry are still imported, since the local production from fisheries is decreasing. The Cypriot consumers prefer seabream, than seabass, as most of the Eastern Mediterranean countries. It is anticipated that the local market for aquaculture fish has further prospects for expansion. Cypriots are heavy meat eaters (the per capita meat consumption in 1998 was about 120kg). It is estimated that the flourishing tourist industry consumes about 10% of the total local fish consumption.

LOCAL CONSUMPTION OF AQUACULTURE PRODUCTION



The consumption of fish, particularly fresh, is expected to progressively increase in Cyprus, due to the rise in the standard of living in conjunction with the new nutritional and health perceptions by the consumers, despite of the fact that some consumers still keep reservations as regards the hygiene and quality of the product, which could be attributed to the misinformation and the lack of good marketing strategy.

The price of cultured fish is generally lower than that of similar fish from capture fisheries. Marketing can contribute considerably to the enlargement of the market and the increase of consumption, if the

fisheries products could reach the consumer at affordable prices and high quality. The prices of cultured marine fish also are still considered attractive and profitable for the producers. Even though the fuel prices increased considerably recently, the aquaculturists did not increase their whole sale prices. On the contrary, shrimp production is declining due to the soaring fuel prices and competition from other countries with lower production costs.

The enlargement of the domestic market has been put into motion with the intervention/ involvement of the big supermarkets in the traditional system of fish marketing, in a way that the fish products become more easily accessible to households.

The import of preserved or processed fisheries products exhibit an increasing trend. In general, there is a marked turn of the consumer's preference towards pre-packaged products, ready for consumption, a development which is facilitated by the increased role of supermarkets in the distribution of fisheries products and particularly aquaculture products.

6.4 Aquaculture products promotion

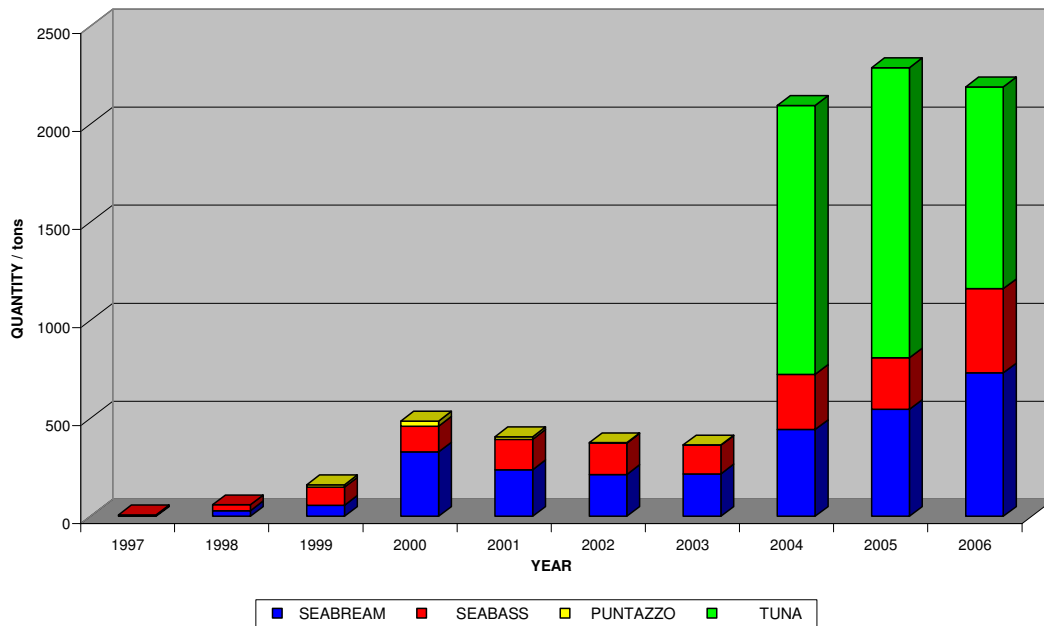
In the past the Department of Fisheries and Marine Research as well as the fish farmers undertook advertisement campaigns in the television, radio programmes, and articles in the local press, as well as the collection, publication and distribution of recipes of aquaculture products targeted to the further enhancement of the consumption of aquaculture products. The above efforts, in combination with the relatively lower prices of farmed fish than those of the wild fish of similar category, contributed to the expansion of local market and help minimizing the consumers' reservations on farmed fish, especially in times of crisis (dioxin, alleged ruminants' meat in fish food etc.).

6.5 Export market of Aquaculture products

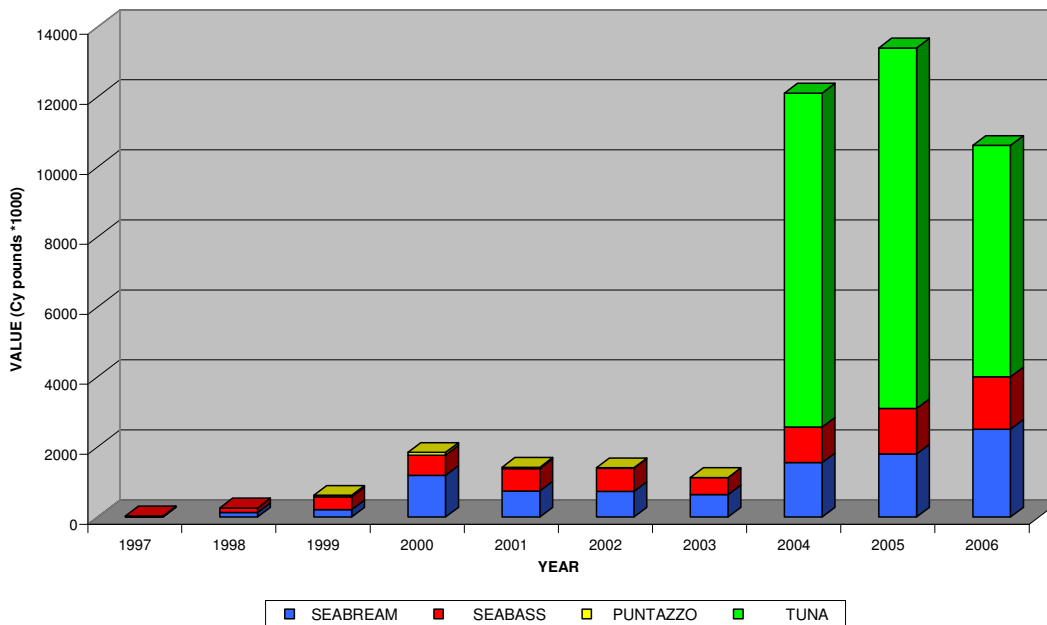
6.5.1. Export of fish

Market size fish exports increased during 2005. The largest part of production of market size fish from marine aquaculture referring to seabream and seabass was consumed domestically and about 41% of the production was exported. The main export destinations were the USA, Russia, and Israel.

AQUACULTURE EXPORTS (QUANTITY)



VALUE OF AQUACULTURE EXPORTS (BY SPECIES)

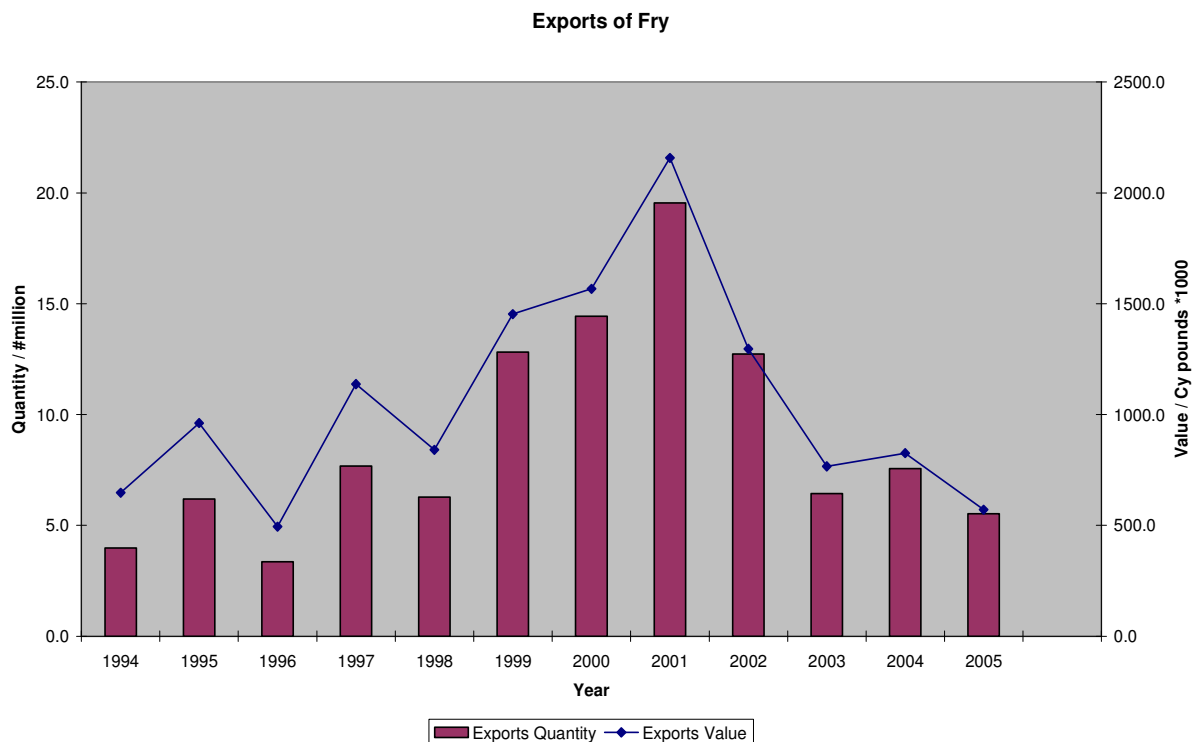


The Blue Fin Tuna production (1480 tons) was exported to Japan. Total exports of market size fish from aquaculture in 2005 were 2350 tons valued at CY £13.5 million.

6.5.2 Export of fry

The main countries of export of fry are Greece and Israel. This preference for the Cypriot fish fry is due to its good quality and to the absence of contagious and other serious diseases in the island's hatcheries.

The total exports of marine fish fry in 2005 reached about 4.5 million fry valued at £ 500,000. The prices were around EUROS 0.21 per fry CIF.



7. Aquaculture contribution to the economy

The fisheries sector constitutes an important activity in Cyprus, despite its relatively small contribution to the Gross National Product (GNP), which does not exceed 0,3%. As already stated, in 2005 aquaculture accounted, in terms of volume, for approximately 66% of the Cyprus fisheries production, while in terms of value, it reached the 72%. Due to the total value of the exported aquaculture products, the fisheries products trade deficit remained close to zero, since its improvement in 2004 from negative to zero (0) and is attributed mainly to the initiation of tuna ranching. This accomplishment reflects and emphasizes the importance of aquaculture activity in the economy of Cyprus.

Approximately 1400 individuals are directly occupied in the fisheries sector as fishermen or aquaculturists or in the processing sub sector. The multiplier effect of aquaculture on other relevant sectors of the economy can not be overlooked as approximately another 1000 individuals are occupied indirectly, in auxiliary professions such as boat builders, retail fish sellers, technicians for maintenance of equipment, machinery, nets, importers of fishing gear and equipment etc.

The contribution of the aquaculture sub-sector in the economy of the country has increased considerably during the last decade (with the growth mainly of marine aquaculture), due to the marketing of its products locally and abroad. Higher investments in Cyprus aquaculture took place as a result of the securing of funds from the relevant Structural Funds of EU, and further increase is anticipated in the future.

8. Management of the Aquaculture Sector

8.1 The institutional framework and support

Aquaculture in Cyprus is supported by the Ministry of Agriculture, Natural Resources and Environment, through the Department of Fisheries and Marine Research (DFMR).

The DFMR has its headquarters in Nicosia and five District Units, located in the five coastal areas of Paphos, Limassol, Larnaca, Paralimni, and Latsi. The DFMR is operating two research stations, the Meneou Marine Aquaculture Research Station (MeMARS) and the Fresh Water Aquaculture Research Station at Kalopanayiotis

At the laboratories of DFMR, work is carried out in the fields of fish biology, marine ecology, contaminant concentration in marine organisms, seawater analysis, etc.

The fieldwork as well as the monitoring and inspection capabilities of the Department are strengthened with the supply of four well equipped vessels, while a larger one is under construction financed by EU funds.

The DFMR, with a current staff of about 100, has five Divisions:

- Division of Fisheries Resources (Policy, Research and Development)
- Division of Aquaculture Research and Development
 - Section of Aquaculture Development
 - Section of Aquaculture Management
 - Section of Aquaculture Research
 - Section for the Implementation and Management of the Fisheries Structural Fund.
- Division of Research of Marine Environment
- Division of Support and Services
- Division of Control
-

The DFMR is responsible for the sustainable development and management of marine and inland water fisheries and the protection of the aquatic environment, while it undertakes research on these topics, including oceanography. This is put into effect mainly by the application of measures for the sound management and national exploitation of fishery resources and by enforcing the Fisheries and Aquaculture Legislation as well as the relevant legislation regarding the protection of the marine environment.

8.2. The Strategic Development Plan 2004 – 2006

The global strategy for the Fisheries Sector, envisaged in the Strategic Development Plan 2004-2006, aims at the attainment of a competitive and sustainable commercial fishing and aquaculture industry, which is capable of offering the consumers high quality products, meet the demand of the market, and successfully face both the European challenge and the broader international competition.

The main objective is the sustainable balanced development of aquaculture, mainly in the coastal areas but also in the mountainous regions in order to maximize its contribution to the domestic fisheries production, according to the needs of the market.

Due to the need of aquaculture development, the strategic aims defined are:

- (a) The modernization of the fish farming enterprises, as regards technological, organizational and marketing issues.
- (b) The enhancement of the competitiveness of aquaculture and the improvement of productivity and quality.
- (c) The sustainable development of aquaculture in respect to the environment and socioeconomic conditions.
- (d) The creation of new employment positions, mainly for scientific and technical personnel.

Specific actions to implement this strategy are as follows:

- Application of the legislative framework for the development of aquaculture, which includes the Environmental Impact Assessment and the Environmental Monitoring System for existing, as well as new aquaculture units.
- Improved framework for the control of the health of farmed fish, as well as for the control of the hygiene of aquaculture products and their promotion, through the adoption of self-monitoring systems and quality standards.
- Creation of a sustainable infrastructure as a basis for further development of the aquaculture sector.
- The land surveying of aquaculture activities and the inclusion of marine fish farming in any coastal zone management plans.
- The monitoring of production and marketing through the establishment and operation of a relevant data bank.
- Raised compliance with the Code of Conduct for Responsible Fisheries of FAO.
- Utilisation of information and the adoption of modernized technology and innovations in the sector.

Within its scope of activities for the increase of fish production, productivity and efficiency, technical and financial support was granted during 2004 -2006 to aquaculturists, always within the framework of the Common Fisheries Policy (CFP) and the Fisheries Structural Fund of the EU, through the FIFG (Financial Instrument for Fisheries Guidance) and according to the relevant legislation regarding the state aids.

The two specific Measures that were included in the Cyprus Single Programming Document (SPD) to promote and support the aquaculture industry were: (1) Development of Aquaculture and (2) Development of the Processing and Marketing sector for fisheries and aquaculture products.

More specifically the measures aimed at:

- Increasing the production of the already established farms and or possibly the establishment of new one(s).
- Increasing the sustainability of the aquaculture sector, through modernization of the facilities and equipment.

The objective of the second Measure was the improvement of the product supply to the market and the utilisation of the fisheries and aquaculture products as well as the strengthening of the competitiveness and the contribution to the development of economically viable industry.

This was to be achieved through the:

- The promotion and encouragement of investments regarding the marketing and processing.
- The implementation of the relevant EU standards.
- The processing of high value added products of aquaculture and fisheries.
- The adoption and implementation of modern technology.
- The production of high quality products, which match the needs of the domestic and the foreign markets.

- The increase of productivity and competitiveness of processing, marketing and distribution units.
- The monitoring of production/marketing.
- In the Financial Instrument for Fisheries Guidance 2004 -2006 (+2) the total Public Expenditure to the < Programme for granting financial incentives for the modernization and development of aquaculture> is £ 1.151.691. In addition to this £791.497 represent the Total Public Expenditure for the< Programme for granting financial incentives for the processing and marketing of fisheries and aquaculture products>.

In the case of Cyprus the Community Expenditure contribution to the Total Public Expenditure accounts usually only to 15% of the total investment cost, while in cases with environmental aspects it could increase up to 25%. Cyprus government provides usually the 25% of the total investment (National Public Expenditure), while the rest 60% has to be covered by the private sector.

The DFMR is presently preparing its new National Strategic Plan for Fisheries 2007 -2013 and the related Fisheries Operation Programme 2007- 2013 which proposes substantial increase to the financial incentives, through increase of the National Public Expenditure, the Community funding, and, consequently, the relative investments by the private sector.

8.3 The governing regulations

There is an intensive effort to implement the National and Community legislation in order to ensure compliance with the Common Fisheries Policy of the EU and for the best possible management of the resources. The national legislation was amended once more in 2005 to modulate all types of fisheries (professional and sport fishing), in order to control the whole fishing intensity and to fully manage the fishing resources. The legislation provides for the protection of the sea from pollution, for controlling the aquaculture production, for protecting the marine endangered species and their biotopes, and for regulating the fishing shelters.

The main objective of the government policy concerning aquaculture is the sustainable development of aquaculture, taking into consideration the protection of the marine environment by applying the precautionary approach and the gradual development of the sector. As far as marine aquaculture is concerned, which represents 95% of the sector, the off shore cage culture methods used are considered by the EU Commission as techniques that substantially reduce environmental impacts and are included in the same priority category with extensive aquaculture techniques.

The main regulations governing aquaculture are the following:

- Aquaculture Law 2000, amended 2002
- Aquaculture (General) Regulations 2002, amended 2003
- Fisheries Control Law and Regulations, amended 2005
- Law 102(I) 2005, regarding the environmental impact of particular or specific projects, regarding the recognition of Producers Organizations in the fisheries sector.
- Laws and relative Regulations, regarding the health conditions for the production and the marketing of fisheries products, including Council Directive 91/492/EEC.

8.3.1 Licensing- Environmental considerations

Licensing

The relevant legislation for the Capture Fisheries and Aquaculture in respect to the environment has been harmonized with the EU legislation. Specifically, Law 102(I) 2005, regarding the environmental

impact of particular or specific projects, requires the mandatory environmental impact assessment study for aquaculture projects and its evaluation by the environmental authorities, before the relevant license is granted. The culture of species that might have environmental impact, like fast growing large species (tuna), are given specific attention by the appropriate authorities and in some cases an experimental small-scale license is given, with strict regulations and environmental monitoring before any large-scale operation is approved.

The measures implemented to integrate the environmental aspects in the licensing procedure, according to the Aquaculture Laws of 2000 and 2002 as well as the Aquaculture Regulations of 2002 and 2003, are as follows:

1. Establishment of an Aquaculture Advisory Committee with the purpose of advising the Director of the Department of Fisheries and Marine Research (DFMR) concerning policy matters.
2. For the establishment of new marine fish farms the Director of DFMR releases an announcement in the local press informing the public for his intention to grant licenses for the establishment of new farms and asks for the expression of interest on behalf of the private investors and the submission of relevant tenders for the renting of the necessary sea area.
3. The license for the establishment, expansion, diversification of farming units is issued by the DFMR, after the applicants secure all the other necessary licenses. The ones relevant to environmental aspects are:
 - Environmental consent, according to Law 102(I) 2005 for the assessment of the effects of certain public and private projects on the environment which is harmonized with Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment.
 - Town planning permit (except for projects undertaken in the sea).
 - Permit for water usage (Freshwater).
 - Permit for effluent discharge according to Law 106(I) of 2002 for the control of pollution of water and land sectors which is harmonized with the water sector Council Directives.
 - Permit for the use of sea area which is issued by Council of Ministers.
4. In the DFMR < License for the establishment and operation of a fish farm>, which is issued according to the provisions of the Aquaculture Law and the Aquaculture (general) Regulations, it is stated the type of culture , the sea surface water area which is defined, the fish annual production, its duration, which is 10 years for marine fish farms. Also the Environmental Impact Assessment Study (EIA) becomes an integral part of the license. Generally the license includes terms and conditions which aim at safeguarding good management practices, collection of statistics, protection of the environment according to the EIA study, the relevant conditions imposed by the Environmental Authority and the Cyprus and EU laws, compliance with the Art. 9 of the FAO < Code of Practice for Responsible Fisheries in the Mediterranean>etc.

The lease of the necessary sea area is done, according to the provisions of the aquaculture legislation, by the Council of Ministers and the tenders procedure is followed. The tenders are assessed according to technical, economic and financial criteria stated in the aquaculture legislation. Finally the DFMR submits to the Council of Ministers a relevant proposal on the successful tender, who had also secured all necessary permits, including the environmental

consent. The annual rent of the water surface covered by the farms installations is £ 0.10 per square meter (0.16 EURO). The fee for the issue of an Aquaculture marine fish farm license is £100.

Environmental Monitoring

Generally the operation of all the fish farms is regulated by strict Laws and Regulations and all the marine cage farms are obliged by law to submit an Environmental Monitoring Report every six months (winter and summer). It is stressed that aquaculture sector is one of the limited economic activities that is required by law to carry out specific environmental monitoring for its operation. The Environmental Monitoring is performed according to a Protocol (APPENDIX III) issued by the DFMR and it includes sampling and analyses of the water column and the macro benthos from several stations, at certain distances from the farms. The Protocol is presently under revision according the experience gained from its so far application. The monitoring is conducted by independent scientists or companies that have been pre-approved by the DFMF. The relevant cost is covered by the farmers.

Two European Union research projects, the MedVeg and MedMPA, which focused on the effects of nutrient releases from Mediterranean fish farms on coastal ecosystems and on the development of marine protected areas were completed successfully in 2005. They showed that there is no large scale degradation of the marine environment because of the aquaculture activities. Only small areas are covered with bacteria mats (*Beggiatoa* sp.), during mainly summer months. The open sea conditions that prevail in the areas of fish farms, that are characterized by strong currents and large depth, contribute to the better dispersion of the released nutrients which are produced during the fish grow out activities. During winter the storms are dispersing most of the sediments. The impact is restricted mainly underneath the cages and to a lesser degree extends up to the distance of 50 to 100 meters from the farms. This refers mainly to organic enrichment of the sediments and is reversible. The nutrients that are released from the farms were found to affect (increase) the primary productivity in a distance of 80m from the cages. The Nitrogen is immediately being assimilated by the plankton web in oligotrophic waters, like the waters in the Cyprus sea. Furthermore, the areas beneath the cages act as refuge of fish which are also very actively feed on food remnants, fish faeces and the organic material accumulated on the bottom, thus minimizing the environmental effect.

Of special consideration is the effect on *Posidonia* beds and the placing of farms in their area or vicinity is not allowed. In Cyprus sea the *Posidonia* beds extend up to 45 m. depth.

As regards the tuna ranching, several mitigation measures are imposed mainly for the collection and disposal at an approved method the fish oil and fish which escapes from the nets during the feeding process, in order to avoid conflicts with the fishermen, the general public and the tourist industry. The bottom beneath the tuna cages is recovering during the almost 6 months of the year that the cages are not being used.

9. Applied research, education and training

The Meneou Station (MeMARS) undertakes programmes of research and development mainly on the diversification of marine aquaculture. The Station has a hatchery, a small tank grows out facility and some small cages in the nearby Larnaka harbor area. The governmental status of MeMARS ensures that the station is committed to work on both academic and applied research. This commitment acts as a bridge between the academic and industrial aquaculture sector creating a network which involves regulatory, academic and industrial bodies. The main objectives are:

1. Diversification of aquaculture production. This includes research on a number of possible candidate species for aquaculture, assessing their biological requirements in captivity and producing technical protocols and scientific papers.
2. Co-operation and assistance to private sector. There is a continuous collaboration with all aquaculture farms in Cyprus, which enables the sustainable development of the sector through the common confrontation of problems and concerns and updating on new developments.
3. Education and training. This includes the involvement of university students at the station and their participation in experiments and daily work. The Station has been included in the list of EU Centres offering training on aquaculture aspects.

MeMARS is currently working on a number of marine species which are considered good candidates for aquaculture. The most important are:

- Rabbit fish (*Siganus rivulatus*)
- Amberjack (*Seriola dumerili*)
- Common octopus (*Octopus vulgaris*)
- Common pandora (*Pagellus erythrinus*)

The research that is currently undertaken at the station aims at assessing the biological and physiological capacity of the species aiming at producing technical protocols for broodstock management, larval rearing, mass production of fry and grow out. In order to achieve this a number of experiments are conducted on the major bottlenecks of the production cycle. The main research programmes that have been running during the last years are:

- Gonadal development in rabbit fish (*Siganus rivulatus*).
- Assessment of different reproductive techniques in rabbit fish (*Siganus rivulatus*).
- Larval rearing of rabbit fish (*Siganus rivulatus*) in order to achieve mass production of fry.
- Nutritional requirements of rabbit fish (*Siganus rivulatus*) and the use terrestrial plant protein sources in feeds.

The Cyprus Research Promotion Foundation is a source of financial support of research projects on selected topics deemed to have an impact on the economy, including aquaculture ones. Furthermore there is an effort from some private marine fish farms, in cooperation with DFMR, to establish the infrastructure for genetic improvement programmes (selective breeding) in order to start carrying out experiments for the genetic improvement of the survival rate of the fry as well as the growth rate for both the fry and market size fish. The operating tuna farm is expressing keen interest in participating in EU Research Projects aiming at tuna controlled reproduction and study of the interactions between Fisheries and Aquaculture (like the relative programmes included in the EU FP7 Cooperation Work Programme: Food, Agriculture and Fisheries and Biotechnology), for environmental reasons and the long term sustainability of the Sector. Cyprus is not a member of DOTT, although it took active part in it during its initial steps.

As regards freshwater fish research, the Kalopanayiotis Station operates mainly as a fish hatchery station for the supply of trout fry for fattening to the private fish farms and for limited research, mainly for new species like Siberian sturgeon (*Acipenser baeri*) for the production of fry and brood stock rearing. In 2006 about 5000 fry of Siberian sturgeon were produced and are being used for experimental rearing in the Station and private trout farms. The installations and equipment of the Station underwent upgrading, allowing the temperature and photoperiod control for the reproduction of other freshwater species, intended also for the stocking of reservoirs for angling. The Station is also used for the keeping of certain other fresh water species for stocking reservoirs.

10. International cooperation

Cooperation exists between Cyprus and other Mediterranean countries as well as other EU member states in the field of aquaculture through various thematic Networks (SIPAM, SELAM, TECAM), EU research programmes, international organizations, like FAO, according to bilateral agreements etc. The Cyprus Mariculture Association is an active member of FEAP. Projects funded either by national funds or on bilateral basis or by the EU are undertaken within this context of cooperation. The DFMR is participating, through the Meneou station, in the AQUA-TNET SOCRATES Thematic Network for Education and Training in the Aquaculture Industry and the COST Action 867-Wellfare of Farmed Fish in European Aquaculture. Some of the private farms and hatcheries are also participating in programmes funded by the EU. Students from EU countries are doing part of their practical training in marine fish farms.

11. Aquaculture Sector trends and prospects

The small size of marine fish farms in Cyprus in the middle of the nineties resulted to a relatively high cost of production. The non-existence of ``economies of scale`` rendered them less competitive at the international level. So the policy target since then has been the long term sustainable development of the local aquaculture, mainly through the increase of production and always in respect to the environment. The achievement of "economies of scale" lowered the cost of production; however this implied that a large part of the production has to be exported, since the small Cyprus market cannot absorb all the production. It is deemed that a volume of production above the "critical mass" is essential in order to allow the Cyprus aquaculture to be viable and competitive in EU markets and in view of the globalization of trade. Aquaculture exports of seabass and seabream, have already increased during the last 2 years as a result of production increase. The long term production target, as defined by the relevant Decision of the Council of Ministers No. 52.849 of 13 Dec., 2000 , is 10000t p.a. Although this target sounded somehow unrealistic, in view of the prevailing situation in 2000, it now looks attainable with the tuna ranching, the expansion of the existing farms of seabream, seabass and the granting of new licenses for fish farms. Already applications of existing farms to increase their production to 1000 - 1300t p.a. are being examined by the government.

The farms need to be modernized and mechanized in order to cut down production costs. To avoid environmental impacts and conflicts with the existing users of the coastal zone and to overcome the scarcity of sites, the larger farms have to go further away from the coast, into deeper waters, which implies increased investment costs.

The species presently under culture are deemed limited and inadequate to ensure the viability and sustainable development of the sector. Further expansion and diversification are necessary for the long term viability of the sector. Cyprus has been considered one of the leading countries in marine fish species diversification in the Mediterranean, but the up to now commercial success of the species diversification was limited, despite the successes on technological grounds. The differentiation of the fisheries products, through aquaculture fish, is expected to have a beneficial impact on consumption, as well as on the marketing system. The diversification in the size of the < classic > species seabass and seabream and/ or the production of new products, like organic ones, could contribute to securing new and/or niche markets, both in Cyprus and abroad. Already Cyprus seabass and bream are successfully marketed as far as Russia and the USA, where they are esteemed for their high quality. The culture of new species that are lower in the food chain (like siganids) is promoted by Cyprus, and priority is given in culturing such species.

It is deemed appropriate that the aquaculture industry continue to pay much attention to products quality, since it is not envisaged that the island could compete with the large Mediterranean

aquaculture producers on quantity grounds. The small island character of Cyprus as well as its distance from the Central Europe market is also contributing to increased marketing costs. Improved management and quality control systems, that are also promoted by the government firms like HACCP, ISO 9000, ISO 1400, EMAS are increasingly introduced and adopted by the aquaculture sector.

It should be emphasized in this context that Cyprus, being predominantly a tourist destination, is very conscious on environmental aspects. Hence the policy of the state has been the “Precautionary Approach” principle, which supports the increase in production in small steps, with strict and constant environmental monitoring at the same time. The necessary relevant regulatory framework has been developed and is expected that minimal changes to it could successfully be faced as the needs arise.

The strategy for the further sustainable development of Aquaculture in Cyprus aims at creating the best possible conditions that will enable aquaculture producers to offer a healthy product in the quantities required by the market, without any harm to the environment. The success of this strategy will depend on the collaboration of all stake holders in the sector: national and local and public administrations, aquaculture producers and consumers. Also funds secured from EU, in the framework of the application of its Aquaculture Policy, will play a vital role, safeguarding and accelerating further developments. The existing situation is analyzed in the attached SWOT analysis (APPENDIX IV).

In the framework of the economic development of Cyprus and in accordance with the Common Fisheries Policy and the EU Strategy for the Sustainable Development of European Aquaculture, the ultimate target for 2007-2013 will be the sustainable development of Aquaculture, mainly in the coastal and mountain areas, with the promotion of economically and environmentally viable businesses, so that the Aquaculture industry becomes able to cope with the competition which is anticipated in the new market. The three main criteria for the achievement of the above targets will be 1) the quality and safety of food for the consumer, 2) the creation of permanent number of jobs and 3) the respect and protection of the Environment. These targets are expected to be addressed in the new National Strategic Plan for Fisheries 2007- 2013 and the related Operational Programme 2007-2013 that are under preparation by the Cyprus government.

12. ACKNOWLEDGEMENTS

I wish to express my thanks and deep appreciation to A. Kimonides, S. Agrotis and A. Petrou, key figures of the private sector of Cyprus Marine Aquaculture, my ex-colleagues of the Department of Fisheries and Marine Research G. Georgiou (Director), Y. Kyriakou, V. Papadopoulos and their colleagues for their substantial contribution to the preparation of this report. Special thanks are addressed to my husband Achilleas for his valuable assistance and guidance.

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APPENDIX I

Table 1.4 Seabass production per Mediterranean country (tonnes)

	2005 Real	2006 Estimation
Cyprus	583	600
Croatia	1,900	1,600
France	4,300	4,599
Greece	36,100	34,023
Italy	8,600	9,500
Spain	5,492	6,910
Turkey	21,100	27,720
*Portugal		
Total	78,075	84,952

Table 1.5 Seabream production per Mediterranean country (tonnes)

	2005 Real	2006 Estimation
Cyprus	1,465	1,200
Croatia	1,100	1,000
France	1,900	2,000
Greece	44,000	49,604
Italy	8,500	8,805
Spain	15,577	18,540
Turkey	17,500	17,650
Total	90,542	98,799

APPENDIX II

NEW QUOTAS FOR ATLANTIC TUNA FISHING IN EU COUNTRIES (2007)	
CYPRUS	154.68 tons
FRANCE	5496.65
GREECE	287.23
ITALY	4336.31
MALTA	355.59
PORTUGAL	523.88
SPAIN	5568.21
Total EU Quota:	16779.55 tons
Total ICCAT members Quota:	29500.00

APPENDIX III

ENVIRONMENTAL MONITORING PROGRAMME FOR AQUACULTURE ACTIVITIES IN CYPRUS

PROTOCOL FOR SAMPLING AND ANALYSIS

SAMPLING REGIME

At each offshore marine Fish Farm (FF) site, a transect of four sampling stations downstream of the fish farm cages will be established. The first station (Station 0), is set at the edge of the last fish cage, towards the direction of the prevailing current¹, while, Stations 1, 2 and 3 will be at a distance of 50, 200, and 500 meters respectively. A reference station, Station 4, will also be established upstream (towards the opposite direction of the dominant currents) at a distance of approximately 2km from the FF.

¹Please note that the information regarding the direction of the dominant currents for each site can be obtained from the Oceanographic Database that is been maintained in the Department of Fisheries and Marine Research (DFMR).

WATER COLUMN PARAMETERS

- **Nutrients** (NO_3^- , NO_2^- , NH_4^+ , PO_4^{3-}).

These inorganic compounds are necessary for the nutrition of primary producers. Eutrophication events are largely associated with increases in nutrient concentrations from anthropogenic inputs, particularly in oligotrophic waters.

Methodology: From every station an integrated (from the surface to the bottom) water sample will be collected, will be filtered through GF/F Whatman filters and then, the filtrate will be analyzed for the above nutrients according to standard spectrophotometric techniques. Two replicates of each station are requested.

Sampling Frequency: Twice a year (July and January).

- **Chlorophyll α**

It's an indicator of phytoplankton biomass and used, among others, as an index of eutrophication.

Methodology: At each station, samples for chlorophyll- α analysis will be collected in conjunction to those collected for the nutrient analysis. From each integrated water sample, 2 lt of seawater is filtered through a Whatman GF/F. Filters, then, must be wrapped with aluminium foil and stored at -30 °C.

Chlorophyll- α will be determined according to standard fluorometrically or spectrophotometrically techniques. Two replicates of each station are requested.

Sampling Frequency: **Twice a year (July and January).**

BENTHIC BIOTA

- **Macrobenthos**

Macrobenthos is a useful indicator of environmental status, because it responds predictably to many kinds of natural and anthropogenic disturbances.

Methodology: At each station five macrobenthic samples (replicates) will be collected using a Van Veen grab sampler with 0.2 m² surface area. Sediment samples will be then sieved through a 0,5 mm mesh sieve to collect macrofauna and macrophytes. After collection, specimens will be identified to the lowest species, where is possible, using a stereo-micro/scope and their diversity and abundance will be estimated.

Sampling Frequency: Once a year (July)

- **Macroscopic Inspection**

The following parameters will be documented with photographs and video.

- **Visual Survey (water column, sea bed)**

An underwater macroscopic survey in the area beneath the cages as well as in the adjacent coastal area will provide some information on the presence of large invertebrates, fish, occurrence of macrophytes, etc.

Frequency: Annual (every summer).

- **Presence of *Beggiatoa***

Beggiatoa is a chemoautotrophic (sulphur) bacteria, which forms a white mat on the sediment surface in anaerobic conditions (in areas of intense organic enrichment).

Methodology: An underwater macroscopic survey in the area beneath the cages, which is the area of highly enriched with organic material, can provide qualitative information on the presence of *Beggiatoa*.

Frequency: Annual (every summer).

Note: All the analyses will be done by using approved and well established techniques and methods by laboratories that are recognized and are pre-approved by the DFMR.

SWOT analysis of Cyprus marine aquaculture sector.

STRENGTHS	WEAKNESSES
<ol style="list-style-type: none"> 1. Application of open sea technology for the marine fish culture. 2. Very favourable physicochemical conditions for fish culture compared to other marine aquaculture producers in the Mediterranean. 3. Lack of serious fish diseases. 4. Entepreneship of the private sector and keen interest in investing in aquaculture. 5. Local existence of know how and high caliber human resources of various specialties. 6. Existence of the relevant infrastructure locally. 7. Export orientation of the farms.. 	<ol style="list-style-type: none"> 1. Limited sites for the establishment of new farms. 2. Small size of aquaculture farms, resulting to low production volume. 3. Lack of a coastal zone plan and high competition from other users. 4. Lack of cooperation between the producers (lack of Producers Organizations). 5. Great distance from production and consumption centers of aquaculture fish and inputs, resulting to high transport costs.
OPPORTUNITIES	THREATS
<ol style="list-style-type: none"> 1. Opportunities for financing from EU relevant Funds. 2. Increase market potentials, both in the local and international market because of new dietary trends and the decrease of fisheries production. 3. Utilization of the existing research results for diversification of species and products. 4. Application of new organizational structures and adoption of modern technological advances. 5. Promotion of organic aquaculture 6. Fish marketing potentials in the Near East countries. 	<ol style="list-style-type: none"> 1. Increase of competition as a result of Cyprus becoming full member of EU. . 2. Globalization of trade/ liberilization of the fish market, in conjunction with the low local farms production. 3. . Possible drop in seabass, sea bream prices in EU markets 4 Consumers prejudice towards aquaculture products.

APPENDIX V

CYPRUS MARINE AQUACULTURE USEFUL ADDRESSES

1. Government Department in charge of Aquaculture:
Department of Fisheries and Marine Research
101 Bethlehem str.,
1416 Nicosia - Cyprus
Tel: 22-807862, 22-807809
Fax: 22-775955
E-mail: ykyriakou@dfmr.moa.gov.cy
vpapadopoulos@dfmr.moa.gov.cy
www.moa.gov.cy/dfmr
2. Institution in charge of Aquaculture Research:
Department of Fisheries and Marine Research
101 Bethlehem str.,
1416 Nicosia - Cyprus
(Meneou Marine Aquaculture Research Station)
ganastasiades@dfmr.moa.gov.cy
Tel.: 24-422888
Fax : 24-424054
(Kalopanayiotis Fresh Water Aquaculture Research Station)
Tel: 22-807862, 22-807809

FARM REGISTER

- A. Open Sea Cage Farms
- B. www.cyprusaquaculture.com

<p>NAME: ALKIONI FISH FARMS LTD. ADDRESS: P.O.BOX 52077 , Limassol 4060 PRODUCTS: Seabream and seabass NAME AND POSITION OF CONTACT PERSON: Nikos Lofitis (Managing Director) TEL: 25576506 FAX: 25569337 E-mail: alkioni@cytanet.com.cy FISH FARM LOCATION: Moni, Limassol COMPANY ACTIVITIES IN AQUACULTURE (a) Production-marketing of fish (b) Consultancy services</p>

NAME: BLUE ISLAND HOLDINGS LTD.

ADDRESS: 10 Polyfimou str., Strovolos Industrial Area, 2033 Strovolos, Nicosia

PRODUCTS: Seabream and seabass

NAME AND POSITION OF CONTACT PERSON: John Economides (Managing Director)

TEL: 22516555

FAX: 22518044

E-mail: info@blue-island.com.cy/blue@blue-island.com.cy

Web-page: www.blue-island.com.cy

FISH FARM LOCATION: Zygi

COMPANY ACTIVITIES IN AQUACULTURE:

(a) Production-marketing of seed

(b) Production-marketing of fish

(c) Fish processing

(d) Consultancy services

(e) Equipment supplies

NAME: EAST MEDITERRANEAN AQUA TECHNIQUE LTD

ADDRESS: P.O.BOX 224805, 1304 Nicosia

PRODUCTS: Seabream and seabass

NAME AND POSITION OF CONTACT PERSON: Christakis Nathanail (Director)

TEL: 99458364

FAX: 22768370

E-mail:

FISH FARM LOCATION: Ayios Georgios Alamanou/Limasol

COMPANY ACTIVITIES IN AQUACULTURE:

(a) Production-marketing of fish

NAME: KIMAGRO FISHFARMING LTD.

ADDRESS: New Port, P.O. Box 55576, 3781 Limassol

PRODUCTS: Seabream, seabass and sharp-snout bream, blue fin tuna

NAME AND POSITION OF CONTACT PERSON: Antonis Kimonides (Director)

TEL: 25713009

FAX: 25712628

E-mail: kimagro@spidernet.com.cy

FISH FARM LOCATION: New Port, Limassol

COMPANY ACTIVITIES IN AQUACULTURE:

(a) Production-marketing of fish

(b) Fattening of blue fin tuna

NAME: SEAWAVE FISHERIES LTD.

ADDRESS: Larnakas avenue 133, P.O. Box 21708, 1512 Nicosia

PRODUCTS: Seabream and seabass

NAME AND POSITION OF CONTACT PERSON: Loukas Louka (Production Manager)

NAME: SEAWAVE FISHERIES LTD.

TEL: 99629359

FAX: 22521977

E-mail: amenicou@cytanet.com.cy

FISH FARM LOCATION: Vasiliko

COMPANY ACTIVITIES IN AQUACULTURE:

(a) Production-marketing of fish

NAME: TELIA AQUA MARINE LTD.

ADDRESS: P.O. Box 21886, 1514 Nicosia

PRODUCTS: Seabream and seabass

NAME AND POSITION OF CONTACT PERSON: Marios Katelaris

TEL: 22750238

FAX: 22758828

E-mail: telia@logos.cy.net / mkatelaris@telia.com.cy

FISH FARM LOCATION: Liopertri area

COMPANY ACTIVITIES IN AQUACULTURE:

(a) Production-marketing of seed

(b) Production-marketing of fish

NAME: TELIA (TUNA) LTD.

ADDRESS: P.O. Box 21886, 1514 Nicosia

PRODUCTS: Blue fin tuna

NAME AND POSITION OF CONTACT PERSON: Marios Katelaris

TEL: 22750238

FAX: 22758828

E-mail: telia@logos.cy.net / mkatelaris@telia.com.cy

FISH FARM LOCATION: Vasilico, Agios Georgios (Alamanos)

COMPANY ACTIVITIES IN AQUACULTURE:

(a) Production / Fattening of Blue Fin Tuna

NAME: KITIANA FISHERIES LTD. ADDRESS: P.O. Box 21886, 1514 Nicosia

PRODUCTS: Blue fin tuna

NAME AND POSITION OF CONTACT PERSON: Antonis Kimonides (Director)

TEL: 25713009

FAX: 25712628

E-mail: kimagro@spidernet.com.cy

FISH FARM LOCATION: Vasilico, Agios Georgios (Alamanos)

COMPANY ACTIVITIES IN AQUACULTURE:

(a) Production / Fattening of Blue Fin Tuna

B. Hatcheries

NAME: **ALKIONI FISH FARMS LTD.**
ADDRESS: P.O.BOX 52077 , Limassol 4060
PRODUCTS: Seabream and seabass
NAME AND POSITION OF CONTACT PERSON: Nikos Lofitis (Managing Director)
TEL: 25576506
FAX: 25569337
E-mail: alkioni@cytanet.com.cy
FISH FARM LOCATION: Moni, Limassol
COMPANY ACTIVITIES IN AQUACULTURE
(a) Production-marketing of fish

NAME: **BLUE FISHERIES**
ADDRESS: 10 Polyfimou str., Strovolos Industrial Area, 2033 Strovolos, Nicosia
PRODUCTS: Seabream, seabass, red sea bream and others in experimental stage
NAME AND POSITION OF CONTACT PERSON: John Economides (Managing Director)
TEL: 22516555
FAX: 22518044
E-mail: info@blue-island.com.cy/blue@blue-island.com.cy
Web-page: www.blue-island.com.cy
FISH FARM LOCATION: Zygi
COMPANY ACTIVITIES IN AQUACULTURE:
(a) Production-marketing of seed

NAME: **SAGRO AQUACULTURE LTD.**
ADDRESS: 296 Ayiou Andreou street, P.O.BOX 51761, 3509 Limasol
PRODUCTS: Seabream, seabass and sharp-snout bream
NAME AND POSITION OF CONTACT PERSON: Savas Agrotis (Director)
TEL: 25369691
FAX: 25369695
E-mail: sagroltd@spidernet.com.cy
FISH FARM LOCATION: Kouklia, Paphos
COMPANY ACTIVITIES IN AQUACULTURE:
(a) Production-marketing of fish
(b) Consulting services

NAME: TELIA AQUA MARINE LTD.
ADDRESS: P.O. Box 21886, 1514 Nicosia
PRODUCTS: Seabream and seabass
NAME AND POSITION OF CONTACT PERSON: Marios Katelaris
TEL: 22750238
FAX: 22758828
E-mail: telia@logos.cy.net / mkatelaris@telia.com.cy
FISH FARM LOCATION: Liopertri area
COMPANY ACTIVITIES IN AQUACULTURE:
(a) Production-marketing of seed
(b) Production-marketing of fish

C. Marine Shrimp Farm/Hatchery

NAME: A.P.Z. AQUARIUM LTD.
ADDRESS: P.O.BOX 53854, 3318 Limasol
PRODUCTS: Shrimps
NAME AND POSITION OF CONTACT PERSON: Polyvios Tsingis (Director)
TEL: 25991211
FAX: 25934350
E-mail: seaqueen@cytanet.com.cy
FISH FARM LOCATION: Akrotiri
COMPANY ACTIVITIES IN AQUACULTURE:
(a) Production of seed
(b) Production-marketing of shrimps
(c) Consulting services

D. Producers Organization

Organisation: ΠΑ.ΣΥ.ΘΑ (Pancyprian organization of marine farmers)
ADDRESS: 296 Ayiou Andreou street, P.O.BOX 51761, 3509 Limasol
PRODUCTS: Seabream, seabass and sharp-snout bream
NAME AND POSITION OF CONTACT PERSON: Savas Agrotis (Director)
TEL: 25369691
FAX: 25369695
E-mail: sagroltd@spidernet.com.cy

CYPRUS FRESH WATER AQUACULTURE FARM REGISTER

A. Trout

Name: Sabrina Fish Farm Ltd.
Address 69^A Mamandos, Kakopetria, 2800 Λευκωσία
Products: Trout
Name and Position of Contact Person: Basilis Blaxos
Tel: 22922901, 99680235
Fax:
Fish Farm Location: Platania
Company Activities in Aquaculture:
Production and Marketing of Fish
Fish Processing

Name: Fini Fisheries Ltd.
Address Fini, 4814 Limasol
Products: Trout
Name and Position of Contact Person: Christakis Sava
Tel: 25421679, 25422045, 99401551
Fax:
Fish Farm Location: Fini
Company Activities in Aquaculture:
Production and Marketing of Fish
Fish Processing

Name Vamaria Ltd.
Address 69^A Mamandos, Kakopetria, 2800 Λευκωσία
Products: Trout
Name and Position of Contact Person: Basilis Blaxos
Tel: 22922901, 99680235
Fax:
Fish Farm Location: Galata
Company Activities in Aquaculture:
Production and Marketing of Fish
Fish Processing

Name: Charalambos Mylonas
Address 9 Zinonos Kitieos street, apt. 6, Engomi, 2406 Λευκωσία
Products: Trout
Name and Position of Contact Person: Charalambos Mylonas
Tel: 22661214, 99309744
Fax: 22421977
Fish Farm Location: Ayios Nikolaos, Kakopetria
Company Activities in Aquaculture:
Production and Marketing of Fish
Fish Processing

Name: Chrysanthos Andreou
Address 24 Troodos street, Kakopetria, 2800 Λευκωσία
Products: Trout
Name and Position of Contact Person: Chrysanthos Andreou
Tel: 22922202, 22924919
Fax:
Fish Farm Location: Kakopetria
Company Activities in Aquaculture:
Production of Fish to satisfy the adjacent restaurant needs

B. ORNAMENTAL FISH

Name: Med Koi Ltd.
Address Theklas Lusioti 29 , Kassandra Centre, Office: 201, 202 3731 Limasol
Products: Ornamental fish
Name and Position of Contact Person: Frederick John Dutton
Tel: 25820650
Fax: 25431966
Fish Farm Location: Aradipou- Kalo Chorio , Larnaka
Company Activities in Aquaculture:
Production and Marketing of Fish

Name: Cypri Koi Fisheries Ltd.
Address P.O.BOX 58367, 3733 Limasol
Products: Ornamental fish
Name and Position of Contact Person: Nikos Lofitis
Tel: 25336506, 99640732
Fax: 25339337
Fish Farm Location: Zygi, Limasol
Company Activities in Aquaculture:
Production and Marketing of Fish

Name: Andreas Theodotou
Address 48 I. A. Avramidis Street, Dasoupoli, 2024 Nicosia.
Products: Ornamental fish
Name and Position of Contact Person: Andreas Theodotou
Tel: 22428265, 22316752
Fax:
Fish Farm Location: Kalo Horio Klyrou dam
Company Activities in Aquaculture:
Production and Marketing of Fish

Name: Java Enterprises Ltd.
Address 2 Limasol Ave., Latsia, 2220 Nicosia
Products: Ornamental fish
Name and Position of Contact Person: George Constantinou
Tel: 22488950
Fax: 22486667
Fish Farm Location: Lythrodontas dam
Company Activities in Aquaculture:

Name: Paradise Pet Shop Ltd.
Address 65 Prodromou street., Strovolos, 2063 Nicosia
Products: Ornamental fish
Name and Position of Contact Person: Pavlos Tilliros
Tel: 22662100
Fax: 22666079
Fish Farm Location: Atsa dam
Company Activities in Aquaculture:
Production and Marketing of Fish

APPENDIX VI



1. Telia Aqua Marine Ltd (Hatchery)
2. Telia Aqua Marine Ltd (Fattening)
3. Seawave Fisheries Ltd
4. Blue Island Holdings Ltd
5. East Mediterranean Aqua Technique Ltd
6. Telia Tuna Ltd
7. Kitiana Fisheries Ltd
8. Alkioni Fish Farms Ltd
9. Kimagro Fishfarming Ltd
10. Blue Fisheries Ltd
11. A.P.Z Aquarium Ltd.
12. Sagro Aquaculture Ltd.

