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Aquaculture planning in Mediterranean countries

Zaragoza : CIHEAM

Cahiers Options Méditerranéennes; n. 43

1999

pages 35-40

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=99600252>

To cite this article / Pour citer cet article

Stephanou D. **Marine aquaculture development and tourism: The case of Cyprus**. *Aquaculture planning in Mediterranean countries*. Zaragoza : CIHEAM, 1999. p. 35-40 (Cahiers Options Méditerranéennes; n. 43)



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## Marine aquaculture development and tourism: The case of Cyprus

**D. Stephanou**

Ministry of Agriculture Natural Resources and Environment  
Fisheries Department, 13 Aeolou str., Nicosia, Cyprus

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**SUMMARY-** The paper deals with the interactions between marine aquaculture and tourism development in the touristic island of Cyprus and the relevant government policy. Tourism is the main industry with significant contribution to the GDP, while mariculture in offshore cages is a new development which is providing good quality fish in increasing quantities to a local market that covers about 60% of its needs in fish and fishery products by imports. The massive growth of the algae *Cladophora* and its repercussions on the tourist industry played a decisive role in the adoption of offshore cage technology for fattening fish. The present state of marine aquaculture and tourism is described and the latter is discussed and analysed as consumer of aquaculture products and as competitor with mariculture for coastal land and sea areas. Information is given on the public reactions on the perceived environmental impact of fish farms as regards the degradation of marine development and its anticipated repercussions on tourism development potentials. The Cyprus government policy is cited which aims at safeguarding the development of both activities. Issues like the procedures and regulations for the establishment of farms, their environmental impact and the monitoring of their operations are being examined. Also, information is given on tourism-aquaculture as regards navigation hazards and boat refuge. The role of marine aquaculture as a tourist attraction is examined and the relevant regulations on recreational fishing around the fish farms are stated. The paper concludes that tourism and marine aquaculture interact both positively and negatively on each other and an integrated approach is advisable on coastal zone management. Although tourism development is given priority, the government policy aims at the sustainable development of both activities which could lead to the diversified use of the sea resource on the island.

**Key words:** Marine aquaculture, tourism-aquaculture interaction.

**RESUME -** "Développement de l'aquaculture marine et du tourisme : Le cas de Chypre". Cet article présente les interactions entre le développement de l'aquaculture marine et du tourisme à Chypre, île touristique, ainsi que la politique gouvernementale qui s'y rapporte. Le tourisme est l'industrie principale, et contribue fortement au PNB, tandis que la mariculture en cages en mer ouverte est un nouveau développement le long de la côte, qui permet d'apporter du poisson de bonne qualité en quantités grandissantes à un marché local qui couvre environ 60% de ses besoins en poissons et en produits de la pêche par des importations. La croissance massive de l'algue filamenteuse *Cladophora patentiramea* et ses répercussions sur l'industrie du tourisme ont joué un rôle décisif dans l'adoption de la technologie des cages en mer ouverte pour le grossissement du poisson. Des informations sont rapportées sur la situation actuelle de la mariculture et du tourisme. De plus, le rôle du tourisme est discuté et analysé en tant que consommateur de produits aquacoles et comme concurrent de la mariculture pour l'espace littoral et marin. Des éléments d'information sont apportés sur les réactions du public concernant l'impact environnemental qu'il perçoit, dû aux exploitations piscicoles pour ce qui est de la dégradation par développement marin et ses répercussions prévues sur le potentiel d'essor du tourisme. La politique du gouvernement de Chypre est présentée ; elle vise à la sauvegarde du développement de ces deux activités. Certaines questions sont examinées telles que les procédures et les réglementations pour l'établissement des fermes, les aspects de leur impact sur l'environnement et le suivi de leurs opérations. Des données sont également présentées sur le tourisme et l'aquaculture concernant les accidents de navigation et les refuges pour bateaux. Le rôle de la mariculture comme attraction touristique est examiné, et les réglementations se rapportant à la pêche récréative autour des fermes piscicoles sont présentées. Cet article parvient à la conclusion que le tourisme et la mariculture interagissent à la fois positivement et négativement l'un sur l'autre, une approche intégrée étant recommandable pour la gestion de la zone côtière. Bien que priorité soit accordée au développement du tourisme, la cible de la politique gouvernementale est le développement durable des deux activités, ce qui pourrait mener à une utilisation diversifiée de la ressource mer sur une île qui, jusqu'à récemment, était utilisée pour le tourisme et la pêche uniquement.

**Mots-clés :** Aquaculture marine, interactions tourisme-aquaculture.

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## Introduction

The Mediterranean countries as a whole are the first tourist destination in the world. They attract more than 30% of the international and national tourists (250 million). A great part of the tourists is staying along the coasts enjoying the sea. Tourism contributes substantially to the economies of all Mediterranean countries where it represents 14% of their exports, 23% of the export of services, more than 6 million posts of direct employment and at least 14 million posts of direct and indirect employment (Languar, 1995).

Marine aquaculture is being practised on the coast as well as in the sea itself, where it struggles to find its niche as a considerably new economic activity along with the other well established and accepted ones. Tourism and marine aquaculture development in Cyprus is used as an example of the efforts being paid towards this direction. Tourism and marine aquaculture have certain conflicting areas but also common interests.

Cyprus is the third largest island in the Mediterranean (area 9251km<sup>2</sup>) found at a distance of 390 km north of Egypt, 75 km south of Turkey, 380 km from the Greek island of Rhodes. Like most parts of the Mediterranean, Cyprus is a tourist island that is visited each year by an increasing number of visitors (about 2 million in 1996, local population about 650,000). Tourism is the main industry in Cyprus. Tourism receipts in 1996 were C£780 mn and represented 36.8% of the total receipts from exports of goods and services. The main attraction is the sun and the clean, warm sea (15°C-30°C) and, to a lesser extent, the archaeological sites. After the 1974 Turkish invasion, which resulted in the occupation of 40% of the island, tourist development projects occupy most of the south coast in the government-controlled areas.

Along the coasts, on the narrow continental shelf of the island, fishing (both inshore and trawling) and marine aquaculture are also practised. Fishing is of far smaller economic importance than tourism (Table 1). Marine aquaculture's economic importance, although smaller than that of fisheries, is increasing with the development of offshore mariculture; it is estimated that in 1997 its products valued about C£5 million compared to C£3.6 million in 1996. The sea around Cyprus is poor, like most of the Eastern Mediterranean, oligotrophic, the fishing grounds being almost fully exploited and the fishing stocks depleted by over fishing. So the island imports about 60% of what it consumes in fish and fish products. The government promotes marine aquaculture acknowledging its potentials in increasing the most needed good quality fresh fish for its local population and the tourists.

Table 1. Comparison between the economic importance of tourism and fisheries  
[Source: Department of Statistics and Research, Ministry of Finance, Agricultural statistics 1996, Department of Statistics and Research, Ministry of Finance, National Accounts 1996 (provisional estimates)]

Economic indicators	Tourism	Fisheries
Contribution to the GDP (%)	8	0.25
Value added of the sector in C£ million <sup>†</sup>	330	10.5
Employment as % of active population	10.5	0.4

<sup>†</sup>C£ 1 = US\$2

## The Cladophora case

A decisive role to the formulation of the government policy for the development of offshore marine aquaculture was played by the "Cladophora case".

In 1990-1991 massive growth of the green filamentous algae *Cladophora patentiramea*, an Indopacific species, immigrant through the Suez Canal, occurred in the most touristic areas of Ayia Napa area. The algae grew epiphytically, in huge quantities, on the algae *Cystoseira sp.*, in the shallow waters frequented by tourists. Dead Cladophora was washed ashore, piling up in the shores and causing nuisance to the tourists.

There was a massive public debate and outcry against the operation of the first landbased marine fish fattening farm at Liopetri that operated in the vicinity and whose effluents were accused as the causative agent of the phenomenon. The public reaction was organized mainly by the hoteliers, land developers and the nearby communities whose main concern was the effect that *Cladophora* could have on the tourist industry. In-depth study of the phenomenon by the local and foreigners experts proved that domestic/tourism development projects and intensive agriculture contributed 300% more nitrates to the sea enrichment than the fish farm. The scientific rationale was not accepted by the hoteliers and the local communities demanded the closing down of the farm. The government reconsidered its policy for landbased marine aquaculture, allowing only hatcheries on the coast, while fish fattening was to be undertaken offshore in cages. Financial assistance was provided for the conversion of the landbased facilities of the Liopetri fish farm into a marine fish hatchery and the setting up of offshore cage facilities. Technical assistance from FAO was secured for the introduction of this new technology of offshore cage culture into Cyprus in conjunction with the environmental management of aquaculture development. Meanwhile the *Cladophora* died off, while the farm was still in operation, in 1991. The *Cladophora* growth was attributed to a coincidence of favourable environmental parameters, like a series of years of warm, calm winters, high water temperatures and a favourable nutrient environment.

The *Cladophora* case on the one hand had a favourable result on aquaculture, resulting in the introduction of offshore technology, but on the other hand it created a negative public image for aquaculture as being an enemy to the environment, which is still affecting negatively the efforts for the establishment of new farms.

## The present state of marine aquaculture

Presently there exist three commercial hatcheries and eight private commercial marine fish cage farms, of an average annual production of 150t each, for Seabream (*Sparus aurata*) and Seabass (*Dicentrarchus labrax*), but also new species like the Sheephead Bream (*Puntazzo puntazzo*). A landbased shrimp farm and hatchery for the production of the Indian prawn (*Penaeus indicus*) is also operating.

In 1996 the production of fry was 6.8 million, of table fish 663 t and of prawns 12 t. Marine aquaculture production was valued at about US\$7.6 million and represented in quantity about 25% of total fish production and more than 60% of the high quality fresh fish in the local market. Farmed fish replaced imports, since the government liberalized fish imports in the framework of GATT as from 1996, while it imposed an import duty on fresh imported fish. The measure aims at protecting the local fisheries production and gives time for the consolidation and expansion of the fish farms in order to become competitive at national and international level.

## Tourism as a consumer of marine aquaculture products

The bulk of the fish produced by marine aquaculture is consumed locally and in 1996 only 14 t of fish were exported. The consumption of seabream and seabass is increasing, while their price remains at profitable levels for the producer. The per capita consumption of fish is generally rather low compared with that of the North Mediterranean countries, being around 13 kg in 1996.

Tourism presents a main outlet for aquaculture products. Each tourist was estimated to consume at least 1.5 kg of fish (Stephanou, 1995), out of which a large part come from aquaculture. Seabream and seabass are served extensively in the local taverns frequented by tourists, both local and foreign. Publicity to aquaculture fish is being given through the Cyprus Tourism Organization leaflets and other publications.

## Tourism as competitor for land and sea

Aquaculture activity is a newcomer as regards the use of the coastal zone where well established and accepted activities, with their cons and pros, were, until recently, urban development (5 out of the 6 Cyprus towns are found on the coast), tourism and fisheries. Tourist installations and activities occupy a large part of the limited coastline.

The coastline length of Cyprus is 782 km out of which 413 km are inaccessible to the government because of the political problem and 73 km lie within the British Military Sovereign Base areas, leaving only 296 km under Cyprus government jurisdiction. Large parts of this area (about 65 km of the coastline) are being developed since 1974, with seaside resorts and big hotel complexes further limiting the coastal land that could be used for marine aquaculture projects bearing in mind that most of the south and west coast of Cyprus is very exposed.

The exploitation of the coastal land for tourism development resulted in excessive increases in price and become prohibitively high for other forms of development, including aquaculture. The application of offshore cage culture technology offered a breakthrough to the scarcity of sites for aquaculture projects.

Apart from the competition for land, tourism development limits also the available sea sites-candidates for the establishment of cage farms, since the related recreational activities are taking place along the coast, mainly opposite tourist areas.

According to the government Country Plan, which regulates the use of land on the island, aquaculture could take place in tourist zones, under certain assumptions. In an effort to find a compromise solution for the development of both tourism and mariculture, the Department of Fisheries decided to promote aquaculture in sea areas which are not opposite tourist zones, but in front of agriculture zones and at a minimum distance of at least 1 km offshore, with water depth of at least 20 m and distance between the farms of at least 3 km. Hatcheries and farm supporting facilities are found mainly in agricultural zones. This policy is under study and some changes are anticipated in the near future.

## **Tourism development and environmental impact of fish farms**

Good water quality and general healthy environment, which plays a primary role to the sustainable development of marine aquaculture, is also a must for an island like Cyprus, where the clean, transparent sea water is one of the main advantages offered to the visitor. So the government is very sensitive on environmental impact issues and takes precautionary measures to safeguard the high quality of the sea. The government considers the submission of an Environmental Impact Assessment Study as a prerequisite for any aquaculture project which, once accepted by the appropriate government bodies, it becomes part of the terms and conditions of the relevant operation licence which is issued by the Department of Fisheries. So the EIA is being used as a tool to minimize the possibility of negative environmental impacts. Also special terms and conditions are imposed on the licence which aim at safeguarding good management practices, responsible use of chemicals and general protection of the marine environment. In addition to that it undertakes the environmental monitoring of the farms operation.

The setting of new farms in deeper waters, further away from the coast, is being considered. This may allow the siting of fish farms opposite tourist zones. Furthermore, the Town and Country Planning Act of 1990 requires an Environmental Impact Study to accompany the applications for the establishment of any aquaculture development project.

Nevertheless the perceived environmental impact of offshore farms, even their aesthetic effect, is over emphasized and lead to public reactions against the establishment of cage farms. Local reactions to the setting of marine cage farms, even in the vicinity of tourist zones or opposite areas with tourism development potentials, mainly stem from concerns about the possibility of the degradation of the marine environment and its subsequent effect on tourism. The licence for the establishment of a cage farm in Pamos Sea area (north-east coast) where the land owners and the prospective tourist developers formed strong pressure groups was cancelled because of the alleged negative aesthetic effect that this would have in the bay. Some reactions against an existing farm were also taking place in Paphos sea area under the same pretext.

## **Tourism - Aquaculture and navigation hazards**

Leisure boat traffic is quite intense along the coast where the fish farms are found, especially in summer. To minimize the hazards to boats and farms, including leisure boats and surfing boards, the

Ports Authority as the competent authority requires the good demarcation of the cage farms, including the use of effective lights and radar reflectors. Farm positions are also marked on the Admiralty charts.

In some case tourism and aquaculture are using the same infrastructure facilities. Both the fishing shelters and the marinas are offering refuge to recreational tourist boats as well as to fishing boats or boats servicing the cage farms. The fishing shelters are being managed by the Department of Fisheries on the basis of the Fishing Shelters Law No. 171 of 1990 and the relevant Regulations of 1994, while the marinas are either governmental or private. In the fishing shelters priority is given to fishing boats, including boats servicing the fish farms. New marinas, designed mainly for nautical tourism, which is promoted by government, are expected to be used also by the new cage farms now planned. The use of marinas by fishing-aquaculture boats add a special folkloric tone which is more noticeable in some other Mediterranean areas like Spain.

### **Marine aquaculture as a tourist attraction**

Marine aquaculture is being used directly or indirectly as a tourist attraction. One of the distinct environmental effects of the operation of cage farms is the increase of fish population below the cages and around them. The fish are mainly attracted by fish food remnants and fish excreta. The prevailing species are Bogue (*Boops boops*) and various species of mullets as well as some predators, mainly Amberjack (*Seriola dumerilli*) and sometimes the Bluefin Tuna (*Thynnus thynnus*). The fish aggregation attracts both commercial and recreational fishermen in the area of fish farms. To avoid undesirable situations no recreational fishing is allowed within a distance of 350 m from the floating installations of cage farms and a specific provision is included in the relevant licences issued by the Department of Fisheries. Nevertheless spear fishermen often fish in the area of cage farms.

The farms are attracting tourists, especially the offshore cage structures, which are visited mainly by speed boats, a practice which is not very welcome by most fish farmers. Also the marine hatcheries and the Meneou government marine aquaculture research station are visited by an increasing number of tourists on, presently, unorganized basis. An application for the incorporation of a commercial marine fish hatchery into a marine, landbased thematic park is pending in front of the government. Farmed marine fish species are kept in a marine and freshwater private aquarium in Paphos frequented by tourists and are used for exhibition and educational purposes.

### **Conclusion**

Tourism and marine aquaculture interact positively and negatively on each other and an integrated approach is advisable on coastal zone management. Tourism objectively poses mainly site constraints to the development of marine aquaculture. Tourism development is given priority because of its economic importance. It depends on the government and the private sector to adopt the necessary measures to achieve the peaceful coexistence of the two activities (which in some cases has been proved not an easy task) as well as their sustainable development to the benefit of the Cyprus economy.

Presently the government is at the stage of revising its policy for the further development of marine aquaculture in order to attain economies of scale and survive the liberalization of imports. Special attention is being paid to the environmental impact aspects of such development on the coastal zone, because of the repercussions on the tourist industry.

Further growth of the marine aquaculture will safeguard the diversification of the sea resource of this Mediterranean island which is mainly exploited for tourism and, to a much lesser extent, for fishing.

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