

Marine aquaculture: a success story in Greece

By Dr. George Triantaphyllidis, LAMANS Management Services SA, Greece



Marine aquaculture is a success story in Greece. Starting in the early 1980s, the first hatcheries supplied the first fingerlings for on-growing in cage farms. Cage farming technology was known from the salmon industry and easily adopted in the Mediterranean conditions. As the European Union (EU) imports of fishery products are much higher than its exports, aquaculture was always in the priorities of the EU strategy. Therefore, major EU funding programs and a few entrepreneurial individuals that have undertaken the challenge and the risks has led to a rapid increase in production and Greece became, and still is, the largest producer of seabass (*Dicentrarchus labrax*) and seabream (*Sparus aurata*) in the world. From 100 tons of ready product and 12 fish farms in operation in 1985, in just two decades the production had been increased at 1000% and fish farms exceeded 320. Greece has reached a pick in 2008 by producing more than 450 million fingerlings and 120.000 tonnes, but this production has reduced in order to restore satisfactory prices.

In Greece, the rapid development of aquaculture, and in particular mariculture, has been based on:

- The National and the E.U's policies of financial incentives and subsidies
- The favourable, and largely 'competitive', geomorphologic and environmental conditions
- The increasing interest shown by private investors
- The market developments, which showed signs of increasing demand for fresh fish
- The scientific developments in the research and technology for culturing marine species.

At present, aquaculture (and mostly mariculture), is considered a mature industry in Greece, not only because of the impressive results in production volumes but also because of a number of important socio-economic aspects associated with it. The sector provides employment to more than 10,000 people, through direct and indirect activities, especially in rural areas with scarce investments and no employment alternatives. The high rate of investment in the sector has created the necessary infrastructure and has developed the relevant 'know-how', having thus improved the economic indices of the wider fishery industry as none of the other sectors of the national primary production have done.

Production is mostly in floating plastic cages and costs of production are among the lowest in Europe. Production sites are located all around Greece, but are most prevalent in the central regions close to good infrastructure and export routes through the port of Patras (Western Greece).



Cage farm in western Greece. In fish farming of seabass and seabream in sea cages stocking density is between 20-30 kilos/m³ and leads to the production of marketable size fish (300-450 gr) in 14-17 months.

The need for species diversification in the Greek aquaculture industry emerged after the first price crisis, in the mid 1990's. Producers and research institutes experimented with a variety of species. Unfortunately, producers pressed for immediate results and the R&D departments (of the very few companies that had one actually operating) focused on species with similar culture requirements as the bass and bream. The sharpsnout bream (*Puntazzo puntazzo*) has been the 'new species' for many years, without however really diversifying the product in the market (whole whitefish, plainly sold on ice, of similar size and appearance to the seabream). Moreover, it uses the same culture technology and husbandry protocol, even the same artificial feed. From the latter becomes apparent that the industry has not been able to actually progress and develop towards an effective species diversification strategy. However, the following species have been produced: *Pagrus pagrus*, *Dentex dentex*, *Diplodus sargus*, *Pagellus erythrinus*, *Oblada melanura*, *Lithognathus mormyrus*, *Argyrosomus regius* and *Solea solea*.

On the other hand, research institutes experiment with a much wider variety of fish species. Without the pressure for immediate results for commercial application (at a scale comparable to the bass and bream, which was what producers wanted) researchers work with a more long term horizon.

As species diversification for the Mediterranean fish-culture has become an issue of importance, there have been numerous efforts towards that direction, mainly from the national research institutes. The Table below presents some preliminary results of such efforts, as presented by the researchers Divanach and Rene in the PROFET conference «RTD needs in Mediterranean fish farming».

Table 1 Preliminary results of research efforts for the cultivation of 'new species'
Source: PROFET Conference «RTD needs in Mediterranean fish farming»

Species name	Remarks
NEW MIMETIC SPECIES (Reared with "bream type" technique)	
<i>Boops boops</i>	Reared in cages, reaches 200 gr in 6-12 months
<i>Pagellus acarne</i>	Reared in cages, reaches 200-250 gr in 14 months
<i>Diplodus vulgaris</i>	Slow grower, reaches 230 gr in 30-36 months
<i>Diplodus sargus</i>	Slow grower, reaches 230 gr in 36-42 months (in 24 months in warmer waters)
<i>Pagellus erythrinus</i>	Reaches 130 gr in 12 months, 300 gr in 24 months
<i>Lithognathus mormyrus</i>	Reaches 220-240 gr in 12 months, 330-350 gr in 24 months
<i>Oblada melanura</i>	Reaches 50 gr in 12 months, 150 gr in 24 months
MEDIUM GROWERS	
<i>Pagellus bogaraveo</i>	Reaches 400 gr in 24 months
<i>Pagrus pagrus</i>	Reaches 400-450 gr in 18-20 months
<i>Puntazzo puntazzo</i>	Reaches 350-400 gr in 24 months
<i>Pagellus erythrinus</i>	Reaches 130 gr in 12 months, 300 gr in 24 months
<i>Umbrina cirrosa</i>	Reaches 340gr in 12 months, 750 gr in 22 months. Cage adaptation problems
<i>Sciaena umbra</i>	Reaches 400 gr in 12 months. Cage adaptation problems

PROMISING SPECIES (Growth performances, maximum size or market image)	
<i>Dentex dentex</i>	Reaches 450 gr in 12 months – 1.000 gr in 24 months Bad behavior with dry pellets
<i>Epinephelus marginatus</i>	Nodavirus problems. Reaches .150 gr in 12 months, 450 gr in 24 months. Bad behavior in cages
<i>Argyrosomus regius</i>	Reaches in 12 months 1.500 gr, in 24 months 1.800 gr. Bad behavior in tanks
<i>Epinephelus aeneus</i>	Reaches 1.500 gr in 24-30 months (experiments in Israel) Susceptibility to illness
Big fish and fast growers	
<i>Seriola dumerilii</i>	Reaches 1 kg in 12 months. High preference on wet and live feed, less preference on dry pellets. Problems associated with larval stage feeding.
<i>Polyprion americanus</i>	Reaches 2.7 kg in 12 months, 3.5 kg in 24 months and 5 kg in 36 months. Ongrowing with fresh food and moist pellets easy. Thermal optimum between 17-19 C.
<i>Schedophilus ovalis</i>	Reaches 1.8 kg in 5 months
<i>Coryphaena hippurus</i>	Reaches 2 kilos in 5 months Maximum :1.5 m and 35 kg at 4 years - 1.8 kg in 5 months. Exhibits cannibalistic behaviour.
<i>Thunnus thynnus</i>	Collected in the wild and transferred for ongrowing and fattening in cages. (The cage can be towed to the culture site at distances up to 3.000 km. Reaches over 3 m and 600 kg
<i>Octopus vulgaris</i>	Reaches up to 3 kg in one year and 10 kg in 2 years
<i>Rachycentron canadum</i>	Fast grower, global market
Problematic species (species with unresolved problems despite R&D efforts)	
<i>Solea solea</i>	Problems associated with fish pathology and feeding with artificial feeds
<i>Solea senegalensis</i>	Problems associated with fish pathology and feeding with artificial feeds
<i>Mullus surmuletus</i>	Reproduction problems
Hybrid species	
<i>Pagrus x Aurata</i> <i>Pagrus x Dentex</i> <i>Sargus x Dentex</i> <i>Puntazzo x D. vulgaris</i>	All combinations gave poor results in relation to the parental species



Biofence system and conventional bags for cultivation of microalgae in a hatchery in Greece.