Marine fish diseases in Greece

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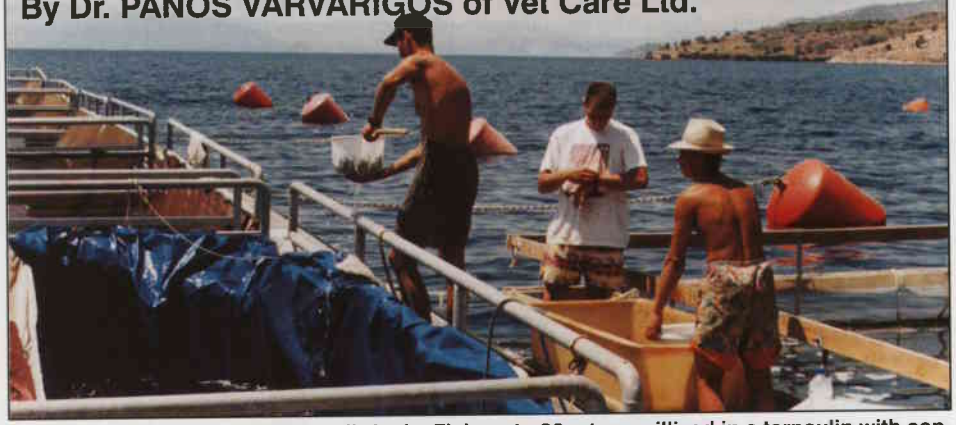

Vaccination of sea bass against vibriosis. Fish up to 30g, tranquillized in a tarpaulin with constant oxygen supply, are netted out and immersed for 30 seconds in vaccine solution.

DEVELOPMENT of marine fish farming in Greece has been rapid in recent years. It has been boosted by financial grants from the EU and has benefited by the considerable advantage of the many suitable on-growing and hatchery sites around its coastline. As a result, Greece has become the major producer of Mediterranean farmed fish. Twenty-five hatcheries and 200 fish growers produced a total of 24,000 metric tons of farmed fish in 1996, of which over 70 per cent has been exported. Production is expected to rise beyond 35,000 tons by the turn of the century. (Official figures from the Agricultural Bank of Greece, Fisheries Statistics Dept. Shellfish farming is not referred to here.)

The main fish species grown are sea bass (*Dicentrarchus labrax*, family *Serranidae*) and sea bream (*Sparus auratus*, family *Sparidae*). Each accounts for about half of total output. Currently, however, there is a noticeable shift towards the cultivation of additional marine species which command a high market price and may help in increasing the market penetration of all farmed fish products. Such new entrants in farming belong to the family *Sparidae* (breams) and comprise sheep's head sea bream (*Puntazzo puntazzo*), red porgy (*Pagrus pagrus*), and dentex (*Dentex dentex*). Their contribution to the overall farmed output is still marginal but is expected to increase in line with the accumulation of experience in stock management techniques, nutrition and feeding, but most importantly, disease control.

Critical problems

Nevertheless, despite the air of success that proclaims the industry to the eyes of the public, many fish farms are facing critical problems, mainly due to the haphazard way that the state authorities have responded to the sudden influx of investors and the rapid expansion of this commercial activity.

Severe legislative shortcomings, have led to the virtual lack of industry standards and regulations. In addition, due to over-borrowing and investing with undue enthusiasm towards expansion, some farmers have cornered themselves financially and are forced to sell off their businesses.

Apart from these, difficulties at production level are getting worse as output is scaled up and hindering the production plans. Stock management, application of new technologies and automation, nutrition and feeding as well as disease prevention at present comprise the main challenges to production itself. Each particular field is multifaceted and in need of specific attention.

Experience that the farming of fish is a delicate business demanding care and meticulous management at all levels is, unfortunately, gained at a slow pace by farm owners and workers alike and only through costly mistakes.

Devastating epizootics

This is typically exemplified nowadays by the fact that the sporadic, usually mild disease outbreaks of the past have been replaced by widespread, devastating epizootics. In some cases, even the viability of farming a particular fish species is put in doubt due to disease.

The species farmed in Greece usually suffer from bacterial, viral and parasitic diseases caused by pathogens that are common throughout the warm Mediterranean waters. The severity of infection and hence mortality usually depends on fish size, farm site and water temperature (season).

Among the list of bacterial pathogens, those most economically important are *Vibrio anguillarum* causing Vibriosis to sea bass, and *Pasteurella piscicida* (recently renamed *Photobacterium damsela* var. *piscicida*) causing Pasteurellosis (or Pseudotuberculosis) in both sea bass and bream. Both are Gram negative bacteria causing systemic disease.

All fish farms have at some stage experienced the grave consequences of vibriosis to their stocks of sea bass. Outbreaks can occur any time, usually after stress, but most often during early spring and autumn when seawater temperatures are unstable. Vibriosis presents itself as a haemorrhagic septicaemia. The bass "turn red" due to extensive skin haemorrhages mainly around the head, the belly and the base of fins and die in numbers. The abdomen is distended, the internal organs are congested, the spleen is grossly enlarged, the intestine is full of

Vibriosis in sea bass. Fish "turn red" due to haemorrhages.

Sheep's head sea bream suffering myxosporidiosis.

transparent fluid, whereas petechiae are found on the peritoneum and liver.

Pasteurellosis on the other hand is disastrous mainly to young sea bream, especially in hatcheries. In its acute form the cumulative losses of infected bream juveniles may be anything between 50 per cent and complete loss.

Sea bream suffer the greatest of losses due to pasteurellosis infection when still young, usually below 4g in weight. Sea bass, on the other hand, suffer until up to 60g while larger fish apparently are more resistant. Cumulative mortality can be anything between 0.5 and 20 per cent.

The common lesions of the disease in its chronic, slow form are focal gill necrosis and whitish nodules (pseudotubercules) on the enlarged and darkened spleen. Pasteurellosis is water temperature dependent. It is diagnosed in hatcheries at temperatures above 17°C and at on-growing sites when sea-water temperature is above 19°C.

Myxobacteriosis

Other Gram negative bacteria inducing serious pathologies are *Flexibacter sp.* which induce a pathological condition to all species, usually subsequent to handling and surface injuries, known as myxobacteriosis. Skin necrosis on the head and body covered with mucus as well as fin rot comprise the common lesions of myxobacterial infection, almost invariably associated with fish transportation, change of nets and other handling trauma.

Aeromonas sp. and *Pseudomonas sp.* are usually induced as a result of environmental stress, malnutrition and/or hardship of the growing fish and cause haemorrhagic septicaemia. *Aeromonas sp.* have been isolated from occasional outbreaks in sea bass and had to be differentially diagnosed from vibriosis. *Pseudomonas sp.* are often blamed as one of the causative agents of the "winter disease syndrome" of sea bream. The aetiology of the syndrome is not clearly established. Nutritional disorders as well as infection with *Pseudomonas* are suspected.

Gram positive cocci

Disease outbreaks associated with Gram positive cocci have been identified recently and several strains of *Staphylococcus sp.* have been isolated from farms throughout Greece. *Staphylococci* are causing staphylococcal septicaemia to all farmed species mainly during late spring and summer when sea-water temperatures are high. Mouth, skin and fin rot are the common external lesions, whereas distinct enteritis and enlarged spleen and gall bladder are often observed internally. The daily mortality toll is about 2 per cent but the condition is easily complicated by infections with Gram negative bacteria, such as *Pasteurella*, resulting in steep rises in mortality.

Viral diseases of prevalent importance comprise lymphocystis which affects sea bream and is due to infection by an *Iridovirus*, and recently, viral nervous necrosis (VNN) of sea bass which is induced by a *Nodavirus*.

Lymphocystis presents itself in the form of whitish nodules scattered on the body and fin surface. The degree of infection among a batch of bream may be high, especially in juveniles. However, apart from a temporary growth retardation, mortality is insignificant unless the condition is aggravated by additional stress or other infections. The disease has a chronic course with a benign outcome.

In contrast, VNN of sea bass is a killer. All age groups are susceptible. The disease may decimate growing stocks of sea bass, especially at elevated summer sea-water temperatures of about 24°C. Then cumulative mortality may be as high as 60 per cent of the stocks. The condition is suspected by the erratic swimming and spasmodic behaviour of the infected fish. Histology reveals vacuolation of the brain and retina tissues.

Parasitic diseases are of increasing importance to the Greek aquaculture industry. They are not often associated directly with heavy mortalities in sea bass and sea bream, but recently proved the major problem for the rearing of *Puntazzo* (sheep's head bream).

Among the prevailing fish ecto-parasites, ciliate protozoans, (phylum Ciliata), such as Cryptocaryon sp., infect the gills of sea bass

but mainly sea bream. Numerous deaths of broodstock bream in hatcheries are occasionally associated with cryptocaryonasis due to inflammation and necrosis of the gill epithelium by the parasites.

Crustacean ecto-parasites, belonging to the sub-class *Copepoda*, usually infest sea bass reared in net cages. These parasites either colonise the skin around the head part of the fish (*Caligus sp.*) or attach themselves in the buccal cavity (*Anilocra physodes*). They cause mechanical injury, tissue necrosis and stress leading to secondary bacterial infections.

The common metazoan ecto-parasites belong to the phylum *Platyhelminthes* (flatworms) and class *Monogenea*. Of those, *Microcotyle sp.*, and *Furnestinia echeneis* are usually found on the gills of sea bream. They can produce local inflammation and hypersecretion of mucus that impairs respiration. Usually, they do not induce significant pathologies unless under stressful conditions when secondary bacterial infections can be provoked. *Diplectanum aequans* is the monogenetic trematode which is most often found on the gills of sea bass.

The main protozoan endo-parasites belong to the class *Myxospora* causing myxosporidiosis. Among these parasites *Myxidium* sp. infect the liver, gall bladder and gastrointestinal tract of sea bream and sheep's head bream. The latter suffers massive losses due to the extensive necrosis of the affected organs, rendering its cultivation uneconomic at times. *Ceratomyxa* sp. are found in the liver, gall bladder and intestine of sea bass and dentex but with rather limited direct consequences.

The fight against all the above serious diseases is intensifying but unfortunately, the known treatments are frequently proving ineffective, perhaps as a result of the excessive use of antibiotics and chemo-therapeutics over recent years, which lead to the establishment of resistant strains of bacteria.

Wide spectrum antibiotics are still used to treat bacterial diseases, but, there are no means to treat the viral diseases, and the parasitic infections are proving extremely difficult to combat.

The medications used against the endo- or ecto-parasites are drawn from similar conditions on terrestrial livestock, hence, are applied empirically. The necessary scientific, experimental data for their efficacy on fish is not yet established.

In addition to the direct economic consequences when losing fish due to disease and the considerable expenditure associated with veterinary costs and medications, disease also has a significant psychological effect on the fish farmers who observe their stocks dying and are often unable to reverse the situation.

Disease prevention is the only safe way towards maintaining the good health of the growing fish. Improved nutrition and stock management as well as routine rapid diagnostic screening and vaccination against the most catastrophic of diseases are gradually accepted by the farmers who have to fulfill production plans and keep their businesses profitable.