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SEAFDEC "Better life through aquaculture"

IDENTIFYING MILKFISH FRY

The term "fry" is often used loosely to refer to different, often undefined, sizes or stages of young fish and shrimps caught from coastal waters (shore, estuaries, lagoons, swamps). Used to stock culture ponds, "fry" is synonymous with "seed" in frequent usage.

Milkfish fry (Fig. 1) are late post-larvae 10-17 mm in total length (average about 14 mm) which are caught from shore waters when they are about 2-3 weeks old from the time of spawning. Fingerlings are 15-100 mm long, about 1-2 months old, which are occasionally caught in inland waters fronting the fry collection beaches, but are more commonly produced in nursery ponds stocked with fry, as in the Malabon area in the Philippines. In countries like Sri Lanka, Kiribati, and Fiji, both the fry and the fingerlings are collected from natural waters and used as seed for ponds.

Upon capture from shore waters, milkfish fry have transparent, elongate bodies like those of larval anchovy and sardines and some gobies (Fig. 2). In the collector's basin, milkfish fry can be readily picked out by their energetic movements and their conspicuous eyes. They swim together and circle continuously in the same direction. They are able to stay alive where the fry of most other fish species in the same catch have died. Under the microscope, milkfish fry can be seen to have a straight gut without transverse foldings of the intestine, unlike in anchovy and sardine larvae where the intestines appear striated (Fig. 2). A single line of pigments runs along the loweredge of the abdomen from the throat almost to the anus. The liver is large and sometimes looks like yolk, which is why the fry have been mistaken to be newly hatched when they are in fact 2-3 weeks old.

After one day or more in storage, milkfish fry show a dark spot and a bubble in the middle part of the body - this is the pigmented, inflated swimbladder. With longer storage, the fry gradually develop a dusky coloration over the body and silvery coloration on the abdomen. The pelvic fins on the lower side are absent at capture but develop 5-6 days later. Within one month of capture the scales develop, the body becomes bright silvery, and the fingerlings develop the typical milkfish shape and appearance At this time, the fingerlings are ready for stocking in grow-out ponds. Fry and fingerlings produced in the hatchery are heavier at a given length than those from the wild, but there are no significant differences in growth and survival performance in ponds.

Milkfish fry are often confused with the larvae of tarpon (buan-buan, Megalopscyprinoides), ten-pounder (bidbid, Elops machnata) and some gobies. The larvae of tarpon and ten-pounder are larger (25-35 mm) and have flatter, ribbon-like bodies, relatively smaller eyes, and slightly amber body color (Fig. 2). Goby larvae have shorter guts than milkfish fry, a conspicuous swimbladder, and two dorsal fins. In the collector's basin, goby, anchovy, and sardine larvae do not school or swim together continuously in the same direction; they also die more readily.

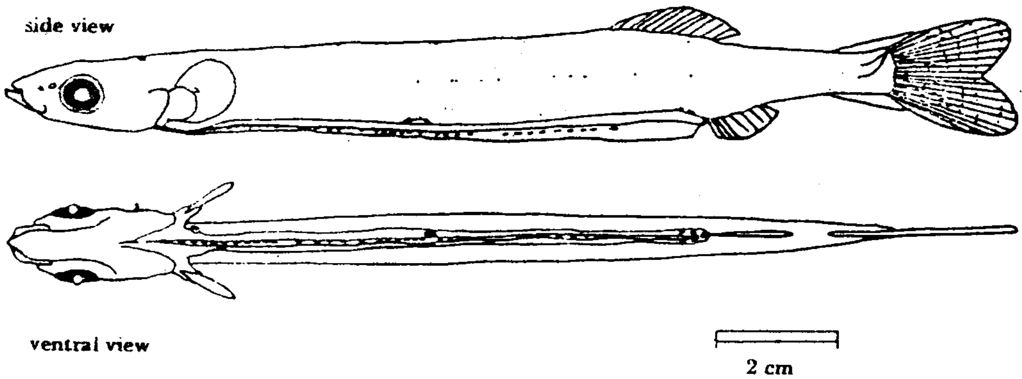

Fig. 1. Milkfish fry from shore waters.

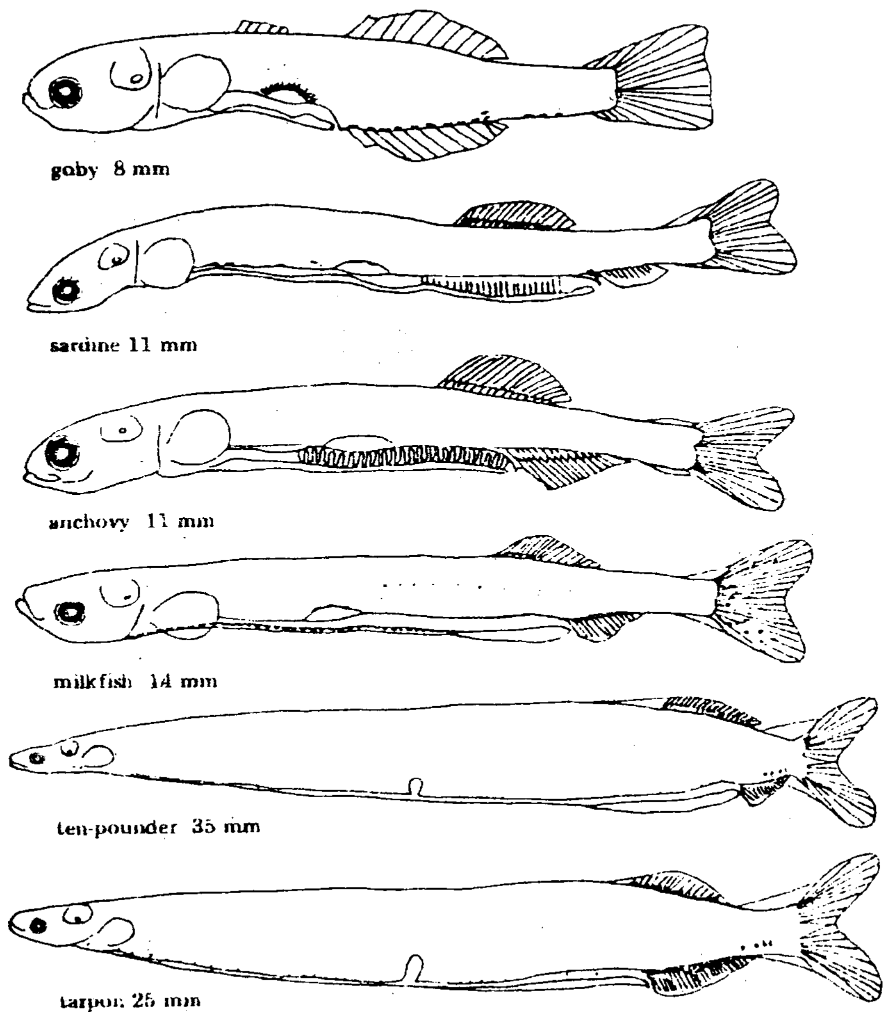

Fig. 2. Larvae of other species of fish that are often confused with milkfish fry.

Source: Bagarinao TU, Solis NB, Villaver WR, Villaluz AC. 1986. Important Fish and Shrimp Fry in Philippine Coastal Waters: Identification, Collection, and Handling. Aquaculture Extension Manual No. 10, SEAFDEC Aquaculture Department, Tigbauan, Iloilo.

IDENTIFYING SIGANID FRY

Siganid fry (Fig. 1) collected from coastal waters are of a wide size range. The padas in Pangasinan are 10-35 mm in length, mostly 20-30 mm, while those of the Visayas are 10-40 mm and estimated to be 1-3 months old. Siganid fry collected in Pandan, Panay Island in 1976-1977 with a two-man dragged seine were 10-40 mm in total length. Siganid vermiculatus fry in Israel measure 36-46 mm in the Red Sea and 45-95 mm in the Mediterranean. At the SEAFDEC Aquaculture Department hatchery, S. guttatus fry are defined as early juveniles 20-30 mm in total length and 35-45 days old.

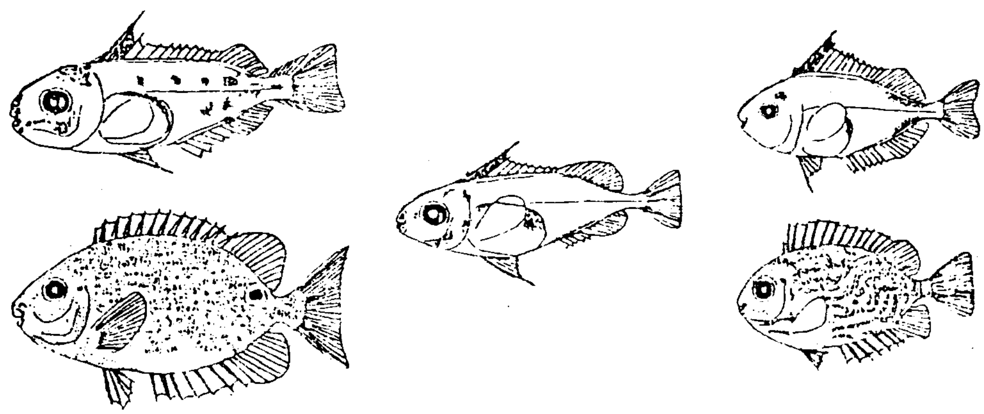

Fig. 1. Siganid fry of different species and stages. Scales represent 2 mm.

Younger siganid fry up to about 10mm long are pale and transparent, with few pigments on the body. The front part of the head has a series of short spines. The gut is visible through the body wall. Older fry are darker in pigmentation, have silvery abdomens, relatively short, deep bodies, a high number of fin spines, and oftentimes exhibit the color pattern of the adult (Fig. 1).

Siganid fry, being deep-bodied and laterally compressed, may be confused with the larvae and juveniles of surgeonfish (Acanthurus spp.), filefish Monacanthidae), snappers (Lutjanus spp.), and the slipmouths (Leiognathidae) (Fig. 2). Siganid fry may be distinguished by the high number of still fin spines and by the blunt, rabbitlike snout. Surgeonfish juveniles occasionally found in shore waters often have the adult color pattern already, and the scalpel-like spine near the tail. Younger ones have elongate first dorsal and second anal spines. File-fish juveniles have erect first dorsal spine and sandpaper-like skin. Snapper larvae have elongate second dorsal and pelvic spines and a large mouth with canine-like teeth. Slipmouth juveniles in shore waters are silvery bodied, with highly protrusible mouths.

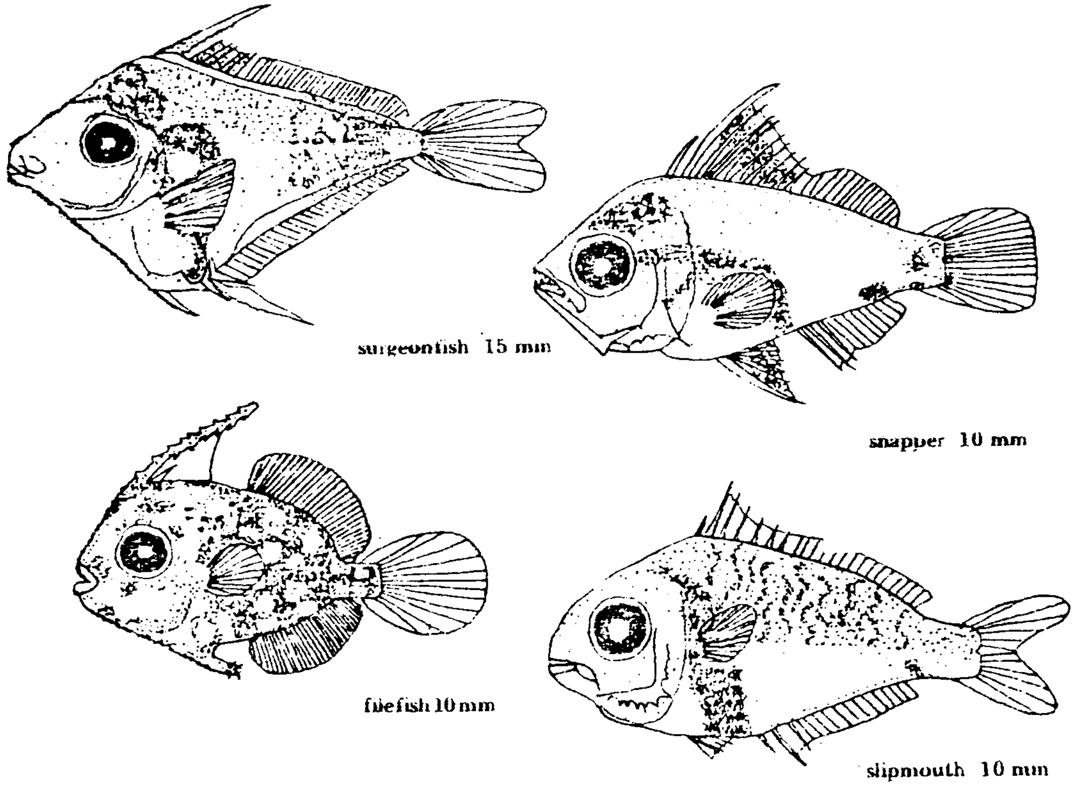

Fig. 2. Fry of other fish species that may be confused with siganid fry.

Source: Same as AFN-VI-2-1

AFN-VI-2-2

IDENTIFYING SEA BASS FRY

Sea bass fry (Fig. 1) are likewise of a wider size range as siganid fry. Wild fry may be as small as 5 mm and as large as 10-20 cm. The sea bass fry collected in milkfish fry gear in Iloilo are 5-8 mm in total length, probably 2-3 weeks old from hatching. In Thailand, where sea bass is cultured in floating cages and 1 kg. fish are harvested for the market, juveniles 10-20 cm long are used. for stocking. Wild sea bass fry and juveniles are not abundant and most of the present supply comes from hatcheries. Hatcheries in Thailand and at SEAFDEC AQD produce sea bass fry that are 1-2 cm long between 1 to 2 months of age.

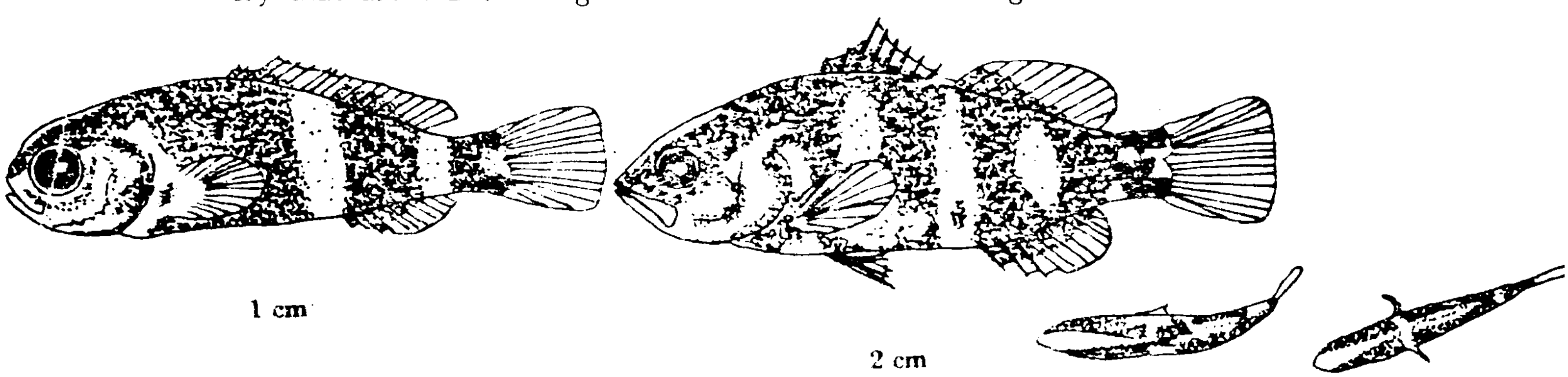

Fig. 1. Sea bass fry of different stages, showing dorsal head stripe.

Very young sea bass fry less than 1 cm in length appear black. Those about 1 cm and larger are dark brown with three roughly vertical white bands on the body, and a white longitudinal stripe on the head between the mouth and the dorsal fin, the "dorsal head stripe" (Fig. 1). The juveniles larger than 5 cm are light brown or blush-black with silvery abdomens and a concave head profile, as in the adult fish.

Sea bass fry may be confused with the juveniles of snappers (Lujanus spp., particularly L. argentimaculatus), tiger perch (Therapon spp.), scate (Scatophagus argus), tripletail (Lobotes surinamensis), damselfish (Abudefduf vaigiensis), mullets, and groupers (Fig. 2). Sea bass fry may be distinguished from all these other species by its dorsal head stripe. L. argentimaculatus has 5-6 vertical white stripes on the body while sea bass has only three when young (up to 2-3 cm) and none later. Tiger perch fry have a black blotch on the first dorsal fin; slightly older ones have black stripes running in a curve from behind the head to the tail. Scat fry are black, almost discoidal in body outline and have a bony head armor; slightly older ones are brown with small black spots. Tripletail and damselfish juveniles also have stripes on the body, but both are deeper bodied than sea bass. Mullet fry are dark-colored with a silver sheen, with two short dorsal fins placed far apart. They are abundant in shore waters, occurring in schools of mixed species, mostly small and slow-growing. Grouper fry have rarely been collected from shore waters. They have a single continuous dorsal fin while sea bass fry have two dorsal fins placed close together. Younger grouper fry may have elongate second dorsal spine and pelvic spine as in snappers.

These species may occur all together in the same fry ground. Snappers, scats, mullets, and groupers are highly valued food fish and have been or should also be collected for culture.

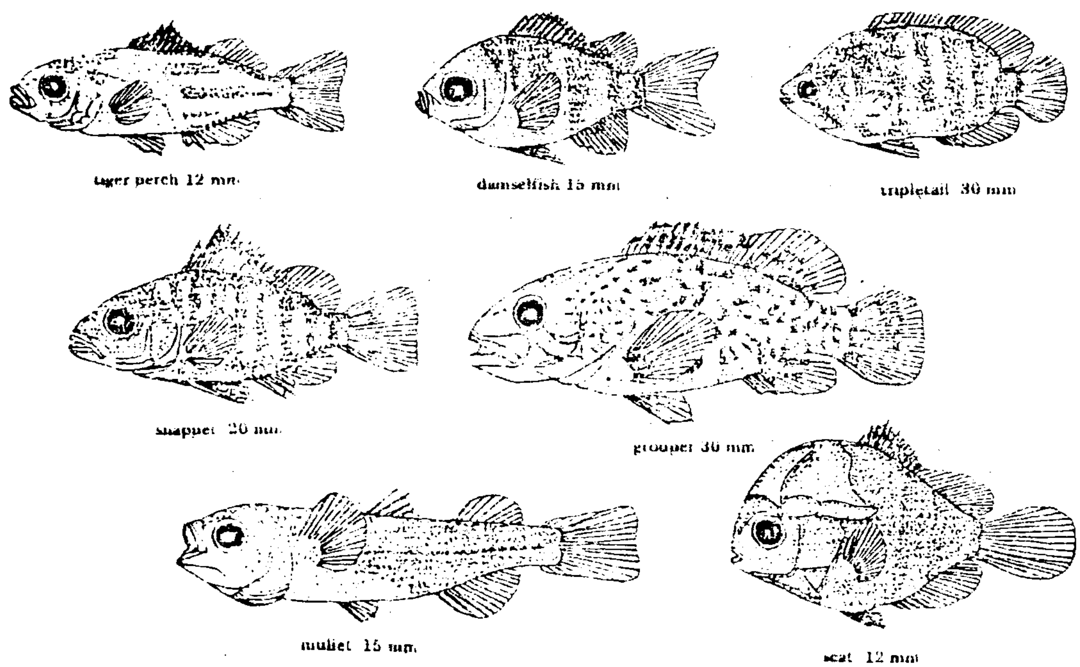

Fig. 2. Fry of other fish species that may be confused with sea bass fry.

Source: Same as AFN-VI-2-1

CULTURE OF SEA BASS

Sea bass has been commercially cultivated in brackishwater and freshwater ponds and marine cages in many Southeast Asian Countries. While cage culture technology is now established, grow-out techniques in ponds are still in the developmental stages. Although considerable progress has been made over the past ten years, many problems have remained unsolved.

The major problems that are always encountered during the culture period are cannibalism during young stage (1-20 g) and dependence on trash fish as a main food which has a very limited supply in many countries.

Cannibalism is one of the most serious problems in sea bass culture. High mortality is often encountered when uneven sizes of the fish are stocked. This mostly occurs during the first two months of culture. To minimize this problem, culture of sea bass should be approached in two phases: the nursery phase and the grow-out phase.

The main purpose of the earthen nursery phase is to culture the fry from hatchery to juvenile size. This can solve the problem of space competition where fry are cultured in the nursery tanks. Beyond the nursing period, juveniles, can be graded into different size groups and stocked in separate grow-out ponds. The juveniles from nurseries perform better in terms of growth and survival than those stocked directly into the grow-out ponds. Nursing the fry in the concrete tanks is not advisable, as excess feeds accumulate on the bottom of the tank which can cause bacterial diseases.

The grow-out phase involves the rearing of the sea bass from juveniles marketable size requirements of sea bass vary from country to country, e.g., Malaysia, Thailand, Singapore, and Hongkong. The normally accepted marketable size of sea bass among these countries is 700-1200 g, while in the Philippines marketable size is 300-400 g. The culture period in grow-out phase also varies from 3-4 months to 8-12 months to produce 300-400 g.

Source: Kungvankij P, Pudadera BJ Jr, Tiro LB Jr, Potestas IO. 1986. Biology and Culture of Sea Bass. NACA Training Manual Series No. 3. NACA RLCP, Tigbauan, Iloilo, Philippines.

FRESHWATER RED TILAPIA GROW WELL IN SEA WATER

Red tilapia or cherry snapper is a freshwater tilapia hybrid but can be readily acclimated to and cultured in sea water in tanks. With a biodrum and a water-recirculating system to maintain water quality in the culture tank, the fish can attain an average weight of 437 g within 8 months from an initial weight of 0.7 g. The system can support a biomass density of 49 kg per cubic meter. These findings were obtained in a joint study by the Primary Production Department and Flowell Farm Pte Ltd, a commercial fishfarming company, at the Marine Aquaculture Section in Changi, Singapore.

Red tilapia is a hybrid obtained from crossing a mutant red-orange strain of *Oreochromis mossambicus* female with a normal colored tilapia male. Unlike the normal colored female parent, which is grayish, red tilapia is widely accepted by consumers.

Taiwan is reported to be one of the major producers of red tilapia in fresh water, with an annual production of 2,500 metric tons. There have been some studies on culturing red tilapia in sea water, but such operations have yet to be commercialized. In Singapore, the study showed that the freshwater red tilapia fry survived the acclimation well with a survival rate of 86.6% in the treatment group. However, at the end of day 58, the fry suffered a 44.2% mortality rate. This was due to the weaker fry being drawn in and crushed by the rotating drum after removal of the protective fine-meshed net-cage that keep them away from the drum on day 15.

During the early grow-out period from day 59 to day 179, the survival rate of the treatment group was 83.9%. The survival rate of the fish improved further to 90.2% during the final grow-out period from day 180 to 239 indicating that the larger fish had well adapted to the rotational movement of the biodrum.

During the nursery period, the average growth rate of the individual fish in the treatment group was 0.65 g per day. The average growth rate increased from 1.66 g per day during the early grow-out period to 2.89 g per day during the final grow-out period. An average body weight of 437.46 $\pm$ 92.2 g and a biomass density of 49.35 kg per cubic meter were achieved. The overall feed conversion ratio for the group was 2.46, i.e., 2.46 kg feed were required to produce 1 kg body weight.

The study was conducted in two indoor fiberglass tanks measuring 4 meters in diameter with water capacity of 8 cubic meters. One tank was installed with a biodrum and the other without such an installation. The biodrum and the recirculating system helped to maintain the oxygen and ammonia levels within the tolerable range for the fish.

Source: PRIMARY PRODUCTION BULLETIN # 284 a publication of the Primary Production Department, Maxwell Road, Singapore, March 1988.

SHRIMP FARM BOOM: HARVEST COULD TOP ONE MILLION TONS BY THE TURN OF THE CENTURY

World farm production of tropical shrimp and freshwater prawn is now increasing so rapidly that the harvest by the end of the century could well exceed one million metric tons a year. At the Shrimp '88 (Bangkok, Thailand) conference, speakers from the Food and Agriculture Organization (FAO) told some 640 participants from 45 countries that the total in 1987 was probably about 340,000 metric tons, up from 305,000 metric tons the year before, and by 1990 it may amount to 440,000 metric tons.

Also revealed at the Bangkok conference was the very rapid progress now being made in intensive and semi-intensive farming of penaeid species such as the tiger shrimp (**P. monodon**). In Taiwan, where it is the main species farmed, growers are getting six and seven metric tons a hectare.

But the world's top farmer of tropical shrimp is now China, with an estimated harvest in 1987 of 85,000 metric tons. By 1990, at the present rate of development, Chinese farmers may be producing over 100,000 metric tons and estimates for the year 2000 indicate over 200,000 metric tons. By that time farmers in Asia may be producing some 800,000 metric tons. This figure was suggested by FAO regional aquaculture officer in the region, Imre Csavas, at Shrimp '88 .

For shrimp farming the trend is up and up and the opportunities of farmers, technologists, feed suppliers, and others who can contribute to expansion are enormous.

Source: FISHFARMING INTERNATIONAL, Vol. 15, No. 3, March 1988.

CHINA IS WORLD'S TOP SHRIMP PRODUCER

The lead in shrimp farming has now been taken by China although Taiwan has the most advanced techniques of intensive culture. This was disclosed in the recently concluded "Shrimp '88" conference held in Bangkok, Thailand, January 26-28.

In a comprehensive and wide ranging review of Asian farming, Imre Csavas, Aquaculture officer of FAO's Bangkok-based Regional Office for Asia and the Pacific, noted that despite the growth of shrimp farming in Latin America and the contribution through catching and farming in Africa and the Pacific, nearly 75% of production still came from Asia. He was referring to all crustaceans but pointed out that in Asia shrimp account for 90% of the total.

Some astonishing changes have taken place in the production of cultured crustaceans in the continent. In 1975 when the total was 25,100 metric tons (mt), Indonesia was the leader with 10,000 mt, followed by India with 4,000 mt, and Thailand with 3,300 mt. Five years later the order was about the same, but by 1985, when production exceeded 200,000 tons, there were significant changes. China was top with 42,700 mt, followed by Indonesia with 38,000 mt, Taiwan with 31,000 mt, and the Philippines with 29,900 mt.

After describing farm developments and methods in the main producing countries, Mr. Csavas said he had attempted to assemble a tentative and "rather subjective" table on shrimp culture potentials of Asia around the turn of the century. He warned the conference not to take the projection too seriously. But a roughly four-fold increase in the Asian output in 15 years' time "seems to be a realistic estimate."

This would give Asia a farm shrimp harvest of about 800,000 mt by the year 2 000. Add the rising production of Latin America, and that of farms in the Pacific islands, North America, the Caribbean, Africa and Europe, and Australia and New Zealand, and the farm harvest of shrimp by the end of the century may exceed one million metric tons a year.

Source: Fishing News International, March 1988.

EUROPE BEATS JAPAN AS TOP MARKET FOR SHRIMP

Europe has been overtaking Japan as a top market for shrimp of all kinds, and in 1986 took in 216,000 metric tons compared with Japan's 214,000 metric tons.

This was disclosed in the recently concluded "Shrimp '88" conference held in Bangkok, Thailand, last January 26-28. But exporters were strongly advised not to regard Europe as a single market with similar requirements and tastes. Says David Janieson of the London-based company Industrial Market Research when he spoke in the session dealing with market access: "Each market requires careful investigation and in many cases a fundamentally different market approach."

Speaking of the problem of getting shrimp into Europe, Mr. Janieson said the traditional import channels were breaking down. "If you stick to them you will be left behind, particularly in the retail sector," he warned.

Ole Persson, Managing Director of Johan J. Helland in Norway told the Conference that during the second half of 1986, export prices for cold-water shrimp in the traditional markets almost doubled and pushed retail prices in the UK from £3 to around £6 a pound.

These prices and the fall in supply because of a drop in catches have pushed importers towards cheaper warmwater shrimp. It is being said that this shrimp now accounts for about half the market. "There is no doubt that warmwater shrimp has gained a considerable foothold in the European market and I am sure it has come to stay," said Mr. Persson.

Norway, Greenland, and Iceland are the three major suppliers of the pandalid shrimp and Norway has been the worst affected by lack of raw materials. Three main causes had been suggested for the decline: a reduction in the biomass, low or weak year classes, and recent recovery of the northern cod stocks. which eat the shrimp. Research has indicated that cod consumed 600,000 tons of shrimps in 1984 - eight times the Norwegian catch that year.

European producers are very concerned about the changes in supply and markets, and prepared to take action "to take possibilities for their product."

Source: Fishing News International, March 1988.

SOME HANDY INFORMATION ON FIBERGLASS TANKS

Glass Reinforced Plastic (G.R.P.) tanks have a great advantage over any other material. They are strong, light, easy to maneuver around the hatchery and can be stacked inside each other for transport or storage. They are easy to keep clean and sterilize, and last but not least, G.R.P. is a noncorrosive material which will remain in trouble-free service for many years. All tanks for the aquaculture industry should be constructed from a male mould, with the smooth isophtalic (food grade) gel-coat inside. This assists in keeping the tanks clean and bacteria-free Gel-coats can be pigmented with a wide range of colors which vary according to the nature of the work being carried out. Colors may be white, grey, light blue, dark green, to mention just a few.

The gel-coat is the most important item in the construction process, as it is the only part of the tank that has direct contact with the water and marine life within. There is only one grade of gel-coat that is suited for the construction of aquaculture tanks, and that is Neopentyl glycol (NPG) - isophtalic high performance gel-coat. This gel-coat results in an extremely tough high finish that provides a superior resistance to weathering, corrosion, and chalking. It is used in sanitary wares, swimming pools, spas, and marine industries.

Tank designs also vary greatly from hatchery to hatchery and depend on the nature of work being carried out. The tanks normally range in size from the small 130 l brine shrimp tank to the extra large storage reservior of 120,000 l.

Some things to consider in tank design are sump, tank supports, stand pipes, water circulation and aeration, lids, volume, drains and overflows. In the tank manufacturing process, moulds are sprayed with a release agent such as P.V.A. (Polyvinyl alcohol) or distillate. P.V.A. forms a thin plastic skin soluble only in water. Therefore, all new tanks should be scrubbed in warm soapy water to remove all traces of P.V.A. and wax which may adhere to the tank during construction.

The curing period for G.R.P. tanks normally takes 10 to 14 days. During this period, styrene fumes may leach from the gel-coat and resin. As these styrene fumes are heavier than air, the tanks should be stored out in the open upside down, placing them on wooden chocks to keep them off the ground to allow the vapors to escape. Lay-up of tanks vary from one design to the next, depending on the diameter, height, tank support, etc.

Source: Austasia Aquaculture Magazine, Vol. 2, No. 4, November 1987.

AQUACULTURE DEFINED BY FAO

Speaking at the Shrimp '88 conference (Bangkok, Thailand), Michael New said that one of the problems in determining the scale and nature of shrimp production by farming was the lack of adequate statistics. There was a grey area between fisheries and farming and, as a preliminary to separating its figures for these activities, the Food and Agriculture Organization (FAO) of the United Nations has decided to define aquaculture as follows:

Aquaculture is the farming of aquatic organisms, including fish, molluscs, crustaceans, and aquatic plants.

Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predation, etc.

Farming also implies individual or corporate ownership of the stock being cultivated.

For statistical purposes, aquatic organisms which are harvested by an individual or corporate body which has owned them throughout their rearing period contribute to aquaculture, while aquatic organisms which are exploitable by the public as a common property resource, with or without appropriate licenses, are the harvest of fisheries.

Source: FISHFARMING INTERNATIONAL, Vol. 15 No. 3, March 1988.

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