

1994

Cage culture of sea bass in Malaysia

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Southeast Asian Fisheries Development Center, Aquaculture Department (1994). Cage culture of sea bass in Malaysia. Aqua Farm News, 12(1), 12, 15.

<http://hdl.handle.net/10862/2497>

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feeds represent 40-60% of total operating costs. The market and other factors must be able to justify the high cost of feeds involved.

Variations of the theme

More and more systems are now completely integrated. Units for staff accommodation, power generation, automatic or computerized feeding, feed storage, and fish grading and transport equipment are built together. In a

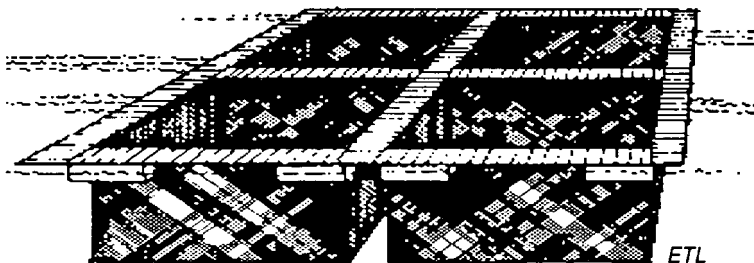
vacuum pump system, fish are sucked into a hose and into a sorter that removes the water and size grades the fish. This minimizes damage during transfer of fish to cages or boats.

Some farms use a computer program in stock management. The program simulates biomass changes during the growth cycle and records stocks and feeds.

Source: F Buranudeen. *The basics of cage and pen culture*. INFOFISH International 2/89.

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Cages are generally rectangular and are made of polyethylene nets. Their sizes vary: 3 x 3 x 2 m, 4 x 4 x 3 m. The estimated cost of one platform (4 cages of size 3 x 3 x 2 m) is MYR 2000-2500.



Sea bass 5-8 cm long are stocked in cages at densities of 15-25 fingerlings per m³. After several weeks, densities are reduced to 10-23 per m³. Although there is a large government hatchery and some local seed suppliers, the bulk of sea bass stock is imported from neighboring countries, especially Thailand.

Sea bass are fed "trash fish" once a day. As they grow, sea bass are periodically graded to prevent cannibalism.

Sea bass attain marketable size (500-600 grams) in about 6-8 months. Survival is 60-80%. They are marketed live in local restaurants or exported to Singapore. The ex-farm selling price is around M \$ 9-10 per kilogram.

Problems

Foremost among the problems are feed and seed. "Trash fish" is the main source of feed for the cage culture industry; supply is limited

and the quantity and price subject to seasonal variations. Although a number of prepared feeds have been introduced by both the government and the private sector, their use has not quite caught on, mainly because of high cost and doubts about their efficiency.

Most of the seed supply is from Thailand and the longer transport time means stress. Transport costs add to the price of the fry. The government encourages and provides training in hatcheries. Many have already set up their own sea bass hatcheries after attending the government courses.

Another problem is overcrowding of fish cages in a particular area. Water flow is hindered, resulting in accumulation of feces and uneaten food. Excessive stocking and feeding by some overzealous but misguided culturists further worsens the problem. Overcrowding and poor water quality stress the fish and they suc-

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Pearl culture in abalone



Pearl culture in the abalone *Haliotis* is carried out in Japan, Korea, Canada, and the United States. The quality of abalone pearls, as determined by surface texture, is superior to

those produced in freshwater mussels and comparable to those of the marine pearl oyster *Pinctada*. Abalone pearls are priced at about US\$300 for a 13-millimeter AAA grade semispherical or mabe piece.

The farmer can grow pearls in 6-8 cm abalones for a year or so. This size of abalone, however, takes about 3 years to grow. Hatchery-bred abalone seed cost Canadian \$16 per pound. Pearl culture can take 3-18 months depending on water temperature, and age and food of abalone. But the abalone can be sold as food, and production costs can be more than offset by the price of the pearls.

Pearls are produced by nucleation, where plastic, soapstone, or mother-of-pearl is slipped beneath the mantle epithelium of the abalone.

The nucleus must be secured against the movement of the abalone's muscular foot. Following nucleation, the mobile abalones are placed in a secure enclosure to prevent their escape. In British Columbia and California, screened plastic drums suspended in the sea are used. Abalones must be fed at least weekly with the kelp *Macrocystis*, and the seaweeds *Gracilaria*, *Laminaria*, and *Nereocystis*. Fouling organisms, sea stars, and octopuses must be regularly removed from the culture area.

Within several days following nucleation, a thin chalky layer is secreted against and around the nucleus. Then, a thick, tan-brown layer of conchiolin is deposited. Conchiolin forms the foundation for a layer of porcelain-like, prismatic aragonite crystals, and a layer of nacreous aragonite. In a properly cultured abalone pearl, the conchiolin is about 1 mm thick. In Vancouver, semispherical pearls can be cultured in *Haliotis kamtschatkana* to a diameter of 17 mm. In Japan, pearls can be grown to 22 mm in *Haliotis discus*.

Source: P Fankboner. *Pearl culture in abalone*. INFOFISH International 4/91.

New Zealand

A mussel farm is usually 3 hectares with 10 surface longlines. The farm is sited in areas with a current flow of 0-4 knots, in unexposed, semi-enclosed bays and moderately exposed open seas with depths of 5-40 meters. Spats are collected where they are abundant by "catching ropes" and transferred to farms. It takes 1-6 months for the mussel to grow to the ideal reseeding size of 10-20 mm. The mussels take 10-12 months to grow to market sizes in reseeded lines.

Source: P Large. *Mussel culture success*. INFOFISH International 4/89.

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cumb easily to diseases and parasites. Mass mortalities of fish have occurred in a number of cage farms.

Cage culture booms, nonetheless

In spite of these problems, sea bass farming has so far managed to sustain its boom in Malaysia. In 1989, the sea bass production of 1538 tons was 21% higher than the preceding year. In fact, production has been increasing steadily over the last 5-6 years. With good management and attention to some of the problems being faced, there is every likelihood of a further increase in production in the future.

Source: T Singh. *Malaysia enjoys the sea bass boom*. INFOFISH International 2/91.