

FEATURE CREATURE

Ground-breaking hatchery technology paves the way for sea cucumber culture in Australia



Sea cucumber culture species *Holothuria versicolor* (Golden sandfish)

Sea cucumber is one of the four "sea treasures" of Asian cuisine, the others being shark fin, abalone and fish bladder. It is one of the most important and highly priced seafood products in the international market and is generally marketed as *beche de mer* (trepang or hai-som in Chinese). Besides its reputation as an Aphrodisiac, *beche de mer* is also said to cure many illness such as low blood pressure, kidney disorders and impotence.

Fisheries in decline

The decline of sea cucumber fisheries worldwide owing to over-exploitation has primed the sea cucumbers for listing in CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). Aquaculture could be one of the best ways to bring back the depleted sea

cucumber fisheries to a sustainable level.

The culture of sea cucumbers is common in China and Japan using coldwater species. However, there have been very few successful commercial attempts to rear the larvae of economically valuable species of tropical sea cucumbers. But now, commercialization of sea cucumbers in Australia has taken a pioneering step with the Bluefin Sea Cucumber culture project.

Bluefin a first

Bluefin Sea Cucumber Hatchery is the first of its kind in Australia and its ground-breaking commercial culture technology brings good tidings for troubled sea cucumber fisheries around the world as well as aficionados of the popular seafood delicacy. The Queensland-based hatchery currently produces hundreds of thousands of sea

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Hatchery-produced sea cucumber juveniles ready for seeding.

cucumber juveniles every year to release in the sea for restocking.

This programme was initially funded by the Federal Government of Australia under the Innovation Programme to develop hatchery technology for the commercial culture of economically valuable sea cucumbers.

This new form of marine aquaculture has developed after many years of research in the fields of spawning inducement, larval culture and settlement and juvenile rearing



Sandfish release area.

Juvenile growout

The nursery phase is from settlement to 30 to 60 mm juvenile size and this stage takes 8 to 10 weeks. Settled pentaculacae feed on Algamac 2000 or other benthic diatoms present on the settlement surfaces. Juveniles are reared in the nursery with a flow-through system. The juvenile diet is supplemented with dead algae, benthic diatoms and powdered algae (Algamac 2000, Algamac protein plus). Mortality in nursery phase can be minimised to less than 25% by management vigilance.

Sea ranching

Hatchery produced juveniles are released in suitable habitats to rebuild the wild populations and increase the harvest. The hatchery is now producing 500,000 to 700,000 sea cucumber juveniles each year and has the capacity to produce 1.5 million juveniles in the future.

Currently research on other high value tropical sea cucumber species is underway in the hatchery. The hatchery manager is confident that these advanced culture techniques will bring fruitful results for commercial production.

Advice relating to commercial culture of sea cucumbers is available from hatchery manager Dr. Beni Giraspy by emailing beni.giraspy@optusnet.com.au

spawning inducement, larval culture and settlement and juvenile grow-out. Nearly three years into this project, several challenges were addressed in the above aspects and also being investigated are juvenile growth, larval stocking density, feeding regime, juvenile growth and sea ranching.

Through continued research and development the hatchery has developed, cost-effective mass production technology to produce sea cucumber juveniles. Currently the hatchery is consistently producing hundreds of thousands of juveniles each year for restocking programmes.

Best species

The tropical sea cucumber species *Holothuria scabra* (sandfish) and *Holothuria versicolor* (golden sandfish) are mass produced in the hatchery for sea ranching. Among the tropical *beche de mer* varieties, these two consistently fetch the highest price in the international markets (Hong Kong and Singapore) and the markets appear firm all year round. Good quality sandfish *beche de mer* fetch up to USD 130/kg in the Hong Kong market, while the export market for golden sandfish is around USD 150 in Singapore.

Sea cucumber culture system

The sea cucumber culture system consists of a microalgal culture unit, brood stock collection and management, induced spawning, larval culture, and a juvenile grow out nursery.

Six species of microalgae were used for feeding the larvae and two species of diatoms were used as settlement cues in the hatchery. Microalgal culture is carried out in 0.5 µm filtered and sterilised seawater in sterile conditions under controlled light and temperature.

Sandfish release area.

Brood stock collection and spawning

Mature sea cucumbers are collected from Hervey Bay waters and transported to the hatchery. Maturity of sandfish is determined in the hatchery by gonosomatic index and the value between 6 and 9% specifies the peak reproductive season.

Thermal stimulation is used for spawning in the hatchery where temperature is raised by 4 to 6°C to induce the animals. Blended mature gonad dissected from the male animals may also act as effective spawning stimulant in females. Males generally spawn first by lifting their anterior region and with a swaying movement induce females which spawn in a series of short powerful bursts. Egg fertilization is excellent averaging 94% and cell division abnormalities were minimal, averaging between 3-6% over all spawnings so far. The eggs are collected from the spawning tanks using 80 µm sieves, washed in 1 micron filtered water and incubated at constant temperature (27°C) for hatching.

Larval culture

The larval cycle of sandfish is relatively short, taking 12 to 14 days depending on temperature. The hatched auricularia larvae are fed with a mixture of live microalgal diets such as *Rhodomonas salina*, *Chaetoceros mulleri* and *C. calcitrans*. With a high-quality microalgal diet the feeding-stage auricularia larvae become non-feeding doliolaria before they transform into benthic pentaculæ. The pentaculæ settles on tank surfaces and plates with settlement cues (diatoms and algae). Water exchange in the larval rearing tanks is almost 200% per day and oxygen levels are constantly at saturation.



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