aquaculture
beche-de-mer

Aquaculture section prepared by Stephen Battaglene

News from ICLARM Coastal Aquaculture Centre

by Stephen Battaglene

Collection and spawning induction

During 1998, there was a ban on the harvesting of sandfish, *Holothuria scabra*, in Solomon Islands. However, villagers continued to harvest them and it was difficult to obtain broodstock and specimens for biological samples. To overcome this problem we put more effort into holding broodstock in captivity and securing new field sites. In 1997, we found spawning could be induced for sandfish, white teatfish *H. fuscogilva* and surf red fish, *Actinopyga mauritiana*, by elevating seawater temperature by 3° to 5°C. This year we evaluated the use of powdered algae as a spawning stimulant and found it to be more effective than thermal stimulation alone.

During the life of the programme we have now obtained fertilised sandfish eggs in all months of the year, except December, a month in which we have not attempted spawning. Overall in 1998, 16 per cent of the sandfish spawned, up from 12 per cent in 1997. To date we have produced over 8.5 million fertilised eggs in 1998.

To assess the use of captive broodstock, we stocked 12 x 4000 l fibreglass tanks with six sandfish each. The experiment will be run from July to December. We have covered half the tanks in 70 per cent shade cloth and feed half of the covered tanks, and half the uncovered ones, with prawn pellets.

After three months the sandfish in tanks receiving pellets weighed more than those which did not receive pellets, and those in uncovered tanks weighed more than those in covered tanks. Isolated sandfish spawned during the first three months, but towards the end of October, 33 per cent spawned, two days after the new moon.

Study of spatial distribution and movement in surf redfish

The decline in harvests of high-value species saw medium-value species, such as surf redfish, come under increasing pressure in 1998. Stocks of surf redfish, once plentiful on inshore reefs near the Coastal Aquaculture Centre (CAC), are now almost completely wiped out.

With the help of an Australian volunteer, Ms Jane Harris, who is undertaking a MSc degree from the Macquarie University in Sydney, we investigated the spatial distribution, movement and exposure of surf red fish within the CAC reserve and another site, Tuki in the Western province.

We found unharvested populations on reef flats to have clumped distributions in association with coralline rock substrates. Densities within clumps ranged from 5 to 10 /100 m^2. Daily movement is generally short, less than 2 m, and there is no homing behaviour. Surf redfish within the CAC reserve displayed distinct movement patterns in relation to tidal cycles: feeding and moving at low tide and sheltering and not feeding at high tide.

In contrast, those at Tuki exhibited a circadian rhythm: feeding and moving at night and not feeding and sheltering during the day. Field observations and tank experiments suggest surf redfish have an endogenous circadian rhythm modified by tidal cycles and wave action.

Determination of spatial distribution and movement patterns will assist in the collection of broodstock and in deciding when is an appropriate time and location for release of hatchery-produced juveniles.

Larval rearing trials

In the second year of hatchery operation, from September 1997 to September 1998, three batches of sandfish, totalling over 50,000 individuals, were produced at the CAC. We conducted three experiments in replicated 500 ml glass flasks to determine the best algae to feed sandfish larvae. The experiments complemented two conducted in 1997, and used a new improved water bath and continuous stirrer. Larvae survived and grew best on single diets of *Rhodomonas salina* (a red alga with a large cell size, 8–12 μm) and *Chaetoceros muelleri* (gracilis) (diatom, 5–8 μm). They grew poorly on diets of *Isochrysis galbana*,and *Tetraselmis chuii* and to a lesser extent *Chaetoceros calcitrans*. The proportion of competent larvae reared on *R. salina*, defined as auricularia with lipid spheres or doliolaria, was higher at algal cell densities of 10 000 cells/ ml, than in those reared at 3000 and 7000 cells/ml. Feeding equal parts *R. salina* and *C. muelleri* was more effective than feeding *R. salina* alone.

Juvenile grow-out

We are now confident that newly-settled *H. scabra* can be reared in tanks using simple technology, and little or no added feed, at low cost. Absolute growth rates of 0.5 mm Day-1 and 0.2 g Day-1 are possible for juveniles reared initially on hard substrates and then on sand at final stocking densities of < 200 g/m^2. We believe there should be no major impediment to the production of juveniles for stock enhancement programmes, provided that juveniles can be released successfully into the wild at sizes of <60 mm and 20 g. The three months it takes to produce juvenile *H. scabra* of this size, and the ease of culturing them, compares favourably with other tropical marine invertebrate species under active consideration for stock enhancement.

However, the large number of juveniles that will be required for stock enhancement, and the possibility that they may need to be larger than 60 mm at release, has prompted us to investigate the possibility of on-growing sandfish in prawn-farming ponds. We have conducted experiments in 50 l and 4000 l tanks which indicated that *Penaeus monodon* stocked into tanks with sandfish juveniles can cohabit, although there were some indications that sandfish may be detrimental to prawns. We were encouraged by the results and sought the co-operation of a local prawn farmer, who allowed us to stock two of his 30 000 l concrete nursery ponds with juvenile sandfish. Early indications suggest that sandfish grow faster in these tanks than in the smaller concrete tanks at the CAC and that there is no negative effect on prawn survival. We have subsequently stocked a larger prawn pond with 1000 juvenile sandfish.

News from the Pacific Islands

Beche-de-mer stocks continue to come under increasing pressure around the region. A ten-year ban has been placed on the taking of sea cucumbers in Tonga, and at a regional SPC meeting I spoke with representatives from many Island countries and territories who are concerned about the future of beche-de-mer stocks. There is also increasing interest in the potential of stock enhancement as a method for restoring depleted stocks.

In Kiribati the Japanese-funded Kiribati/OFCF Fisheries Cooperation Project has made a breakthrough in the production of white teatfish juveniles. The Japanese scientist in charge of the project, Mr Yoshio Sato, has told me he has been able to spawn white teatfish on at least 6 occasions and rear over 40 000 juveniles. Some juveniles have been held for up to 8 months. They have adapted the techniques used in Japan to produce *Stichopus japonicus*; however, the growth rate of juvenile white teatfish appears to be rather slow.

For anyone interested in the culture of *Stichopus japonicus*, I recommend a chapter by Yanagisawa, T., 1998, Aspects of the biology and culture of the sea cucumber, **In**: S. De Silva S. (Ed.), Tropical mariculture, Academic Press, London.. pp. 291-308.

News from Australia

While visiting the Queensland Department of Primary Industry Aquaculture Research station at Bribie Island in September, I spoke with some industry representatives, who indicated that the current harvest of beche-de-mer in Queensland is about 500 tonnes dry weight. Most of the catch is now white teatfish, black teatfish, and sandfish, with some interest in greenfish coming from Japan. Quotas are given to individual divers and area restrictions apply.

The most productive area for sandfish appears to be Harvey Bay. Moreton Bay is closed to fishing but has good populations of sandfish.