

Fiji clams on the rise again

A group of private sector and government participants gathered at the Galoa Brackish Water Research Station in Fiji from 12–24 February 2018 for training in giant clam hatchery techniques. This was the first such training to be organised by the Pacific Community (SPC) in the region since 2014 and it was delivered by the Aquaculture Section Mariculture Specialist, Michel Bermudes with the assistance of Antoine Teitelbaum, who brought his extensive technical expertise in giant clam hatchery operations. Training activities were carried out seamlessly with the assistance and collaboration of the Fiji Ministry of Fisheries staff members Saras Sharma and Babitu Rarawa.

Fiji has a long history in giant clam hatchery production with the Makogai hatchery being established in the mid-1980s and giant clam production starting in 1989, with the first mass production batch being that of *Tridacna derasa*. From 1984 to 1993, Fiji's Ministry of Fisheries took part in three Australian Centre for Agricultural research (ACIAR) projects with goals ranging from stock assessment, conservation, development of hatchery, nursery and grow-out techniques, and assessing the economic feasibility of giant clam farming in Pacific Island countries and territories (PICTs).

In Fiji, the projects resulted in a 10-year ban on the export of giant clam meat, the reintroduction of *Tridacna gigas* and *Hippopus hippopus* (which had become extinct), and in the development of hatchery and nursery techniques for mass production of clams destined for restocking in marine protected areas (MPAs). The Makogai hatchery has been in continuous operation ever since, with the main activity being to supply MPAs with juvenile clams and the export of clams to the US for the aquarium trade.

The Makogai hatchery and fisheries officers living quarters were badly damaged during Cyclone Winston in 2016. Despite the extensive damage to the facilities, Research Division staff of the Minister of Fisheries produced a batch of *T. gigas* in 2017. Some of these clams were sent to Tavarua Island later that year, which was an event that was highly publicised in Fiji and which has contributed to reenergising giant clam conservation efforts.¹

Production at Makogai has, however, been highly disrupted since Cyclone Winston and this has caused a significant loss of momentum. The training comes at a time when the Ministry of Fisheries is in the process of rebuilding the Makogai hatchery and refreshing staff capacity to meet a growing demand for giant clam juveniles for restocking in MPAs.

Workshop activities were hands-on with daily work with clam broodstock and larvae. Participants were placed in conditions of routine hatchery production with livestock (broodstock and larvae), which was their number one priority and required all of their attention. The day generally started with observations of broodstock and larvae in order to decide on the day's planning of activities.

Participants were faced with common hatchery problems and issues for which they had to find practical and effective solutions. Examples of problems that were faced included the following:

- Sourcing of ripe broodstock. The first lot of broodstock was sourced from Serua Island and consisted of seven *Tridacna squamosa* and two *T. derasa*, all of which failed to spawn a significant amount of eggs following natural induction techniques and serotonin injections. A second batch of broodstock was obtained from Makogai including four *Tridacna noae*, five *T. squamosa* and two *T. derasa*. *T. noae* responded immediately to serotonin injections and 92 million eggs were obtained from four brooders. *T. squamosa* broodstock also started spontaneously spawning following transport from Makogai. This exercise demonstrated the need to monitor and record spawning seasonality and cycles for each species, and to be prepared and able to source broodstock from different locations to obtain eggs of targeted species.
- Ciliate infestation during larval culture. The solutions discussed and implemented included daily tank draining to keep the ciliate population under control, the redesign of tank setup to keep larvae and larvae equipment furthest away from the floor as possible, and changes to protocols with larvae buckets where they are kept off the floor to prevent further contamination.

The take home messages at the end of the two-week training period were as follows:

- Understand, plan and be prepared: in particular for broodstock so that there is sufficient contingency to spawn the intended species at the right time. This is in order to be able to respond to demand by stakeholders to target certain species like *T. gigas* for clam gardens in resorts or *T. maxima* for the aquarium trade.
- Use best practice in the hatchery and nursery: adhere to simple rules (daily observations to guide decision-making, quality before quantity, keep records, etc.) and stay abreast of recent developments in the field so that hatchery and nursery operations can be optimised. Hatchery output is critical to any restocking or commercial aquarium and food production operation.

¹ See : <https://www.tavarua.com/news/2017/07/10/tavaruas-giant-clam-restoration-project>

• *SPC activities* •

- Always review current practices to implement change and incorporate new techniques. Work as a team in the process of change and consider one's own context before trying something new. Always maintain a record in order to keep track of change and how it can benefit (or sometimes not) one's own operations.

The workshop concluded on some very positive notes for the future of giant clam aquaculture for restoration. The giant clam is still an emblematic animal with so much potential for its capacity to contribute to food security and livelihoods via meat and shell products, and for the aquarium trade. While there has been extensive research that was done in the 1980s and 1990s, and the premises for the production of giant clams have not changed since (i.e. conservation, aquarium trade and food security), one can only wonder whether the significant socio-economic changes that have taken place in Fiji over the last two decades would make giant clam aquaculture for conservation and/or production for the aquarium trade or food security a more profitable

proposition at community or commercial levels. The presence at the workshop of private sector operators from the aquarium trade and tourist resorts certainly indicates that giant clam seed production is still relevant and that the sector will benefit from the national planning process proposed by the Fiji Ministry of Fisheries, which is to be supported by continued development activities.

For more information:

Michel Bermudes
Mariculture Specialist, SPC
michelbe@spc.int

Babitu Rarawa
Senior Fisheries Officer, Research Division, Fiji
Ministry of Fisheries
babitu861974@gmail.com



A: Antoine Teitelbaum, from Aquarium Fish NC, manipulating broodstock sourced from Serua Island.
B: Incubation tanks being stocked with plenty of fertilised eggs after a day of successful spawning (from left to right: Babitu Rarawa: Fiji Ministry of Fisheries, Sivo Naivua: Aquarium Fish Fiji and Kuva Vatunilagi: Mago Island).
C: Vivina Baukari (Fiji Ministry of Fisheries) carrying out routine daily inspection of larvae tank.
All images by Michel Bermudes.