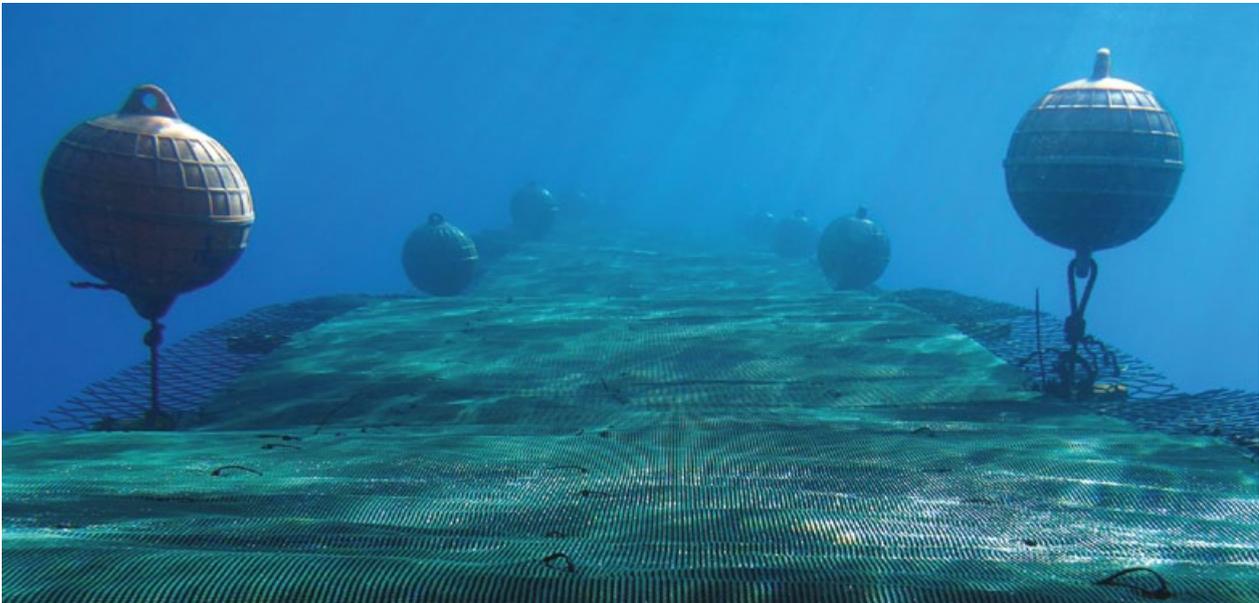


Postlarval capture and culture of *Tridacna maxima* giant clams in French Polynesia



*Eight giant clam spat collecting stations were set up on Reao Atoll in the eastern Tuamotu Islands of French Polynesia, in a recent joint intervention between the Direction des Ressources Marines (DRM) and SPC. The intervention was funded primarily through the auspices of a Fonds Français pour l'Environnement Mondial (FFEM) grant. This brings the total number of collecting stations on Tatakoto and Reao atolls — the only two atolls in French Polynesia where this type of giant clam mariculture is allowed — to 26. It is hoped that the giant clam (*Tridacna maxima*) spat collected from these stations will provide local farmers with a sustainable livelihood, either with the colourful clams reared to a size of at least 4 cm and exported for the aquarium trade, or reared to a bigger size for the meat market (DRM's main long-term goal).*

Postlarval capture and culture

Postlarval capture and culture (PCC) is an aquaculture technique that catches pre-settlement organisms during the high-mortality phase as they “settle out” of the plankton onto their settlement habitat, and rears them on artificial structures away from predators to ensure higher survival rates than under natural conditions. These methods were first developed for oysters and mussels centuries ago (Southgate and Lucas 2008). More recently, PCC methods have predominantly been adapted and applied to fish and crustaceans, such as shrimps and lobsters (Bell et al. 2009).

Background to bivalve PCC techniques and development in French Polynesia

During the 1980s, French Polynesia's Fisheries Department¹ developed and adapted PCC bivalve spat collection techniques for *Pinctada margaritifera* (Cabral et al.

1985). Large-scale adoption of this relatively inexpensive and simple way to obtain mother-of-pearl spat in a number of characteristic lagoons led to the economic boom of the Tahitian pearl culture industry.

In French Polynesia, running a giant clam hatchery is too expensive to be competitive, in large part due to high operating and labour costs. But the remarkable abundance and densities of *Tridacna maxima* giant clams in the eastern Tuamotus (up to 500 ind m⁻²) (Andréfouët et al. 2005; Gilbert et al. 2005), and the ecology of these atolls, offer the opportunity to successfully apply spat collecting methods to this species (Gilbert et al. 2006). Initial work to refine and adapt PCC techniques to the local setting, and determine whether spat collection could be economically viable, was undertaken by the Fisheries Department in the early to mid-2000s in Tatakoto and Fangatau atolls (Remoissenet et al. 2009). Trial results showed that spat densities of up to 400 m⁻² could be reached, with growth averaging 3 cm after one year.

¹ The Fisheries Department was called Service des Pêches at the time. In 2012, it was merged with the Service de la Perliculture (Pearl Aquaculture Division) to form the Direction des Ressources Marines (Marine Resources Division).

This indicates that PCC could indeed be a viable alternative to the wild collection of giant clams and provide local communities, who have few economic opportunities, with a sustainable livelihood.

The development of this technique is part of a larger PCC project funded by FFEM in 2010 and with activities throughout the Pacific region (www.crisponline.net). Initially spearheaded by the Coral Reef Initiative for the South Pacific (CRISP), it has been managed by SPC's Coastal Fisheries Programme since April 2012.

Initiative in the eastern Tuamotus

Tatakoto and Reao were the first lagoons legally opened by the country's government for giant clam PCC activities. One of the main legal (and ecological) prerequisites for opening lagoons to spat collection is the presence of *mapiko*, a local name describing the natural high-density aggregations of giant clams that form visible (including on satellite imagery) mounds in the lagoon's of these atolls.

Tatakoto

In collaboration with DRM, 12 spat collecting stations were constructed and deployed on Tatakoto in January and February 2012. Two more stations were set up by a farmer with support from one of the local exporters based in Papeete in September 2012. Together, with a previous station deployed in September 2011, the total number of stations in the lagoon is 15 — with a total collecting surface area of about 435 m² — split between six farmers. Close inspection of the stations during a recent visit by SPC and DRM showed that all were covered by fine silt (Fig. 1), with algae and small gastropods present on some stations, and oysters often encrusting ropes and the spaces between the stations' mesh and wood supports. Unfortunately, giant clam recruitment at the stations themselves was found to be very low, with records of only a few individuals ranging in size between several millimetres and 2 cm.

Initial results from stock surveys conducted at the same time, in collaboration with the Université de Polynésie française (UPF), at a number of sites previously surveyed in 2004 and early 2012, indicate that giant clam population has suffered a further decline in abundance from the 90% natural mass-mortality estimated to have occurred in 2009 (Andréfouët et al. in press). This could potentially limit recruitment and, thus, PCC activities.

However, strong variation in stock abundances have been recorded in the past, and are likely to be part of a natural cycle, although these may be exacerbated by climate change. It is, therefore, hoped that new recruits will be observed at the stations and in the lagoon when DRM and UPF next monitor the sites. Fishing pressure exerted by local communities on adult wild giant clam stocks for personal consumption and meat exports present additional threats to the emerging sector. However, a number of existing factors — including financial support, by local and foreign authorities, existing PCC expertise by residents on the atoll, local authority involvement and good follow up and enforcement, and technical support and monitoring provided by the DRM — give strength to the sector in Tatakoto.



Figure 1. Looking for spat at collecting station on Tatakoto, eastern Tuamotus.

Reao

Under the same funding arrangement, and with assistance from AusAID, a collaborative mission between SPC and DRM, with support from local authorities and communities, has allowed eight spat collecting stations (30 m² each) (Fig. 2) to be constructed and deployed on Reao Atoll in November 2012. Two days were spent building the stations, and four days were spent on (Fig. 3) and under the water (Fig. 4), bringing the total number of stations on Reao to 11 (3 stations had been previously deployed; 1 in September 2011, and 2 in February 2012).

In parallel to the technical activities undertaken on the ground, a number of workshops were held to train farmers and their assistants in essential giant clam biology and basic mariculture principles. During these workshops, staff also introduced the new paperwork (“carnets à souche”) that will be required of farmers to ensure traceability of all PCC clams exported to Papeete. All participants were asked to go through a number of exercises, which allowed staff to address any potential misunderstandings and/or outstanding queries. Additional hands-on, in-water activities included cleaning stations that had been deployed earlier in the year, mostly to remove silt, ascidians and bryozoans with the use of brushes and chisels (Fig. 5); and how to estimate spat densities using quadrats (Fig. 6). Activities were well received and provided a forum for stakeholders to voice some of their concerns and clarify and address some commonly held misconceptions. Participants were highly motivated, lively, curious and eager to learn, with hands-on activities requiring and fostering a cooperative group dynamic.

Surveys of previously deployed stations indicated that some recruitment had occurred, with individuals of exportable colour and size for the aquarium trade (4 cm and larger) on one, and an estimated 1000–2000 recruits ranging between 1 mm and 2 cm on the other two more recently deployed stations.

Follow-up activities are planned by DRM in April and May this year, and a joint visit with SPC is scheduled for the end of 2013, with the hopes that there will be many colourful giant clams to count on all deployed stations at both atolls!



Figure 2. Spat collecting station prior to deployment.

Figure 3. Loading the concrete blocks that will anchor the collecting stations in place.

Figure 4. Underwater deployment of the stations.

All images in this article by Colette Wabnitz.



References

- Andréfouët S., Gilbert A., Yan L., Remoissenet G., Payri C. and Chancerelle Y. 2005. The remarkable population size of the endangered clam *Tridacna maxima* assessed in Fangatau Atoll (Eastern Tuamotu, French Polynesia) using in situ and remote sensing data. *ICES Journal of Marine Science* 62(6):1037–1048.
- Andréfouët S., Van Wynsberge S., Gaertner-Mazouni N., Menkes C., Gilbert A. and Remoissenet G. (in press). Climate variability and massive mortalities challenge endangered giant clam conservation efforts in French Polynesian atolls. *Biological Conservation*.
- Bell J.D., Clua E., Hair C.A. and Galzin R. 2009. The capture and culture of post-larval fish and invertebrates for the marine ornamental trade. *Reviews in Fisheries Science* 17(2):223–240.
- Cabral P., Mizuno K. and Tauru A. 1985. Preliminary data on the spat collection of mother of pearl (*Pinctada margaritifera*, Bivalve, Mollusc) in French Polynesia. p. 177–182. In: *Proceedings of the 5th International Reef Congress*, vol. 5.
- Gilbert A., Yan L., Remoissenet G., Andréfouët S., Payri C. and Chancerelle Y. 2005. Extraordinarily high giant clam density under protection in Tatakoto Atoll (Eastern Tuamotu archipelago, French Polynesia). *Coral Reefs* 24:495.
- Gilbert A., Remoissenet G., Yan L. and Andréfouët S. 2006. Special traits and promises of the giant clam (*Tridacna maxima*) in French Polynesia. *SPC Fisheries Newsletter* 118:44–52.
- Remoissenet G., Yan L., Gilbert A. and Andréfouët S. 2009. Spat collection of the elongated giant clam *Tridacna maxima* in French Polynesia : results and promises of this aquaculture technique developed in some characteristic lagoons of Eastern Tuamotu. 11th Pacific Science Inter-Congress. 2nd to 6th march 2009, Tahiti. Poster.
- Southgate P.C. and Lucas J.S. 2008. *The pearl oyster*. Elsevier, Oxford, UK.

For more information:

Georges Remoissenet
 Head of Aquaculture Division,
 Direction des Ressources Marines, French Polynesia
 (georges.remoissenet@drm.gov.pf)

Colette Wabnitz,
 Fisheries Officer (Aquarium trade), SPC
 (colettew@spc.int)

Figure 5. Removal of undesirable epibionts, including oysters, bryozoans and other encrusting organisms.

Figure 6. Counting spat with the help of a magnifying glass and a quadrat. Recruits ranged between 1 mm and 2 cm.