SUPPORT FOR THE TONGAN HALF-PEARL INDUSTRY

In May 2008, SPC’s Aquaculture Officer visited Tonga to provide assistance to two projects aimed at stimulating the small-scale, half-pearl (mabe) industry in Tonga’s Vava’u group.

A pearl shell carving training workshop was organised by SPC in Vava’u and involved local craftsmen and women who wished to improve their pearl shell and mabe handicrafts production. Tokerau Jim, a master carver from Rarotonga, Cook Islands, was contracted by SPC to deliver the highest possible quality, hands-on training.

Following the workshop, a hatchery rearing session of winged pearl oyster (Pteria penguin) was undertaken in Tongatapu at the Sopu Mariculture Center. This was conducted as part of an Australian Centre for International Agricultural Research (ACIAR)-funded project for which James Cook University (JCU) in Townsville, Australia is the commissioned organisation and Professor Paul Southgate is the Project Leader. Technical assistance for the hatchery work was provided by Andrew Beer and Paul Southgate, and SPC’s Aquaculture Officer, Antoine Teitelbaum.

The spat produced by the end of this run will be used to supply Vava’u pearl farmers and, thus, increase the supply of raw material of pearl shells and mabe. The spat will also be used in experiments to refine culture and mabe production methods.

Cultured pearls in the Pacific are dominated by the black pearl, which is produced from the black-lip pearl oyster, Pinctada margaritifera. In Tonga, pearl oyster culture began in the early 1960s. In 1975, an experimental venture was set up by the Tongan government. Broodstock of the winged pearl oyster, Pteria penguin, was imported from Japan for initial culture trials. The FAO South Pacific Aquaculture Development Project (SPADP) provided assistance in 1989 in carrying out stock assessment, spat collection surveys, and grafting techniques.

Commercial feasibility of pearl farming in Tonga was initiated in 1993. Japanese specialists estimated that an area of approximately 850 ha in the Vava’u island group could be farmed for half-pearl production, supporting an annual production of around 750,000 pearls, with approximately 30% of these being first-grade. Assuming a value of USD30 each for first-grade half-pearls, potential annual revenue from an area of 850 ha was estimated to be around USD7.5 million (Finau 2005).

Tonga is in a relatively unique position to diversify the range of pearl products because Vava’u has winged pearl oysters from which half-pearl (mabe) can be produced. One of the advantages of producing half-pearls is the lower capital and technological investment required and the value-added opportunities through jewellery and handicrafts. Already there is a small but thriving niche
market to sell mabe pearls to tourists in Vava’u.

**Transferring carving technologies from Rarotonga to Vava’u**

SPC’s Aquaculture Section targets livelihood opportunities. Mabe pearls and carved shell products are one of the lucrative opportunities supporting sustainable and profitable small-scale and rural development, especially in areas where tourism is developing.

In June 2006, SPC’s Aquaculture Section, together with JCU, organised a similar carving workshop in Kiribati to introduce the basics of those techniques (Teitelbaum 2007). That carving workshop was a more advanced course and had two major goals: 1) to provide an overview of the fundamentals involved in pearl jewellery and handicrafts (tools and craftsmanship, jewellery and handicraft design, pearl handicraft preparation and setting and marketing techniques), and 2) pay particular attention to the domestic market opportunities and local cultural carving and handicraft traditions in Vava’u.

Tokerau Jim (www.tokeraujim.com), the master carver hired for this exercise, runs a successful business in the Cook Islands. For the occasion, he brought in some specific tools that he uses in his workshop in Rarotonga. The Taurus ring saw\(^1\) and the Foredom hand drill\(^2\) were the most noticeable technological improvements that were brought to Vava’u. Traditionally, carvers used hand grinders and hacksaws for producing their crafts, taking over 30 minutes to produce shapes out of a shell. A ring saw can produce a shape in less than one minute. Further-

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\(^1\) Available for purchase at the Stained Glass Web Mart www.glassmart.com

\(^2\) Available for purchase at Mountain Heritage www.mhcrafters.com
more, the Foredom hand drill (with an rpm rate of over 45,000 compared with 30–33,000 for standard hand drills) allows carvers to be a lot more precise in their motifs and carvings.

Over this three-day event, trainees learned how to handle the new tools and how to produce better quality products with a true finished luster. Drawing and cutting shapes, designing pendants, earrings or whole shell art was demonstrated. Half-pearls (mabe) were also used for the carving exercises. Tokerau Jim demonstrated how to best use each shell to reveal its best colour and true nature. Thanks to Tokerau Jim, trainees also learned how to incorporate traditional Tongan motifs in the carvings, making those products uniquely Tongan.

One of the bottlenecks of handicraft production is the lack of supply of mabes and pearl shells. How can handicraft and mabe production be improved given the current state of farming in Vava’u?

The need for spat

Until recently, pearl farmers from Vava’u (regrouped under the Pearl Grower Association – PGA) have only been growing a limited number of shells using natural spat collection. The poor recruitment of spat has resulted in the harvesting of adult oysters from the wild, which has further impacted recruitment and natural spat fall of Pteria penguin in Vava’u is now extremely limited.

ACIDAR is funding a 2.5-year research project (FIS/2006/172), focusing on the development of
appropriate hatchery culture techniques for *Pteria penguin* and the use of hatchery-propagated oysters for pearl production. This project involves collaboration with SPC and ties in with SPC’s Aquaculture Action Plan.

Further development of the pearl industry in Tonga is hindered by a lack of knowledge of culture requirements of *Pteria penguin* and methods for optimising pearl production from this species. For example, only one preliminary study has reported on hatchery or nursery culture of *Pteria penguin* (Beer 1999) and, while limited information is available relating to half-pearl production from the related *Pteria sterna* (Ruiz-Rubio et al. 2006), similar information is not yet available for *Pteria penguin*. Research is required to optimise culture methodology and pearl production from *Pteria penguin* as a basis for sustainable industry development. This ACIAR project will address the following major points:

- Hatchery culture of *Pteria penguin* and optimisation of hatchery culture techniques;
- Nursery culture and grow-out, optimising culture techniques;
- Half-pearl production and aspects effecting pearl quality (position, location, time);
- Investigation of round pearl production from *Pteria penguin*;
- Training Tonga Fisheries Department staff in culture methods and pearl production; and
- Training farmers and members of PGA.

Production of high quality half-pearl from *Pteria penguin* in Tonga has been clearly demonstrated and existing pearl farming expertise in Tonga provides considerable opportunity for this project to have immediate impact.

**A SUCCESSFUL SPawning AT SOPU MARICULTURE FACILITIES**

In May 2008, the hatchery at SOPU was upgraded by Tonga Fisheries Department aquaculture staff, and assisted by Andrew Beer and Antoine Teitelbaum. Several tanks were cleaned and prepared for larval rearing. A filtered water system was rigged and a spawning setup (including heat shock setup) was put into place. All hatchery equipment needed for spawning and larval rearing were recovered or purchased, while a first batch of 30 adult *Pteria penguin* broodstock were air freighted from Vava’u.

The first batch of oysters was successfully induced to spawn, and larvae were put in incubation. A second batch of 30 broodstock was induced to spawn several days later and these produced more than satisfactory numbers of eggs, allowing us to fully stock all available hatchery tanks. The extra spawn was placed in outside raceways and those were fertilised using agricultural fertilis-
er, in the hopes of producing a natural bloom of microalgae.

The temperature requirement of most pearl oysters is between 26°C and 29°C for larval rearing (Ellis et al. 2005). During the run, the water was as low as 20°C over night in the hatchery and so a heat exchange system was put into place and aquarium heaters were also used, allowing water temperatures to be maintained between 26°C and 30°C.

A large proportion of the microalgae required as larval food was provided as a commercially available algal concentrate obtained from Reed Mariculture in the USA. The species used were Pavlova sp. and T-ISO. The encouraging results indicate that algal concentrates may be of considerable benefit to hatcheries in the region by reducing the requirement to culture live micro-algae for larval pearl oyster culture. This would simplify hatchery production and reduce the need for specialised culture facilities and technical capacity.

More than 500,000 eyed larvae were placed into settlement tanks. When sample spat collectors from these tanks were inspected two weeks later, large numbers of spat were observed. Spat collectors were transferred to an ocean-based longline and spat will be harvested from them in September 2008.

Both the spawning and larval rearing run of Pteria penguin and the shell carving workshop complemented each other in the sense that they assisted in increasing the supply of spat, which is in high demand in Vava’u and which ultimately improves the end products of the Tongan carved shell and mabe industry. In the near future, this sustainable activity should gain in popularity and provide more alternative livelihood options to Tonga’s rural populations.

REFERENCES


