Acknowledgements

I would like to express my thanks to the staff of the Fisheries Division, the Republic of Kiribati, for their support. This work was funded by ACIAR Pacific Island Pearl Oyster Resource Development Project No. 9131.

References

Braley, R.D. (1992). The giant clam: Hatchery and nursery culture manual. Australian Centre for International Agricultural Research, Canberra, Australia. ACIAR Monograph No. 15. 144 p.

Brown, M.R., S. W. Jeffrey and C.D. Garland. (1989). Nutritional aspects of micro-algae used in Mariculture: a literature review. CSIRO Marine Laboratories Report No. 205. 44 p.

Hayashi, M. and K. Seko. (1986). Practical technique for artificial propagation of Japanese pearl oyster (*Pinctada fucata*). Bulletin of the Fisheries Research Institute of Mie. No. 1, Sept. 1986.39–68. (In Japanese with English abstract).

Ito, M. (1995). A manual of micro-algae culture for hatchery training of the black-lipped pearl oyster *Pinctada margaritifera* (Linnaeus) in tropical atoll conditions. Dept. of Zool., James Cook University of North Queensland, Australia. 18 p.

Lewis, T.E., C.D. Garland and T.A. McMeekin. (1986). Manual of hygiene for shellfish hatcheries. Dept. of Agr. Sci., Univ. of Tasmania. 45p.

Roses, R.A. (1990). A manual for the artificial propagation of the silver-lip or gold-lip pearl oyster *Pinctada maxima* (Jameson) from Western Australia. Fish. Dept., Western Australian Marine Research Laboratories, W.A., Australia. 41 p.

Tanaka, Y. & M. Kumeta. (1981). Successful artificial breeding of the silver-lip pearl oyster *Pinctada maxima* (Jameson). Bull. Natl. Res. Inst. Aquacult. (Japan), 2: 21–28. (In Japanese with English abstract).

Progress of research on the potential of farming blacklip pearl oysters in Solomon Islands

By: Kim Friedman[1], Johann Bell[1], Mark Gervis[1] and Gideon Tiroba[2]
[1] ICLARM Coastal Aquaculture Centre, P.O. Box 438, Honiara, Solomon Islands.
[2] Ministry of Agriculture and Fisheries, P. O. Box G13, Honiara, Solomon Islands.

In late 1993 the Australian Centre for International Agricultural Research (ACIAR) provided ICLARM's Coastal Aquaculture Centre and the Ministry of Agriculture and Fisheries, Solomon Islands, with funding to assess the feasibility of farming blacklip pearl oysters *Pinctada margaritifera* in Solomon Islands. The title of the project was "A Collaborative Investigation of the Options for Spat Collection and Hatchery Production of Pearl Oysters in the Central-Western Pacific".

The aims of the project were to:

1. Test the availability of pearl oyster spat in Solomon Islands waters using a variety of spat collectors;
2. Develop cultivation techniques for pearl-oysters in coastal villages; and
3. Induce spawning and rear larvae and spat of pearl oysters.

The emphasis of the project over the last two years has been placed on the first of these aims, through a sampling programme designed to yield reliable information on spatial and temporal availability in the abundance of spat of the blacklip pearl oyster.

Spatial and temporal variation in the availability of spat of blacklip pearl oysters over a 21-month period was assessed initially by deploying spat col-

lectors at three sites in each of five regions. These regions spanned 500 km of Solomon Islands. Every three months, commencing in January 1994, 50 spat collectors were deployed at each site, to be harvested six months later. Five different types of collectors were tested. The collectors were made of either plastic sheeting or shademesh, but varied in structure. Two types of collectors were placed in protective mesh bags to assess the effects of this measure in reducing predation of spat.

Live spat attached to the collectors were removed and placed in lantern nets at village sites for grow-out to the size suitable for "earhanging". The growth and survival of these juvenile oysters was monitored every three months. The data were used to construct a growth curve for *P. margaritifera* in Solomon Islands.

In collaboration with staff from James Cook University, preliminary experiments were run on the larval rearing of blacklip pearl oysters. Wild broodstock were collected from a variety of locations around Solomon Islands and induced to spawn using heat stress. The larvae were reared both in static and flow-through systems, and using diets ranging from 100% live cultured algae to various blends of live algae and microcapsules.

Results, conclusions and assessments

This project demonstrated that, in Solomon Islands, spat of the blacklip pearl oyster were most abundant on collectors deployed in October and January. On collectors put out in October 1994, spat settled at an average rate of 3.0-4.5 spat per collector at two sites in the Gizo region (Western Province). In addition, average settlement rates in excess of 1.0 spat per collector were recorded at another ten sites from collectors deployed in October or January. The rates of spat collection at the two sites in the Gizo region are considered by sources in the industry to be economically viable for the culture of blacklip pearl oysters by village growers.

In addition to identifying major trends in seasonal availability and location of spat, the project refined methods for collecting spat. There were two main findings in this regard. First, collectors made of shademesh attracted at least three times as many spat of blacklip pearl oysters as those made of black plastic. Second, the cost of shademesh collectors can be reduced by halving the amount of material used (from 1.6 m^2 to 0.8 m^2) without affecting catch rates.

The project also demonstrated conclusively that protective mesh bags around spat collectors did not improve the harvest of spat by protecting them from predators. On the contrary, protective bags became fouled heavily, reducing the water flow to the collector. They were also colonised by predatory gastropods (Cymatium) and crabs (Portunidae and Xanthidae) which settled to the collectors from the plankton. As these predators grew, they were trapped within the protective bags and caused heavy mortality of juvenile oysters.

Growth rates of juvenile *P. margaritifera* held in lantern nets were high when compared to rates recorded from other areas in the Pacific. A Ford-Walford plot of growth of oysters held in lantern nets shows a mean annual increment of over 58 mm for juveniles less than 60 mm, and a mean annual growth increment of between 40 and 55 mm for larger juveniles. On the basis of the data presented here, village farmers can expect to harvest spat at approximately 30 mm DVM and grow them to a minimum size of 80 mm DVM in 12 months.

In contrast to the encouraging rates of growth found during the study, survival rates of *P. margaritifera* spat in grow-out were generally low (38%). The high rates of mortality were due to predation by Cymatium, crabs and fish, but also to inadequate husbandry of the spat due to the infrequency of visits by ICLARM and lack of attention given by village growers.

Attempts to rear the larvae of blacklip pearl oysters were only marginally successful. Although a handful of spat were reared during each of two trials, the mass mortalities that occurred indicated that considerable progress needs to be made before the production of spat in hatcheries can be considered an economically viable way of supplying spat to village-based pearl oyster farmers.

Follow-up

The relatively high rates of spat collection at two sites in the Western Province of Solomon Islands indicate that it could be possible to establish economically-viable farming of blacklip pearl oysters in some of the "open" coral reef habitats in the central-western Pacific. This encouraging result was followed-up by a further request to ACIAR from ICLARM and the Ministry of Agriculture and Fisheries, Solomon Islands, for additional two years of funding to carry out Phase Two of the project. The aims of the continued research are to:

1. Scale-up the collection of spat at the most promising sites in the Western Province to confirm that spat can be collected in commercial quantities;

2. Confirm that the best time to deploy spat collectors is between October and January;

3. Refine the design and deployment of spat collectors to maximise the cost-effectiveness of collecting spat;

4. Develop grow-out methods to overcome the high mortality of spat caused by predators; and

5. Establish pearl oyster farms in villages, using spat collected from the wild.

In November 1995, ACIAR approved a further two-years' funding for a project entitled "Development of Small-Scale Village Farms for Blacklip Pearl Oysters in Solomon Islands Using Wild Spat". As part of the new project, 30 longlines, each holding 100 collectors, were deployed at two of the most promising sites identified over the past two years.

We deployed collectors to coincide with the main period of spawning activity identified during Phase One and are continuing to monitor spat collections over time to confirm findings of seasonality. In addition, refinements made to spat collectors have been incorporated into the new collectors. Spat rope, which is increasingly becoming the collector of choice in Cook Islands, is being used for a proportion of the collectors in Solomon Islands.

Once spat are collected, we will investigate grow-out methods to decrease the high rates of mortality experienced in Phase One. An important question in this context is whether survival of spat can be increased by removing them at an earlier stage from collectors, and placing them in a grow-out system which more effectively excludes predators.

We have seen some of the shortfalls of the lantern net system for the grow-out of juvenile *P. margaritifera* and will be testing a new system based on panel nets. Grow-out will be concentrated in only two areas for phase two of the project. This will allow more regular husbandry checks on the juvenile spat, than was possible during the first two years work.

This project is run in cooperation with village communities who are trained in the culture procedures and who are set to receive any financial returns if the project is successful. The new project provides funding to pay a technician for the seeding of spat held by the villagers. This component of the work offers participants a real possibility of taking the first steps into farming production.

Data collected on the variables associated with farming (e.g. survival of spat) will be used in an economic analysis of potential returns from farms within open reef environments.

First pearl harvest in Marshall Islands

Black pearl industry on its way in Marshall Islands

Roberts Reimers Enterprises (RRE) in the Marshall Islands is now successfully producing gem-quality black pearls—the same pearls of South Pacific fame that come from the black-lipped oyster.

In Majuro, in August 1995, RRE's pearl project coordinator Tim Seitz and Reimers' family members harvested a small number of pearls from a batch of oysters brought in from the RRE pearl farm in Arno, an atoll some 10 miles away.

Ramsey Reimers, CEO for RRE, said the project has progressed in a low-key way over the past two years. Production to date shows that pearl farming will work in the Marshalls, and the firm intends to vigorously increase the growth of its Arno farm to bring it up to a commercially-viable level. The farm, on one of Arno's small islands, was chosen for its nutrient-rich lagoon and shelter. It is being developed similarly to RRE's giant-clam farm on Mili Atoll, which is powered primarily by solar panels and a wind generator. Reimers and Seitz agree that pearl production is very complicated and risky.

"It takes about two years for an oyster to mature to the size when it can be "seeded" and, from that point, it takes yet another two years to produce what one hopes will a high-quality pearl," Seitz said.