UPDATES ON POST-LARVAL FISH CAPTURE AND CULTURE TECHNOLOGY TRANSFER BETWEEN COOK ISLANDS AND FRENCH POLYNESIA

Antoine Teitelbaum
Aquaculture Officer
SPC, Noumea
New Caledonia
(AntoineT@spc.int)

The last issue of the *Fisheries Newsletter* contained a description of the first set of post-larval capture and culture (PCC) experiments that were run in the Cook Islands. These experiments were made possible, thanks to technical input of experts from French Polynesia and financial support from the French Pacific Fund. This article describes the Cook Islands Ministry of Marine Resources (MMR) staff training on Bora Bora. Training took place on a farm where PCC activities have been developed to a semi-commercial level. Some of the results of the sampling performed in Aitutaki from November 2007 to March 2008 are presented here.

PCC training — Bora-Bora, French Polynesia

François Chevalier, manager of Bora EcoFish (BEF), and his two employees Corentine Favre and Alain Bigot (both certified aquaculturists) operate a small PCC-based aquaculture farm. BEF has been operating since 2006 and endeavors to supply ornamental fish captured with hoa nets to the global market. BEF also advises hotels that have artificial lagoons.

BEF has agreed to pass on some of its technical knowledge to its Cook Island counterparts (Koroa Raumea, Director of Inshore Fisheries and Aquaculture, and Richard Story, Aitutaki Marine Research Center manager), and to serve as a training station for one week. During this training, trainees were shown all of the activities involved in running an aquaculture facility based on PCC.

A busy schedule

At the beginning of the training, BEF technical staff gave a guided visit of the farm to Cook Island trainees. The main building has individual areas for live prey, sorting, quarantine, and a range of aquarium racks for grow-out and nursery. Filtration units are kept outside. There is a small greenhouse with several grow-out tanks used for fast growing or larger fish species, and there is also an innovative rack of floating cages in front of the farm.

It was full moon during the training so catches were fairly low, mostly small numbers of triggerfish and cardinalfish that had been trapped by the hoa net. Trainees were involved in the daily harvesting of the nets at the hoa (reef channel), 10 minutes from the station.

Cook Island trainees also had the opportunity to work on the floating cage system where they cleaned, fed, inspected and repaired the nets, all of which are routine activities for cage culture. Species of acanthurids, carangids and holocentrids have been growing out in the cages for one year. Some, such as trevallies and to a lesser extent large surgeonfish, are showing very good growth rates in cage culture conditions, and fed on artificial diets.

Feeding fish with pellets and live prey (Artemia) was demonstrated during the training. Artemia incubation and cyst hatching was thoroughly explained using BEF hatching tanks. This is an area that created much interest among Cook Island trainees as

Feeding the fish at Bora Ecofish floating cage system.

they had never worked with live zooplankton before.

Farm management was also explained and demonstrated (i.e. recording mortality, siphoning tanks, removing unconsumed feed, and adjusting feeding rates accordingly). Backwash from the sand filter was demonstrated and done on a daily basis.

All of these various processes were performed by Cook Island trainees after demonstration. As a result, harvesting post-larvae in the net, sorting fish, managing tanks, producing live prey, and feeding the fish are now familiar activities to the Cook Island trainees.

Visits to Bora Bora's lagoon hotels

One of Bora Bora's assets is its high-end tourism industry. Most hotels have large facilities with over-the-water bungalows and environmental activities for tourists. Lagoon restocking and building artificial reefs are a tourist attraction and helps stock the artificial lagoons faster. BEF works with hotels on environmental projects such as producing artificial reefs (coral frags, PCC fish and soon farmed giant clams).

To date, BEF has serviced a large hotel and are in the process of undertaking some work at the Meridien Hotel where they will provide a "reef enhancement package" that

Richard Story, AMRC station manager's views on the training:

"The training was helpful, especially with Artemia culturing, which I've never done before. Just being there and looking at simple but efficient setups gives me a better picture of what it takes to venture into a PCC operation."

"It was a pity that there weren't many fish to work with during that period. Also, some of the things I thought should have been explained in more detail were marketing ornamental fish, packaging and transportation of fish, maintenance and repair of specific equipment (e.g. crest nets). Also, what are the criteria for identifying high value food fish species?"

Koroa Raumea, MMR director's views on the training:

"As the director responsible for similar research development in the Cooks, it was useful for me to actually assess how other countries are managing and implementing such projects."

"I was quite fascinated by the fact that some of the fish were being grown in sea cages, and that we were able to sample (eat) some. Rearing fish for food is a great opportunity if fish fry can be collected easily. If this is successful on a larger scale, then this can be most appropriate for the Cooks, especially when most of the reef fish are ciguatoxic."

"Overall, the training was good, although it was a shame that there was so few fish being trapped by nets during the training period. Other aspects of the training (e.g. farm maintenance, feeding, etc.) were fine. A lot of what I learned will have direct application in the Cook Islands, and we believe that food fish will soon be a priority for the country."

includes the following concrete structure for corals and fish settlement; settling farmed corals, fish and clams; mangrove planting to stabilise the shores of the artificial lagoon; and follow-up maintenance.

Catching and raising post-larval fish for export was the initial goal of BEF. Nowadays, however, it appears that the company is working towards developing staff skills in environmental consultancy and coral garden installation and management for Bora Bora's tourism industry.

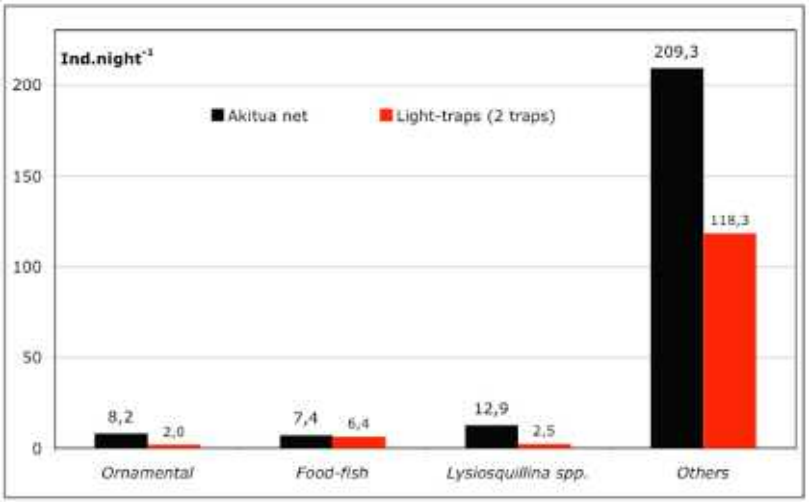

Figure 1: Average number of fish caught by traps (hoa net /light traps), based on five months of sampling in Aitutaki. Fish are classified by categories (ornamental, food fish and others) and the average number of mantis shrimp (*Lysiosquillina* spp.) is also recorded.

PCC trials — Cook Islands

Sampling results

For five months, Richard Story and his staff have been collecting post-larval fish, using the sampling design established at the start of the project in November 2007. Two light traps moored outside Aitutaki's main pass and one hoa net deployed in Akitua Channel, were used to fish five days before and after the new moon of each month between November and March (and currently ongoing). Data were entered into the computer on a daily basis during the sampling period.

In March 2008, Emmanuel Malpot from Aquanesia Consulting and myself took a trip to Aitutaki to work alongside AMRC staff for on-the-job PCC training. The aim of the trip was to finalise the five-month sampling, prepare data for analysis, and develop (together with MMR) plans for future development that should be undertaken.

During this mission, the light traps yielded better catches than the crest net. It was the first time since the initial trials in November 2007 that the light traps yielded better catches than the crest net. However, even if the overall catch was reasonably high (>120 post-larvae/trap/night), the percentage of commercial species remained low. Figure 1 shows that an average of 3.4 specimens of commercial interest for the ornamental trade[1] were caught per night per trap, and 4.6 specimens of commercial interest for food[2]. This accounts for 6.5% of the total catch for fish only.

An interesting finding is the relative abundance of varo (*Lysiosquillina* sp.), which has been recruited in all three traps, and constitutes (4.2% of the catch from the light traps. Varos fetch high market prices, and show good growth potential in captivity and seem to be recruiting consistently in Aitutaki.

Conclusions

Overall, the trial was successful and AMRC staff are fully autonomous in carrying out sampling, sorting, identification and grow-out of target species. The results of the study make it possible to draw conclusions about the potential of PCC after five month of sampling in Aitutaki within the limitation of the sampling design:

- It will be difficult to develop a profitable business for aquarium fish based on this technique because of the highly variable recruitment patterns of ornamental species and their overall low abundance;
- Varo recruits relatively abundantly and seems to be a species of interest for Cook Islands;
- The strongest interest formulated by the Cook Islands MMR was for cage culture of food fish.

These conclusions are discussed further in the next section of this article.

[1] Ornamental species are those found in the aquarium trade (e.g. surgeonfish, butterflyfish, boxfish, triggerfish), and which have a minimum export value of USD2–3.
[2] Food fish are those that exhibit good growth rates and can be raised in captivity commercially.

Where to from here?

Given the catch composition, ornamental fish do not appear to be a viable option. Several consultations with a Rarotongan-based aquarium fish exporter made us think that the sale of PCC products (even if in sufficient number and size) will not be viable. The demand for fish from the Cook Islands is very specific and targets high value and rare species such as longfin anthias, Scott's wrasse or flame angels. Therefore, PCC activities should not focus on ornamental fish in Aitutaki.

Varos seem to be an ideal aquaculture candidate for the tourism and restaurant trade. Further efforts should focus on developing culture techniques, such as ranching, in the northern soft bottom part of the lagoon, and understanding their recruitment patterns.

With declining reef fish stocks, the increasing demand for fresh fish by the tourism industry, and the high incidence of ciguatera, fish farming is of great interest in the Cook Islands. Further trials should be carried on developing low cost, small- to medium-scale fish farming in Aitutaki Lagoon.

Due to the relative reliability of PCC techniques, other local sources of fingerlings should be identified.

Milkfish, rabbitfish and mullet fingerlings are known to recruit in high density during the summer months. Capture-based aquaculture trials using these wild fingerlings could be of interest for Cook Islands. Should these trials be successful and show signs of profitability, then MMR should consider the importation of fingerlings in larger numbers, bearing in mind the risks associated with the translocation of aquatic animals. In a much longer run, finfish could be fully aquacultured in Cook Islands, following the development model of rabbitfish culture in the Pacific.

For further information, contact:

Emmanuel Malpot,
Aquanesia Consulting,
emmanuel.Malpot@mail.pf

Koroa Raumea,
Director MMR,
k.raumea@mmr.gov.ck

Antoine Teitelbaum,
SPC Aquaculture Officer,
antoinet@spc.int

First record of *Acanthurus achilles* post larvae caught by light traps in Aitutaki.