Also to be discussed at the upcoming CITES meeting is the trade in giant clams, especially for the aquarium trade. CITES is concerned that some species being traded are not second generation cultured, and it appears that giant clam exports from some countries in the Pacific are under question.

Closer working relationships between SPC and SCRFA

In February 2007, the LRFT Specialist met with the Director of the Society for the Conservation of Reef Fish Aggregations (SCRFA, website: http://www.scrfa.org) to finalize and sign a memorandum of understanding (MOU) between SPC (through the LRFT Initiative) and SCRFA that the two organisations have been developing and discussing over the last year. In the past, SPC has worked closely with SCFRA informally, for the benefit and interest of SPC member countries. The MOU will allow a closer formal working partnership between the two organisations, so that they can assess reef fish spawning aggregations and establish management and monitoring programmes in Pacific Island countries that will ensure the sustainability of reef fisheries in the region. There are no funding commitments tied to this MOU, but it is hoped that funding proposals will be developed for future work activities.

Tuvalu looks into the marine aquarium trade

In March 2007, Mr. Tupulanga Poulasi, fisheries officer from Tuvalu's Fisheries Department, undertook a three-week attachment training under the LRFT Initiative Attachment Training programme. Attachment training is part of a regular capacity building programme for Pacific Island countries to build local expertise within fisheries departments so that they can conduct resource surveys and analyse and interpret survey results of their live reef fisheries for management and sustainable development purposes.

This attachment training for Tuvalu is a follow-up to in-country training on field survey methodology, and a survey of the marine aquarium trade resources of Funafuti,undertaken in 2005 at the request of the Tuvalu Fisheries Department. This survey looked at the potential of Tuvalu's marine resources for the marine aquarium trade. Unfortunately Tuvalu had to defer this part of the attachment to a later date, due to local staffing shortages.

The aim of the attachment training was to learn how to clean, enter and analyze the Funafuti survey data using RFID, a database and query programme developed by the Reef Fisheries Observatory. The fisheries officer also had the chance to interpret survey results and to write a technical report under the guidance of the LRFT Specialist. The report discussed the current status of the potential marine aquarium trade resources, the available species and stock estimates (with recommendations on how much should be considered for exploitation), and what management setups and logistical factors should be considered before starting up operations. The technical report aimed to provide the status of the resource without trying to promote or negate the possibilities of a marine aquarium trade for Tuvalu. The first draft of the technical report was completed by the end of the attachment. The report has been finalized by mid-April, and submitted to the Tuvalu government for consideration.

AQUACULTURE SECTION

Impacts of Policy and Institutional Environment on ACIAR Research in the South Pacific, USP Campus, Suva, 6-7 March 2007

According to the Centre for International Economics (CIE), policy and institutional settings are a major influence on the uptake, effectiveness and, therefore, the impact of research projects in the Pacific. This was the premise adopted by CIE when it was commissioned by the Australian Centre for International Agricultural Research (ACIAR) to review the impact of policy and institutions on its research projects in the Pacific.

To explore this issue further the CIE organised a regional workshop, involving approximately 20 representatives from industry, academia, NGOs, regional agencies and ACIAR. Country participants included Fiji, Samoa, Solomon Islands, Papua New Guinea and Tonga. The workshop was co-hosted by the University of the South Pacific (USP) Pacific Institute of Advanced Studies in Development and Governance, and was held from 6–7 March at the USP Suva campus. SPC's Aquaculture Adviser also participated.

Policy may negatively influence the incentives of producers to undertake the investments generated by research. Distortions can also lead to situations where new production techniques may have counter intuitive and sometimes counter productive effects. Formal and informal institutions may reduce returns to invest-

ment in new technologies. A lack of managing risk may deter smallholders from becoming specialised and moving out of subsistence production.

The workshop observed that project selection and design are critical stages that often fail to take into account the questions of commercial viability and the link between commercial involvement and adoption. Some of the issues poorly addressed at this stage include:

- Market and risk analysis;
- Consultation with the private sector;
- Analysis of incentives facing quasi-subsistence farmers;
- Recognition of incentives driving researchers (e.g. the emphasis on producing publications); and
- Contractual arrangements with private sector collaborators.

Other important policy/institutional factors include:

- The security of property rights/tenure: Incorporating customary fishing rights; land tenure and its impact on mobilising land for investment or use as security for loans;
- Government funding and its approach to research and extension activities: Donor dependence often deters government from funding or contributing to ongoing research and development; inadequate priority often given for spending in the agriculture/fisheries sector; inherent weakness in government extension services;
- Issues of trust and methods of engagement lead to inappropriate contractual arrangements and enforcement: This impedes the scope for enterprises to be formally involved in growing/distribution/marketing and for input to provide credit and technology;
- Weakness of national biosecurity agencies makes it difficult to comply with requirements for export markets;
- Input costs may be unreasonably high. Especially concerning fertilizers and pesticides for agriculture. This may be the result of high internal costs (taxes) or that the perceived cost/benefits by farmers of technological gains are too low or uncertain;
- Insufficient institutional capacity to absorb and utilise policy analysis (i.e. a lack of analytical tools for policy making);
- Limited capacity to enforce legislation;
- Poor governance influencing the targeted beneficiaries and consistency of application of regulations and taxation; and
- Government marketing agencies may erode incentives for private sector activities.

SPC Aquaculture Section assists with aquaculture environmental impact assessments in the Federated States of Micronesia and Cook Islands

Coral farming in Kosrae, Federated States of Micronesia

In January 2007, SPC's Aquaculture Section commissioned Mr Steve Lindsay (Australia) as a short-term consultant to prepare an environmental impact assessment (EIA) for a coral farm on Kosrae. The farming proponent is Mr Martin Selch, a German entrepreneur who has formed a local company called Micronesian Management and Marketing Enterprises (MMME). MMME proposes to culture and export marine ornamental species, including hard and soft corals, from its base in Kosrae.

The main environmental risk reported by Mr Lindsay's assessment was the required removal of first generation coral fragments to initiate the farm. However, the conclusion drawn from the report supported, in principle, the business plan proposed by MMME. The EIA was submitted to Kosrae's Environmental Protection Agency, and a farming permit has been approved.

The EIA report produced by Mr Lindsay has been designed to provide a template for SPC to assist other commercial coral operations within the Pacific.

Finfish and edible oyster farm in Rarotonga, Cook Islands

During the first quarter of 2007, SPC also provided advice to the Cook Islands National Environment Service to assess the environmental impacts for a proposed aquaculture operation on the main island of Rarotonga. The aquaculture operation is a joint project between Ecoculture Ltd, a local company headed by Mr Tap Pryor, and the Titikaveka Growers Association (TGA), a local association of agricultural growers.

The project will consist of fish ponds and oyster raceways. The

site already has a hydroponic farm. The species to be farmed include edible oysters, milkfish, Nile tilapia, and possibly prawns. The system is designed to use the fish farm's by-products for the growth of the oysters and the prawns. The raceways will serve as biofilters due to the microbial activity, the filter feeding of the oysters. Detritus feeding by the shrimp will help recycle nutrients. Pilot trials involving milkfish resulted in rapid growth rates. Small trials with local *Macrobrachium lar* were also carried out.

A comprehensive EIS was provided. One concern that was addressed was the impact of the project on the water table lens. The project has drilled its own wells to source water and has put in place safeguards for the proper discharge of wastewater. The EIA has also documented the risks and management practices to prevent negative impacts associated with the introduction of aquatic species that are alien to the Cook Islands. It is hoped that this document can serve as a model for enterprises considering similar projects.

After a process of technical reviews and public consultations, the National Environment Service issued Ecoculture and TGA a permit to proceed with farming. The company has since started importing Nile tilapia from the Philippines.

Top: Coral fragments being grown by MMME in Kosrae, Federated States of Micronesia

Middle: Fish ponds for Rarotonga project

Bottom: Mr Tap Pryor next to some trial shrimp ponds for his Rarotonga project.

Fiji: Update on Dairy Farms Fiji's *Macrobrachium* shrimp farm and J. Hunter Ltd's Pearl Farm

While in Fiji recently, the Aquaculture Adviser took the opportunity to visit a shrimp farm in Navua and a black-pearl farm in Savusavu.

DFF prawn farm, Navua

I accompanied Dr Tim Pickering (Aquaculture Lecturer, University of the South Pacific – USP) to the Dairy Farm Fiji (DFF) Aquaculture Unit, located at the former Viti-corp Ltd farm, which the company has leased from the Fiji Islands Government. *Macrobrachium* and tilapia had been farmed there previously, and so DFF inherited the existing ponds and infrastructure. Improvements were undertaken, however, to upgrade pond surfaces, dykes and slopes.

DFF prawn farm operates through a unique relationship between private sector and academia (i.e. USP). Under the current arrangement, USP — through it's Institute of Marine Resources (IMR) — provides technical advice and labour to the farm on a cost-recovery basis. The School of Marine Studies (SMS) Seawater Laboratory at USP (Laucala campus) breeds and rears post-larvae (PL) ready for pond stocking. Avinash Singh (IMR) is project manager.

This is a useful case-study of technology transfer for the Pacific Islands region, as it is a successful demonstration of one mechanism for transferring scientific research and development to industry application. Early projections for the business model were derived from the economic models (available on the SPC Aquaculture portal website); it was interesting to see this model being applied in a real life situation. The model continues to be useful for fine-tuning the whole operation; for example, by inputting real farm data to make decisions about the optimum size of prawns for harvesting, or the best stock density for prawns.

DFF has already completed several harvest cycles. The operation is well into the learning curve, and from this experience the commercial aspects of prawn farming are beginning to be understood. So far DFF has exceeded its harvest expectations (compared with the initial economic modelling), largely by increasing stocking densities. One of the 0.3-ha ponds was harvested the week prior to my visit, had yielded approximately 600 kg of prawns at 38 g/individual, after a six-month grow-out.

During my visit, I also noted some positive indications of the marketing demand for prawns. For example, DFF had just completed building a retail shop, called 'The Prawn Shop', which that week had sold 250 kg of prawns (at FJD25/kg) without any advertising. This consisted of sales made to people driving by who saw the sign and stopped. The product is marketed as 'Fiji Blue Prawn'.

According to Kevin Blake, CEO of DFF, the company is a small portfolio of two of New Zealand's eminent entrepreneurs (Bruce Pulman and Paul Boocock). The primary business of the parent operation in Fiji (Highway Stabilizers Ltd) is road works, bridge construction and other road projects. The Viti-Corp lease for the DFF prawn farm was added as an 'industry good' project, intended to raise the company profile.

Since DFF is generating a quick cash turnover, there is potential for commercial expansion. Currently there are 24 grow-out ponds and there are plans to

The newly constructed Prawn Shop where DFF farm raised *Macrobrachium* prawns are sold. From left to right: Tim Pickering (USP), Avinesh Sing (IMR), and Ben Ponia (SPC)

build another 20 after the rainy season. To take the industry good concept another step further, and to make a wider impact at the community level, the DFF farm is keen to explore a satellite-farming concept. This would involve post-larval prawns being supplied from DFF hatchery extension services to village ponds. After a short grow-out period, these prawns would be marketed through the company chain: a soft version of the Fijian Goodman Fielder Crest Chicken contract grow-out model.

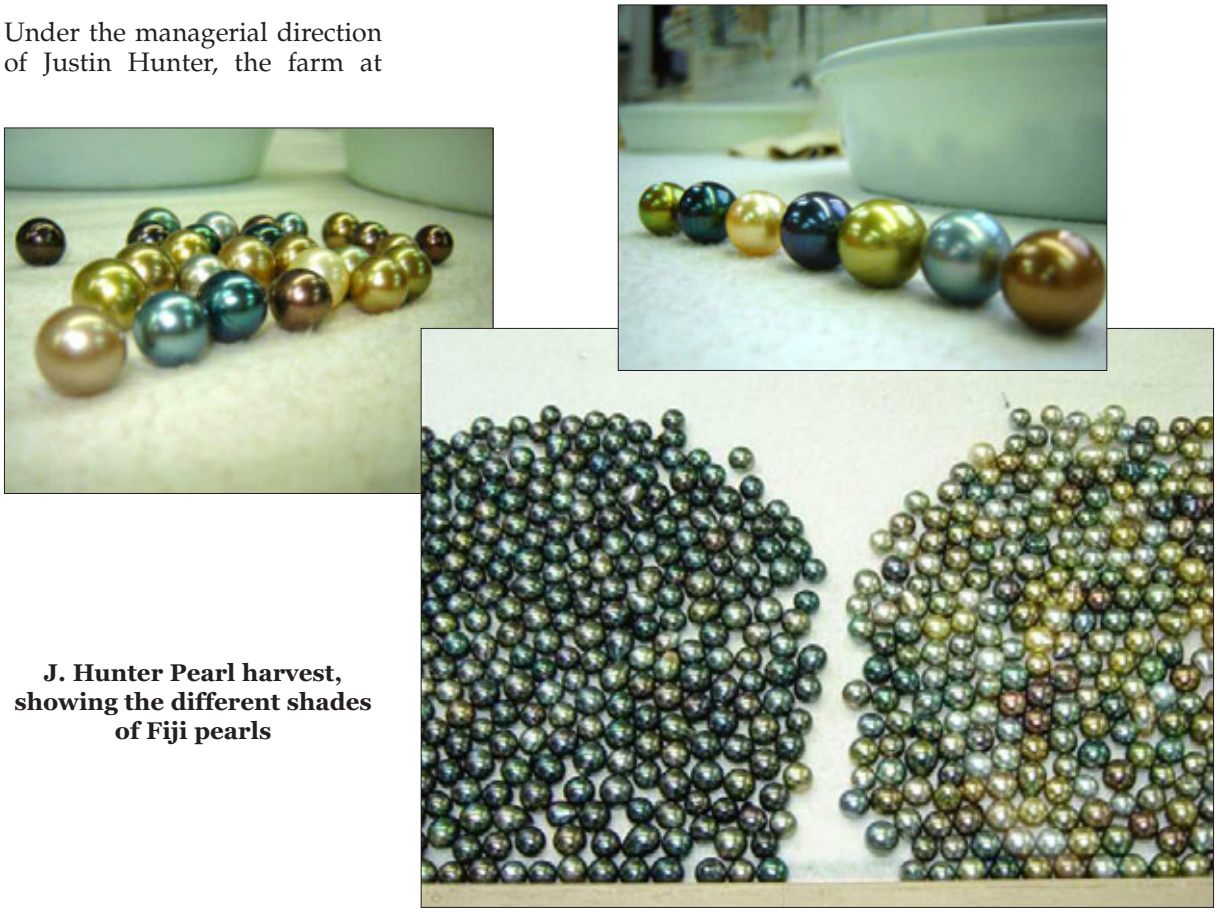
J. Hunter Pearl Farm, Savusavu

The J. Hunter Pearl label is quickly becoming an exclusive, high quality product line for Fijian pearls. The farm's success is the result of attention to a number of critical factors, such as good business acumen, marketing, and consultation with local communities.

Under the managerial direction of Justin Hunter, the farm at Savusavu has approximately 500,000 oysters under cultivation. The pearl harvests several million Fijian dollars (gross) per annum. Upon arrival I viewed several crops that had just been harvested. The pearls display the usual spectacular array of colour that Fiji pearls are becoming renown for. Amongst this crop were some dark 'chocolate' coloured pearls. The quality of the pearls is probably due, in part, to the expertise of the Japanese technicians employed by the farm. These technicians also provide seeding services for other pearl farmers in the surrounding area. The J. Hunter operation is also expanding to a second location.

The pearl farm operates its own hatchery, and routine spawning operations were underway during my visit. The Fiji oysters appear to have a high fecundity and large sized eggs, which could be related to the nutrient-rich water quality environment of Savusavu Bay. While the hatchery is not large by commercial standards, it still has scope for expansion and could accommodate other species. The farm also employs a USP graduate as its biologist to carry out ecological baseline studies, particularly water quality monitoring and carrying out basic pearl grow-out experiments.

The pearl farm provides direct benefits through avenues such as employment (of all genders and a range of ages), but also indirectly through the business that the high investment pearl farming enterprise generates. The farm also pays a dividend from its profits to the local village. For example, it has provided funds for a community hall, which also serves as emergency shelter in case of a cyclone. In addition, the farm sponsors an education scholarship for young students from the vil-



J. Hunter Pearl harvest, showing the different shades of Fiji pearls

lage. Those interesting in knowing more about the farm's operations can visit their website (www.pearlsfiji.com).

At the farm we also discussed the possibility of carrying out some mabe pearl seeding trials. The J. Hunter Pearl Farm has thousands of reject oysters that could be used for experiments. It would be particularly interesting if the geographical scope for this experiment could be standardised and extended throughout the Pacific and other countries.

Publications update

Joint SPC and USP farming and hatchery techniques manual produced for freshwater prawns (*Macrobrachium rosenbergii*)

Two practical manuals on freshwater prawns (*Machrobrachium rosenbergii*), resulting from collaborative work between USP and SPC, have been recently published. Mr Satya Nandlal (SPC Aquaculture Officer) and Dr Timothy Pickering (USP Aquaculture Lecturer) have jointly contributed to the publication. These manuals use the same format for the popular tilapia hatchery and tilapia grow-out manuals produced in 2004 by the same authors.

The first manual is dedicated to hatchery operations (Volume I), and the second manual (Volume II) concentrates on pond grow-out.

The entire *Machrobrachium* prawn industry is relies entirely on the availability of post-larvae. To face the needs of this young but growing industry in the Pacific, more hatchery and best practices are encouraged at the regional level. The hatchery manual is targets fisheries department, NGOs, and the private sector that wish to improve or expand their techniques in setting up or running a freshwater prawn hatchery. The manual covers topics including hatchery techniques (broodstock, larvae, and feeding), system design, water quality management and more.

The grow-out manual aims at assisting small-scale commercial farmers, as the freshwater prawn market is expanding quickly. This manual covers topics such as pond management, water quality management, harvesting and marketing.

Both volumes are well-illustrated and user-friendly documents, well initiated and very descriptive. They will greatly contribute to improve freshwater prawn hatchery and grow-out techniques in the Pacific region.

The manuals are available on the SPC aquaculture portal website:

http://www.spc.int/aquaculture/site/publications/pub_search.asp

Printed copies are also available for a charge. If you wish to find out more information about this publication the please contact:

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SPC Pearl Oyster Information Bulletin revived

After two and half years of absence, the 17th issue of the SPC Special Interest Group Bulletin on Pearl Oysters has been released. Professor Paul Southgate from James Cook University (Australia) has replaced Mr Neil Sims as the principal editor of this publication. The bulletin continues to be produced by SPC, with financial assistance from Australia, France and New Zealand. Although the bulletin will maintain the same general format, it will include minor changes, such as the publication of longer research type articles. It will also be seeking regular updates from major research groups and country statements.

The first issue includes an abstract of pearl oyster work presented during the World Aquaculture Society (WAS) conferences in Hawaii (2004) and Bali (2005). The issue also


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PEARL OYSTER
information bulletin

Editorial

includes news from the industry and a report on the SPC regional pearl meeting (Fiji, December 2005) as well as articles on the progress of pearling in the Pacific region: Cook Islands and Pohnpei, and in Tanzania, East Africa.

The *Pearl Oyster Bulletin* will aim at being published twice yearly and will mostly comprise research articles, reports from research groups or from the industry, as well as reports from member countries.

The *Pearl Oyster Bulletin* is available on SPC's website:

http://www.spc.int/coastfish/news/POIB/17/index.htm

Printed copies are mailed free of charge. The editorial board welcomes any contribution to the Bulletin. If you wish to contribute, join our mailing list or find out more information about this publication. Please contact:

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NEARSHORE FISHERIES DEVELOPMENT AND TRAINING SECTION

SPC assistance to New Caledonia-based tuna longline fishing company

Fisheries Development Officers Steve Beverly and William Sokimi began a medium-term project assisting a New Caledonia-based longline fishing company, Navimon, during the first quarter of 2007. The project began in February and will continue into June 2007, or until most of the company's eight boats and captains have had a chance to benefit from SPC's assistance. A Fisheries Development Officer will accompany the captain and crew of each boat on a regular longline fishing trip to observe standard operating practices with the view of offering recommendations for changes that could increase catch and fish quality and, thus, profitability of the operation.

Navimon has a fleet of eight longline boats (Fig. 1) that were built in either France or French Polynesia. All of the boats have the same general particulars and all have practically the same complement of gear, electronics and safety appliances. What follows are lists detailing boat particulars, fishing gear, wheelhouse electronics, and safety appliances on Navimon's boats.

Particulars

- Built by Chantiers Piriou, Concarneau, France 1999
- Steel stern house longliner
- LOA – 20.7 m
- LWL – 18.75 m
- Beam – 6.9 m
- Molded depth – 3.6 m
- Draft – 2.6 m
- Fuel capacity – 24 m^3
- FW capacity – 12 m^3
- Main fish hold (ice, 0ºC) – 55 m^3
- Freezer capacity (-20ºC) – 20 m^3
- Main engine – 450 CV
- Crew complement – 7

Fishing gear

- Lindgren-Pitman longline reel with 35 nm of 3.5 mm monofilament mainline.
- LS-4 line setter with 100 cm circumference drive wheel. This makes line speed easy to calculate: RPM/31 = speed in kt.
- Floats are 36 cm hard plastic longline floats.
- Floatlines are attached to floats – 12 m long, 6.4 mm black tarred line.
- Branchlines are 18 m of 2.0 mm monofilament with 3.6 Japan tuna hook w/ring (90%) or 16/0 tuna circle hook (10%). There are no swivels except on the snaps. 10% have 30 cm of SS wire leader with eye-to-eye connection. There are approximately 1980 brachlines.
- There are 4 Sel Call radio buoys.

Wheelhouse electronics

- Furuno FCV-291 echo sounder
- Furuno FR-7062 radar
- Furuno FAP-300 autopilot
- Furuno GP-1810 GPS plotter
- Furuno GPS-WAAS GPS
- Furuno FM-8500 VHF radio
- Furuno FM-3510 VHF radio
- Furuno FS-1862-15 SSB radio
- Furuno FAX-207 Weather Fax Receiver
- Linemaster longline controller
- PC with MaxSea plotter software
- CapSat transceiver TT-3022-D VMS system
- Thrane and Thrane INMARSAT system
- Taiyo ADDF-TD-L1100 radio direction finder
- Sel Call SVC-STI buoy caller
- SST monitor