Fisheries Newsletter

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Editorial

Welcome to the latest Fisheries Newsletter. One feature of this issue is an article by the Aquaculture Advisor, Ben Ponia, on his trip to Papua New Guinea. On page 18, Ben gives us an insight into aquaculture in that country. While commercial aquaculture is in its infancy, a few farms are supplying fish to the local market. The favoured species are carp, tilapia and rainbow trout. Pearl culture seems to be a promising option and a pearl farm has been operating in Milne Bay Province since 1998, raising three species of pearl oyster, *Pinctada margaritifera*, *P. maxima* and *P. fucata*.

Two years ago, off the coast of New South Wales in Australia, a trawler was hit and sunk by a 181-m cargo vessel. This collision revealed the risks that fishing boats face from large vessels and the limits of radar. The Australian Transport Safety Bureau has recently issued a leaflet on this problem, from which, with their kind permission, we have extracted some information that fishers may find useful.

Enjoy this issue and, as usual, please send us your comments on it.

Jean-Paul Gaudechoux
Fisheries Information Adviser (jeanpaulg@spc.int)

On-board processing of export tuna during the practical module of the SPC National Fisheries Officers Training Course

[Photo: Steve Beverly]

in This Issue

SECRETARIAT OF THE PACIFIC COMMUNITY
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FISHERIES DEVELOPMENT SECTION

Technical assistance to Marshall Islands

Fisheries Development Adviser Lindsay Chapman travelled to the Marshall Islands in early April, in response to an official request for technical assistance in setting up a longline fishing project. Lindsay worked with the Director of the Marshall Islands Marine Resources Authority (MIMRA), Danny Wase, and his staff to develop a work plan for the assistance. A memorandum of agreement (MoA) was also drawn up for both parties to sign.

MIMRA will use their vessel, FV *Wa-Pal* for the project, and have commenced some refurbishment work on the boat as well as equipping the vessel for tuna longlining activities. It is expected this project will commence late in 2002 when the boat is ready for operations.

FV* Wa-Pal *before work commenced to prepare the boat for project activities
[Photo: Lindsay Chapman]

Midwater techniques training – Nauru

Fisheries Development Officer William Sokimi completed his assignment in Nauru during April and the first half of May. William worked with the staff of the Commercial Fishing Section of the Nauru Fisheries and Marine Resources Authority (NFMRA) to develop an operations procedures manual for their tuna longline vessel FV *Victor Eoaeo II*, and to familiarise these staff with the systems on

***FV* Victor Eoaeo II**
[Photo: William Sokimi]

the boat, as it was in port under repairs at the time of the project. The main purpose of this project, though, was to run workshops on midwater fishing techniques for NFMRA staff and several local fishermen.

The midwater techniques covered during the workshop were vertical longlining, palu-ahi, ika-shibi and a 50-hook horizontal longline. Materials for making up fishing gear and sea safety equipment were displayed during the workshop sessions. Some of the fishing equipment that was needed for the workshop had not arrived, so William had to improvise and gather materials from a range of sources.

This actually worked out well, as it showed the workshop participants that alternative materials could be used if the best or "off-the-shelf" materials were not available. Once the gear was made up, fishing trials were undertaken, some during the day and others at night, in six trips with NFMRA staff and four with interested fishermen.

A total of 526 kg of fish was caught during the trials, including some taken by trolling. Pomfret was the main species taken during midwater fishing activities, and one marlin and several sharks, oilfish, skipjack tuna and small yellowfin tuna were also taken.

Top: Fishing and sea safety equipment on display during workshop sessions
Bottom: Pomfret and blue marlin taken on one fishing trip
[Photos: William Sokimi]

Small boat training – Papua New Guinea

William commenced a new assignment in Kavieng, Papua New Guinea, in June. The National Fisheries College contracted William's services to implement two workshops on small boat fishing operations. The assignment also includes a review of the curriculum after the first workshop is run, with adjustments made to the curriculum for the second workshop. William will also train up some college tutors so they can implement similar workshops in future.

Tuna longline project – Palau

Lindsay travelled to Palau in May in response to an official request for technical assistance in tuna longlining. A work plan was developed and an MoA drafted. Most of the materials needed to conduct tuna longline trials and training were on hand, and the Fisheries vessel had been recently refitted and was in good condition. While Lindsay was in Palau, he was asked to give a one-day seminar to local fishermen on small-scale fishing techniques as an introduction to the tuna longline training planned for later in the year. Twelve people attended the seminar.

SPC/Nelson Polytechnic Fisheries Officers Training Course

Steve Beverly, Fisheries Development Officer, participated in the practical fishing module of the annual SPC Nelson Polytechnic Fisheries Officers Training Course held in Koumac in New Caledonia's Northern Province during May and June (see feature article by Michel Blanc in this newsletter). As in past years, Steve acted as fish master on board Marine Marchande's 12-m aluminium catamaran, FV *Dar Mad*. Two other smaller boats were used for small-scale fishing, École des Métiers de la Mer's 7-m wooden boat FV *Le Crabe* and an aluminium runabout chartered from a Koumac fisherman. During the five-week course FV *Dar Mad* and FV *Le Crabe* were moored at Pandop Marina, the site of one of New Caledonia's newest longline companies, Pêcheries de Nouvelle-Calédonie (see *Fisheries Newsletter* #99).

PNC were very helpful in providing services to the course. In addition to supplying ice and bait to all vessels participating in the course, PNC marketed most of the catch and provided their processing rooms and the expertise of their staff for fish cleaning and packing exercises.

All fish caught during the practical fishing module were marketed by PNC. However, no money actually changed hands. Instead, the revenue was used to offset the cost of ice and bait used during the module.

Ten future Pacific Island fisheries officers participated in the practical fishing module: Nare Wolu (Vanuatu), Hillary Kasai (PNG), Ms Telesia Uhatafe (Tonga), Tekiteki Vailea (Tonga), Mwaka Kaeta (Kiribati), Maatui Filifili (Samoa), Ngametua

***Top: FV* Dar Mad**
***Bottom: FV* Le Crabe**
[Photos: Steve Beverly]

Top: An aerial view of Pandop Marina at Koumac
Bottom: Fish being played on a rod and reel
[Photos: Steve Beverly]

Tangatakino (Cook Islands), Bruno Ned (FSM), Lale Petaia (Tuvalu), and Oswin Agigo (Nauru). All of the participants, including Nelson instructor Brian Fossett, Fisheries Training Officer Terii Luciani, Fisheries Training Advisor Michel Blanc, and Steve, stayed at the Monitel Hotel in Koumac while not out on the boats. The crew of FV *Dar Mad*, Captain Lucky Fogliano and Engineer Velio Famoetau, stayed on the boat but joined the trainees for most of their meals at the hotel.

Before fishing started, Steve and the crew of FV *Dar Mad* instructed the trainees in gear fabrication and repair for trolling, bottom longline and pelagic longline fishing. In all, FV *Dar Mad* made one trolling trip, four bottom longline trips and three pelagic longline trips. The trolling took place on the first day of fishing around an FAD that had been deployed in 2001 by F/V *Dar Mad* about five miles off Koumac Pass at 20°42.9' S, 164°07.9' E at a depth of 1400 metres. Three small yellowfin tuna (*Thunnus albacares*) were caught around the FAD using artificial lures on rods and reels and on handlines.

The bottom longline trips were made near the entrance to Koumac Pass in 300 to 400 m depth. Each bottom longline had about 100 hooks baited with cut South African pilchard. The catch from the bottom longline fishing was very good. The first two or three sets were average but the last few produced spectacular catches of deepwater red snapper (*Etelis carbunculus*) averaging almost 10 kg and weighing up to 20 kg. All of the red snapper were marketed by PNC in Noumea, where they fetched a good price. Before being sent by refrigerated truck to Noumea, the fish were gilled, gutted, cleaned and packed in export cartons with gel-ice packs—all by the trainees under the supervision of PNC.

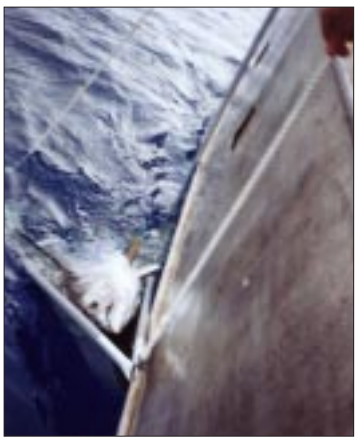
The pelagic longline sets were made about five to 10 miles west of the Koumac FAD. Setting was done in the morning starting at 0530 hours and hauling was done in the afternoon, starting at 1300 hours. Pilchard was used for bait. Trainees learned setting and hauling techniques as well as on-board handling of export grade fish. During the longline trips, each consisting of a set of 270 hooks, 32 saleable fish were caught including two bigeye tuna (*T. obesus*) weighing 68 kg and 55 kg. The 68-kg bigeye was exported to Japan. The 55-kg bigeye tuna was another story (see box on page 6). The catch also included 17 albacore tuna (*T. alalunga*) weighing an average of 20 kg each, two yellowfin tuna (*T. albacares*) weighing 20 and 30 kg, two mahi mahi (*Coryphaena hippurus*), two opah (*Lampris guttatus*) and some other assorted by-product species.

Processing deepwater red snapper at PNC's Koumac facility
[Photo: Steve Beverly]

Packing the processed fish for shipment to Noumea
[Photo: Steve Beverly]

Steve and the future fisheries officers were fortunate indeed to have participated in a remarkable event. The 55-kg bigeye tuna became part of a study being conducted by SPC's Oceanic Fisheries Programme (OFP). OFP's Biological Technician Bruno Leroy came along on the third longline trip in the hopes of tagging and releasing a live bigeye tuna with an archival pop-up tag. Bruno was pleased to see a large bigeye on the line. The fish was retrieved using a special sling that he had designed. The fish was kept quiet by putting a cloth over its eyes while the hook was being removed, and a seawater hose was used to irrigate the fish's gills. Bruno made a small incision in the back just behind the first dorsal fin and inserted the tag. Then the fish was lowered back into the water and released. The whole process took about five minutes. Captain Lucky reported that he could see the tagged bigeye on the sounder as it swam down to 100 m. Then it disappeared off the screen.

Details of the tagging operation are as follows. The bigeye tuna was caught at 1515 hours on 18 June 2002 at 20°40.346' S, 164°00.760' E, weighing approximately 55 kg and having a fork-length of 137 cm. The tag number was OOPO977. The fish came up on the 12th hook of a 25-hook basket so was at the deepest portion of the basket. The calculated depth of this hook was 400 m, based on line setter speed, boat speed and basket size. The tag was due to pop up on 20 August 2002, if all goes well, and make contact with a satellite. All data, including temperature, depth, position, etc., will be downloaded to a land station for later transmission to fisheries scientists at CSIRO and SPC.



Inserting the pop-up tag into the fish ↗

↖ ***Manoeuvring the bigeye tuna into the sling***
[Photos: Steve Beverly]

Horizontal longline manual

Lindsay and Steve have put a lot of effort into drafting the Horizontal Longline Fishing Manual. By the end of June, the text of five of the six chapters had been roughed out. Around 200 of the 300-odd diagrams had been drawn by Technical Support Officer Ms Youngmi Choi. The draft manual will be reviewed by several technical experts, before publication in 2003.

FAD research project update

FAD research project – Cook Islands

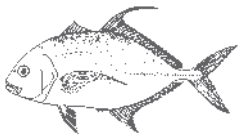
In the first two weeks of April, Fisheries Development Officer Steve Beverly was in Cook Islands, completing the last of several FAD (fish aggregation device) riggings and deployments for the ongoing FAD research project in Niue and Cook Islands (see last issue). Steve deployed a total of seven FADs in Cook Islands, four around Rarotonga and three around Aitutaki.

FAD inspections

Fisheries staff in Niue and Cook Islands reported that all the FADs were on station. The Cook Island FADs have been inspected several times. In Niue, inspections were conducted on the buoy systems using the department's small skiff, but the upper moorings could not be checked as the Public Works' crane, which lifts their work boat in and out of the water, was out of order.

Logbooks

Returns of the catch and effort logbook were very slow from all locations, which was disappointing. More effort is put into this and it is hoped that the returns will increase over the coming months.



Community fishing activity surveys

A database for the surveys of community fishing activity was established. Table 1 on page 8 summarises the data collected in the first survey, soon after the deployment of the FADs. The second and third surveys will be done in 12 and 24 months to see how activity changes over the period of the FAD research project.

Niue

Of the households surveyed in Niue, 79% were involved in some sort of fishing activity, 49% were involved in fishing activities outside the reef, and 33% were involved in fishing activities around FADs. The high percentage of Niue families fishing can be attributed to limited employment opportunities, the need for cheap protein, and people's preference to catch and eat fish or other seafood. The high number of families involved in fishing outside the reef is due to there being no lagoon, limited accessible reef area, and one area being a declared marine protected area. There are also many council by-laws that restrict fishing or water activities at certain times of the year in some locations.

Cook Islands

Aitutaki had 66% of surveyed households involved in fishing. Only 19.2% were involved in fishing outside the reef, with 14.7% fishing around the FADs. The small percentage of people fishing outside the reef is attributed to many households fishing in the lagoon, with a lot of families using gill nets. There are three official marine protected areas (raui) in Aitutaki, two on the reef areas in the south of the lagoon and one on the northeast corner of the main island. There was also one raui under consideration in front of the Fisheries hatchery, and people were already respecting this and fishing outside the area.

Rarotonga had the smallest percentage of the surveyed households involved in fishing activities, with 52.5%. Many of the Rarotonga households interviewed stated that because they were working, in some cases both parents, it was cheaper and easier to buy fish than to fish themselves. Also, there were marine protected areas (raui) around the island, and ciguatera (fish poison) was common in some areas with many reef fish species. Only 14.5% of families were involved in fishing outside the reef, and 13.6% were involved in fishing around the FADs. It should be noted that 19 of the households included in the survey were fishermen who were specifically selected from outside the survey area (see table), as only a very small number of families were involved in fishing outside the reef.

Table 1: Summary of data collected during the first community survey in each location (data were collected in December 2001 for Niue and in March 2002 for Aitutaki and Rarotonga)

Island	Village	H/holds	People	People per h/hold	H/holds fishing	% of h/holds fishing	Canoes	Boats	H/holds fishing outside reef	% of h/holds fishing outside reef	H/holds FAD fishing	% of h/holds FAD fishing
Niue	Alofi North	27	100	3.7	23	85.2%	17	15	15	55.6%	15	55.6%
Niue	Avatele	27	101	3.7	21	77.8%	29	13	19	70.4%	8	29.6%
Niue	Hikutavake	12	33	2.8	7	58.3%	6	0	3	25.0%	2	16.7%
Niue	Lakepa	22	84	3.8	15	68.2%	7	2	6	27.3%	3	13.6%
Niue	Makefu	20	75	3.8	15	75.0%	12	2	8	40.0%	2	10.0%
Niue	Namakulu	7	9	1.3	4	57.1%	2	1	2	28.6%	2	28.6%
Niue	Selected fishermen	3	11	3.7	3	100.0%	4	5	3	100.0%	3	100.0%
Niue	Tuapa	24	75	3.1	23	95.8%	18	6	12	50.0%	10	41.7%
Niue	Vaiea	11	60	5.5	10	90.9%	6	3	7	63.6%	6	54.5%
	Subtotal	**153**	**548**	**3.6**	**121**	**79.1%**	**101**	**47**	**75**	**49.0%**	**51**	**33.3%**
Aitutaki	Amuri	54	214	4	38	70.4%	28	14	10	18.5%	6	11.1%
Aitutaki	Arutanga	27	120	4.4	14	51.9%	4	11	4	14.8%	3	11.1%
Aitutaki	Nikaupara	34	143	4.2	26	76.5%	7	21	10	29.4%	8	23.5%
Aitutaki	Reureu	27	120	4.4	15	55.6%	7	7	3	11.1%	2	7.4%
Aitutaki	Ureia	24	95	4	17	70.8%	10	10	8	33.3%	6	25.0%
Aitutaki	Vaipae and Vaipeka	79	372	4.7	53	67.1%	22	26	12	15.2%	11	13.9%
	Subtotal	**245**	**1064**	**4.3**	**163**	**66.5%**	**78**	**89**	**47**	**19.2%**	**36**	**14.7%**
Rarotonga	Aroko-Avana	23	76	3.3	14	60.9%	0	2	0	0.0%	0	0.0%
Rarotonga	Matavera	25	93	3.7	10	40.0%	0	4	2	8.0%	2	8.0%
Rarotonga	Pokoinu-Tepuka-Nikao	77	338	4.4	33	42.9%	2	10	6	7.8%	4	5.2%
Rarotonga	Rutaki-Aroa	43	174	4	24	55.8%	2	3	1	2.3%	1	2.3%
Rarotonga	Selected fishermen	19	83	4.4	19	100.0%	5	21	19	100.0%	19	100.0%
Rarotonga	Titikaveka	34	136	4	16	47.1%	8	5	4	11.8%	4	11.8%
	Subtotal	**221**	**900**	**4.1**	**116**	**52.5%**	**17**	**45**	**32**	**14.5%**	**30**	**13.6%**
	Total	**619**	**2512**	**4.1**	**400**	**64.6%**	**196**	**181**	**154**	**24.9%**	**117**	**18.9%**

REEF FISHERIES OBSERVATORY

Introduction

The SPC Reef Fisheries Observatory, previously known as the Resource Assessment Section and then as the Reef Fisheries Assessment and Management Section, operates as an independent entity within the SPC Marine Resources Division. It aims to provide SPC's Pacific Island members with scientific information for use in planning the sustainable management of their reef fishery resources.

The Observatory's current focus was established in 2002 to emphasise the specific concerns of reef and lagoon fisheries, which extensively influence island communities' living conditions, impact on food security and are one of the foundations for economic development.

The Observatory has an international multidisciplinary team of six specialist scientists. Five new team members are scheduled to arrive by the end of 2002.

The primary task of the Observatory is to provide information to SPC members themselves, but also to all parties involved in Pacific Island reef resource management. These range from local communities to international donors interested in the sustainability of the various reef fisheries in the Pacific, and include Pacific Island governments requiring advice on the management of local fishery resources under their jurisdiction.

The Reef Fisheries Observatory maintains close ties with IRD (Institut de recherche pour le développement, a research institute and SPC's closest neighbour in New Caledonia) through the CoRéUs project, and with ICLARM – The World Fish Center, whose South Pacific Office is accommodated on the SPC campus.

The team maintains many other partnerships with Pacific intergovernmental organisations, in particular SPREP, SOPAC and USP, but also with non-governmental organisations such as

the International Marinelife Alliance and The Nature Conservancy.

The Observatory provides vital information on reef and lagoon resources of interest for local consumption and marketing. It conducts assessments of their exploitation potential and advises managers and decision-makers on devising and implementing reef fisheries management plans with a view to safeguarding the community's food security and maintaining a sustainable balance between resource conservation and economic development.

The Observatory takes part in strengthening national reef fisheries assessment and monitoring capacities within Pacific Island fisheries services. It has set up projects and undertaken applied research aimed at strengthening knowledge of the reef fisheries resources and their management, including the theoretical bases for their assessment.

The Observatory coordinates regional initiatives implemented in collaboration with other institutions on topics of high priority for Pacific Island fisheries services.

Tonga DemEcoFish Project

The DemEcoFish project's third socio-economic survey was carried out in the two villages of Ha'apai and Manuka on Tongatapu, Tonga, from 24 June to 5 July 2002. This survey completed the socio-economic data set for Tonga. The surveys of two villages each in the Ha'apai and Vava'u island groups and two on Tongatapu island were jointly conducted by the Community Fisheries Scientist from SPC's Reef Fisheries Observatory, Mecki Kronen, staff members from the Tonga Ministry of Fisheries, Headquarters, Tongatapu, and extension officers from the Tonga Ministry of Agriculture. Data collected covers all relevant information on fishing grounds, fishing and seafood collection, consumption and marketing of marine resources concerning households, individuals, fishers and students in each community. As part of the survey, nutritional-health data was gathered to test for relationship between marine resource consumption patterns and occurrence of lifestyle diseases.

First comparison of data suggests that fishing pressure is lowest in Ha'apai, higher in Vava'u and highest in Tongatapu, indicating that the more a community is geographically isolated, the more traditional the lifestyle is and the more important is the role that fisheries still plays in that community. Data analysis and modelling will elucidate commonalities and differences, and reasons for them, between geographical regions and villages surveyed. Findings from socio-economic surveys will be compared and analysed jointly with results of the fish ecology survey.

Information gathered and preliminary results obtained during both surveys will assist to effectively prepare the third and last underwater survey of fish ecology between 29 July and 10 August 2002. The first survey in Fiji Islands is also being planned.

Feke (octopus) fisherman
[Photo: Mecki Kronen]

Invertebrate assessments

DemEcoFish has also provided the opportunity to initiate resources assessments of invertebrate, as well as fish. Dr Kim Friedman has been employed to develop appropriate assessment protocols to monitor non-fish species of importance to subsistence and commercial fishers. Such assessments will be useful in the SPC and European Union ProcFish project to be conducted in 11 Pacific Island countries over the next three to five years. As part of the project, researchers will look for indicators to gauge the 'health' of invertebrate resources.

Gleaning gastropods, bivalves, sea urchins, sea cucumbers and octopus at Kaloa Island, Vava'u, Tonga
[Photo: Kim Friedman]

Initial assessments will concentrate on Tonga and Fiji, with the first scoping trials conducted in Vava'u, Tonga in late June 2002. From preliminary visit, protocols will be formulated for the assessment of molluscs, sea cucumbers and other invertebrates for about six sites per country. Mangrove, reef, seagrass and lagoonal components will be assessed. Qualitative and anecdotal information on the state of resources available to local communities will be recorded.

Kim (KimF@spc.int) would like to hear from other researchers assessing invertebrate resources in the Pacific, to exchange information on the current state of invertebrate fisheries.

TRAINING SECTION

In brief

- Michel Blanc, SPC Fisheries Training Adviser, was in Koumac, New Caledonia, for this year's SPC/Nelson Polytechnic Fisheries Officers Training Course, and while there ran a one-day workshop on tuna grading for processing staff and the quality control manager of the tuna longline company Pêcheries de Nouvelle-Calédonie (PNC). This new company has 10 16-m longliners that target tuna species for export to the sashimi market in Japan. It is possible the Section will provide follow-up training to that company through short workshops on tuna handling for vessel crew.

- A training attachment for the new fishing instructor of the Vanuatu Maritime College, Kuniaki Matsushita, a masterfisherman from JICA with experience in tuna longlining, was organised following the practical fishing module of the 2002 SPC/Nelson in June. The purpose of the attachment was to familiarise him with small-scale fishing techniques used in the South Pacific. On completion of the training, Kuniaki returned to the Vanuatu Maritime College with Vanuatu trainee participant in the SPC/Nelson course, Nare Wolu. Both instructors will be conduct-

Kuniaki Matsushita holding a nice catch
[Photo: Michel Blanc]

ing fishing-skills workshops in the various provinces of Vanuatu

- A request for training assistance was received in June from the Samoa Fisheries Division. The identified need is in the area of tuna grading and follows a previous training assistance in 2000. New recruits from Apia-based tuna processing companies will be trained by Section staff late in July.

- A tuna handling workshop in Cook Islands is scheduled for the third week of August. The workshop will target potential vessel crew from the outer islands and will be the first component of a Cook Islands training programme on tuna longlining organised by the SPC Fisheries Development Section.

AQUACULTURE SECTION

Aquaculture Associate attachment with SPC

Malwine Lober from Samoa Fisheries Division recently completed a six-week attachment with the Aquaculture Section as an Aquaculture Associate. The purpose of the attachment scheme was to provide practical experience for Pacific Islanders at the regional level. Funding was provided through the AusAID regional aquaculture program.

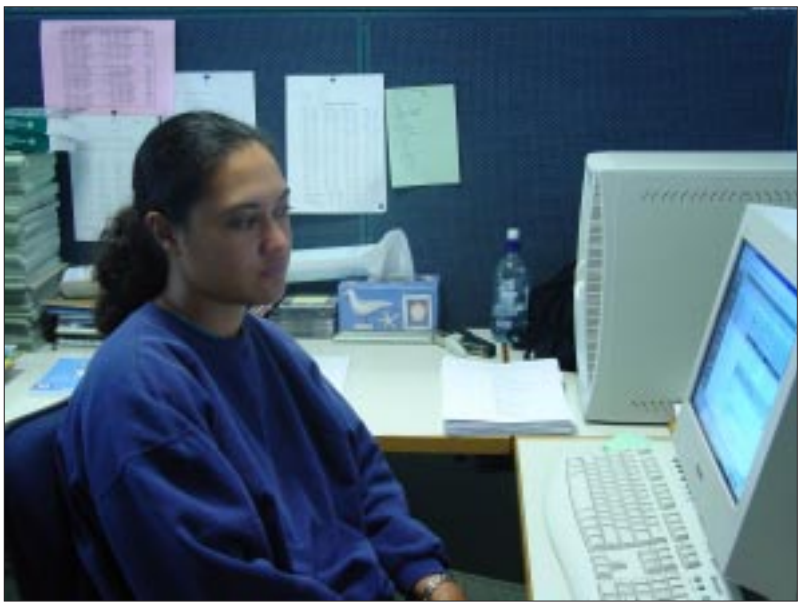
The main professional responsibilities for Malwine involved collecting and compiling information for the regional aquaculture website that is presently under construction—in particular, gathering and analysing data for the webpage templates of country profiles. She also assisted in the development of the aquaculture statistics database that will be hosted on the website.

Malwine's attachment coincided with the signing of a contract between SPC and a local Noumea based software company, Interface, which will develop the website. She received guidance from professionals at both SPC and Interface.

Several commodities are cultured throughout the Pacific and have contributed enormously to island economies; for example seaweed in Kiribati and pearl oyster farming in French Polynesia and Cook Islands. All stages of aquaculture development can be found throughout the Pacific. Profiles of aquaculture commodities, at both subsistence and commercial levels, will be featured in the website.

The aquaculture website will provide an opportunity for interested persons inside and outside of the Pacific region to access information on research and development programs, expert contacts, market information, and links to associated institutions and organisations.

For more information about the SPC aquaculture attachments, contact Ben Ponia (benp@spc.int).



Malwine Lober's main task was to collect and compile information for the regional aquaculture website
[Photo: Jean-Paul Gaudechoux]

COMMUNITY FISHERIES SECTION

I Qoliqoli Management Project for Fiji Islands

In May and June of 2002, in response to a request from the Fisheries Department in Fiji Islands, Community Fisheries Adviser Ueta Fa'asili carried out an assessment which resulted in the recommendation for a national community-based fisheries management plan for Fiji. Fiji Islands, a country with a wealth of marine resources, has an enormous scope for fisheries development, but also many factors which could affect the long-term sustainability of these resources. Inland and coastal developments, changing land use practices, sewage and rubbish dumping systems, increased fishing pressure as a result of increasing coastal populations and improved technology, increased commercialisation and the move into newer more lucrative industries such as the live fish fishery and the aquarium trade can have a detrimental impact on the coastal zone thus resulting in a gradual depletion of resources.

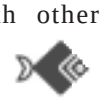
Community-based fisheries management was already in existence in a few places in Fiji Islands, through the initiatives of NGOs, institutions and other conservation agencies. These pockets of initiative prompted the Fisheries Department to seek the assistance of the SPC in the implementation of a national community-based management project to supplement the work already in place. There are over 300 fishing rights areas (*qoliqoli*) in Fiji. Community-based management had been developed by the NGOs and other institutions in five of them, most of which are now collectively known as FLMMA (Fiji Locally Managed Marine Areas). For such community-based management initiatives to have a wider influence and impact there was a need for assistance to the Fisheries Department to implement their management plan at the national level. This initiative had also been built into the Strategies and Policies for the Department of Fisheries for the 2002-2006 period.

As an initial step in the process of the setting up of the community-based management project for Fiji (termed the I Qoliqoli Management Project), there was a training for trainers workshop in Suva from 24 to 28 July, 2002. At the workshop, 25 Fisheries Extension officers from throughout the country were introduced to the concepts and methods of community-based management, participatory interaction and teaching, facilitation at the village level, setting up of committees to be in charge of the project at the village level, identification of problems and likely solutions through participatory learning activities and finally drawing up a village management plan using the information gathered. These officers are to be trainers at the different Fisheries Department centres throughout Fiji and will be also the main contact points for community-based initiatives that will be carried out.

At the end of the workshop, a sample management plan was drawn up by the Community Fisheries Section which the Fisheries Department can use as a guideline in communities. Other recommendations to ensure the effective implementation of the project include the setting up of a Community Fisheries Section in the department, purchase of much-needed facilities and equipment (a proposal has been put in to SPREP to try and facilitate this), appointment of personnel from the Fiji Fisheries Department to oversee the project and the setting up of the initial community-based sites which can then facilitate the drawing up of management plans, and the need to work with FLAMMA and other NGOs. It was recommended that all work carried out by the Fisheries Department be in collaboration with the Fijian Affairs Board, a body that has been tasked with the responsibility of looking after the indigenous people's welfare and resources which includes fishing areas (*qoliqoli*) and user rights.

Awareness work is one of the main tasks of the Fisheries Department in the initial six months of the project, to stimulate communities to seek the Fisheries Department's assistance in setting up their community projects.

Tasks that need to be carried out include an awareness programme for the project through various media, in-house training for fisheries officers in the various districts, securing of funds for the implementation of the initial phase, and identification (through community response) and initial processes with 12 different communities. It is envisaged that at the end of the six months 12 villages will already have come up with their management plans. The Community Fisheries Section in its advisory role and undertaking to the Fiji Fisheries Department will continue to provide advice where necessary and will conduct a six-monthly review of the project in early 2003. The Community Fisheries Section plans a Regional Workshop early next year to share experiences and views with other Pacific Island countries.



USP WORKSHOP ON MARINE TOXINS

Regional and international scientists have recommended the establishment of a Commonwealth Pacific Marine Toxin Research Centre to be located in Fiji Islands, at the recent workshop on marine toxins. The workshop was held from 12 to 21 June 2002 at the Institute of Applied Sciences at USP's Marine Studies centre in collaboration with the Commonwealth Science Council, the University of Queensland, and Queensland Health Scientific Services.

Once established, the centre's activities will focus on researching marine toxins, including rapid methods of assessment, occurrence and distribution, control measures, development of public awareness campaigns, suitable treatment procedures for victims, the provision of expertise in investigating major toxicity outbreaks, and capacity building.

Participants agreed that more research was needed to understand the causes of marine toxin outbreaks and how to manage them. Simple tests are also needed to determine which fish are toxic. The establishment of a Commonwealth Knowledge Network and web-based information exchange were proposed, as possible ways to achieve this.

Representatives from Australia, Brunei Darussalam, Fiji Islands, French Polynesia, Hong Kong, India, Kiribati, Malaysia, New Caledonia, New Zealand, Tuvalu, Commonwealth Secretariat, SPC and USP attended the workshop.

The 'Suva Declaration' issued at the conclusion of the workshop states that a significant knowledge gap exists on marine toxins in the areas of:

- Occurrence and distribution of toxin-producing organisms,
- The physiological conditions under which toxins accumulate,
- The substances responsible for toxic effects and their relative toxicity,
- The persistence of toxicity episodes,
- Appropriate endpoints for determination of toxicity,
- Analytical methods for toxin determination, especially in the field,
- The relationship between environmental disturbances and toxicity episodes,
- Public health implications of marine algal toxins in Asia-Pacific countries,
- Accurate estimation of economic and trade implications, and
- Epidemiological studies on toxicity episodes.

In the Pacific, ciguatera fish poisoning is the most common toxin, accounting for about 95 per cent of all reported cases of fish poisoning, and is prevalent in Kiribati, Tuvalu, Tokelau and the French territories.

Ciguatera outbreaks are often associated with reef destruction, which results in dead coral and algal growth on the reef. The toxin comes from small marine

Top: Participants in the workshop
Bottom: Participants went on a field trip to collect algae
[Photos: Tony Chamberlain]

organisms that grow on these algae.

Ciguatera has a long history but occurences seem to be increasing. Recently, ciguatera episodes have been reported from Niue, a country not normally associated with this toxin. This is worrying because ciguatera damages the health of people eating toxic fish and can also impact the fisheries industry. Emerging industries, such as the live fish trade to Asia, and tourism are also threatened if toxic fish are found. In the Caribbean, the annual economic costs from ciguatera poisoning are estimated at USD 10 million a year.

Workshop participants went on a field trip to collect and test (using cigua-test kit) samples of ciguatera-causing organisms and visited commercial fish exporters to learn how they were dealing with the problems of ciguatoxic fish.

(Source: Tony Chamberlain, Marine Studies Programme, USP; chamberlain_t@usp.ac.fj)

FISHERY COUNCIL APPROVES LIMITED ENTRY FOR AMERICAN SAMOA LONGLINE FISHERY

After intensive deliberations, the Western Pacific Regional Fishery Management Council concluded their week-long meeting in August 2002 by voting to approve a limited entry program for the longline fishery in American Samoa's exclusive economic zone (EEZ). Discussions on this issue began in 1997, due to concerns about rapid expansion of fishing effort and fleet size in the longline fishery around American Samoa.

Between 1997 and 2002, the fleet increased from approximately 21 (mostly small) vessels to 75 vessels of a variety of sizes. The large vessels target albacore tuna to sell to the canneries at Pago Pago Harbor, so most of the fish never reaches the local community. The Council focused on developing a limited entry program that would keep the fishery healthy, without overly hampering its development and limiting the benefits to the local community.

For years, the groups representing different sides of this controversial issue have been meeting to hammer out an agreement that would be acceptable to everyone involved. Afoa Lutu, who came and testified on behalf of the local American Samoan longline fishermen, was thrilled with the decision. "I feel great," he said after the vote was approved by the Council. "It was a long process, but we finally got it."

He also acknowledged Henry Sesepasara, American Samoan advisor to the Council, and Paul Bartram, Council contractor, who worked tirelessly to reach this agreement. John LaGrange, representative for the South Pacific Longliner group, was equally happy with the decision. "The agreement means that both sides are able to come together and move forward as a single group from now on," he stated. "I feel very good about that."

The recommendations will now be forwarded to the US Secretary of Commerce for approval. Examples of recommendations made by the Council include the following:

- To qualify for a longline permit, an individual must have owned a longline vessel on 21 March 2002 and pelagic (open ocean) species must have been landed in American Samoa prior to this date, using longline gear;
- Permits for vessels larger than 40 ft will be transferable to anyone with documented longline catch landed in American Samoa;
- Permits for vessels smaller than 40 ft will be transferable to a permit holder's family, or to a local community;
- No one entity will be allowed to own more than 10 per cent of total permits;
- Certain permits will be allowed to upgrade to a larger size vessel;
- To keep their permit, vessels less than or equal to 50 ft must land at least 1000 lbs (454 kg) of pelagic fish every three calendar years; vessels over 50 ft must land at least 5000 lbs (2270 kg);
- All permit holders will be required to annually attend vessel safety and protected species workshops;
- The program will be re-examined after three years to see it is meeting its objectives.

For more information, contact the Western Pacific Regional Fishery Management Council in Honolulu at fax: +1 808 5228226; info.wpcouncil@noaa.gov; www.wpcouncil.org

(Source: Western Pacific Regional Fishery Management Council)

STUDY OF STATUS AND FUTURE OF THE US WESTERN PACIFIC TUNA PURSE-SEINE FLEET

A recent study by the Pelagic Fisheries Research Program of the University of Hawaii focuses on the dynamics of the United States tuna purse-seine fleet with the intention of increasing the information available for the management of western Pacific tuna fisheries. The fleet's history is reviewed, major interest groups are described, and various factors affecting its operation and forces influencing its future are discussed.

To carry out the study, the authors used their experience with the US fleet together with interviews of a large number of important stakeholders, including present and past US vessel owners / managers, fishing vessel operators, representatives of several tuna processing companies, representatives of the US tuna industry, and tuna fishery managers.

Specific topics addressed are the movement of the fleet from the eastern Pacific to the western Pacific, fishing patterns, specifications of the fleet, stakeholders in the fleet, and major issues confronting the fleet. Positive and negative factors affecting the fleet are analysed and the most important threats to its survival are identified. Current issues are viewed in light of how the fleet has coped with previous threats in the period from the mid-1950s to the late 1980s.

[Photo: David Itano]

Information on the future of the US fleet is conceptually divided into three categories: 1) opinions expressed by other studies and individuals; 2) what can be stated with some degree of confidence; and 3) what can be speculated from information in this report and from other sources. The management implications of both a declining fleet and the demise of the fleet are subsequently explored.

(Source: Gillett, R., M.A. McCoy and D.G. Itano. 2002. Status of the US western Pacific tuna purse seine fleet and factors affecting its future. Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu)

SOUTHEAST ASIA'S REEFS SEVERELY THREATENED

A report, hailed as the most detailed analysis of threats to reefs in Southeast Asia, has estimated that 88 per cent of reefs in the region are severely threatened by human activities. The report, *Reefs at Risk in Southeast Asia*, cited overfishing, destructive fishing methods, sedimentation and pollution from land-based sources as the main source of threats to reefs in Southeast Asia, the region considered to be the global epicentre of marine diversity.

The report, published by World Resources Institute, an environmental policy research institute based in Washington, was launched in Sabah by Chief Minister Datuk Chong Kah Kiat.

The analysis was part of a collaboration between 35 scientists from across Southeast Asia, the United States, Australia and Britain who compiled a vast database on the region's coral reefs.

According to the report, over 90 per cent of the coral reefs in Cambodia, Singapore, Taiwan, the Philippines, Vietnam, China and the Spratly Islands, and over 85 per cent of reefs in Malaysia and Indonesia, are threatened.

Indonesia and the Philippines, which are among the world's largest archipelagos, hold 77 per cent of the region's coral reefs and nearly 80 per cent of all the threatened reefs, the report says. The report concludes that overfishing threatened about 64 per cent of Southeast Asia's reefs, with Cambodia, Japan and the Philippines exceeding 70 per cent.

Southeast Asia has nearly 100,000 km^2 of coral reefs or 34 per cent of the world's total and houses over 600 of the 800 reef-building coral species in the world.

(Source: *Bemama*, 27 March 2002)

SHIPS, FISHING VESSELS AND SAFETY

The following is reprinted with permission from the Australian Transport Safety Bureau (ATSB)

At about 0110 on 21 June 2000, a fisherman from Iluka, New South Wales, was killed when his 14-m trawler was run down and sunk by a 181-m-long, 42,717-tonne deadweight bulk carrier.

The collision highlights:

1. The risks faced by fishermen from large ships;

2. The limitations of radar; and

3. The mutual obligation of all people at sea to observe the International Regulation for Preventing Collisions at Sea, 1972 (Colregs).

The Risks

Since June 1995, the Australian Transport Safety Bureau has investigated 14 collisions between trading ships and Australian fishing vessels. In all these cases, the fact that a collision occurred indicates that the lookout aboard the trading ship—both visual and by radar—was, for whatever reason, ineffective. In a few cases it is probable that the lookout was non-existent. Regardless of any failure on the part of the trading ship to keep a proper lookout:

- Only three involved fishing vessels engaged in fishing.

- Seven involved fishing vessels not engaged in fishing, but en route between fishing grounds.

- Four involved fishing vessels anchored in open water.

- On three of the four vessels at anchor, no lookout was maintained and the crew-members went to bed despite being anchored in open waters in recognised shipping lanes.

- In 12 incidents, the fishing vessel failed to maintain a proper lookout.

  - In four of the incidents, a contributory factor was that the person keeping watch on the fishing vessel had no training, did not understand the obligations placed on a fishing vessel by the Colregs and did not understand how to use the radar.

  - The number of crew typically employed on fishing boats was two or three, which for a sustained 24-hour operation is insufficient to fish and maintain a proper lookout required by the Colregs.

Until 21 June, Australian fishing vessels had been lucky in that no fatalities had occurred.

Figures from the UK show that since 1991, at least 19 fishermen are known to have died as a direct result of collisions. In 1998, five fishermen were killed in four collisions involving merchant vessels and British registered fishing vessels.

The Limitations of Radar

Radar operates by transmitting electromagnetic signals in the form of pulses from an antenna. Radar reflective objects which lie in the path of this transmission, reflect the signal, which is received by the same antenna in the form of a return signal (echo).

Radar technology has developed to the extent that radars are reliable aids to both navigation and collision avoidance. They do, however, have limitations. Radars are not "all seeing eyes".

It is important for fishermen to understand what these limitations are.

The weakest detectable echo that a radar can display is one that is just stronger than the radar receiver noise level.

The display of this echo is dependent on the following four factors:

1. Correct setting up of the radar display,

2. Siting of the vessel's radar antenna,

3. Target, and

4. Weather conditions at the time of using the radar.

All these factors are very important, but the target and weather conditions are crucial to fishermen.

The Target

The echo response received from a target depends upon the following four factors:

1. Size,

2. Shape,

3. Composition, and

4. Aspect

Size

Targets presenting a large surface area to the radar signal will be detected easily and at long range. Small targets of limited surface area which are not very high may not be detected, if at

all, until much closer to the source radar.

Shape

A smooth shaped object (e.g. hull of a fishing vessel) gives a poor radar detection response as compared to a rough shaped object (rocky coastal outcrop).

Composition

Metal objects give a better radar response than wood.

Fibreglass objects are transparent to radar signals and will not be displayed on a radar screen.

Small vessels, particularly of wooden or other non-metallic construction, can have a large number of separate reflectors (metal masts, booms, engine and other metallic reflectors). However, none of these are large enough to provide a constant echo. The close proximity of masts rigging, engine, etc., acting as reflectors, can also make the vessel a 'multiple' reflector target. This characteristic can result in either an enhanced echo or the return echoes cancelling each other out. A very small change in relative distance from the radar antenna can make the difference between being seen "in phase" and not being seen "out of phase".

Similarly, the phase of the radar signal and echo can be affected by skipping or bouncing off the sea surface resulting in signals that may subtract from each other as described above.

Aspect

A target beam on to the radar transmission is more likely to give a radar return than a target lying at an angle of 45° to the transmission.

Weather Conditions at the Time of Using the Radar

Waves themselves form targets, which when reflected and picked up by the radar, form "sea clutter". Sea clutter varies widely with the sea state. Return echoes from rain showers (rain clutter) can have the same effect. Small vessels are more likely to be consistently lost in clutter than are large vessels.

Rain, fog, high humidity and an air temperature lower than the sea temperature will also reduce the radar detection range.

PLEASE REMEMBER

The radar cannot generally detect targets at a long range.

To improve the radar detection of small vessels, fit as high as possible above the water line:

- a metal corner radar reflector mounted "in the catch water position", or
- an octahedral cluster of corner reflectors.

Proper understanding and observation of the Colregs and a listening watch on channel 16 VHF can protect your life and your boat.

Safety at sea is like safety on the road. You should assume everybody else is a potential danger—an idiot—and act accordingly.

The Regulations

The Colregs apply to all vessels at sea.

The requirement to keep a proper lookout is a mutual obligation for all vessels at sea.

> *Every vessel shall at all times maintain a proper lookout by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and risk of collision.*

In short every vessel must keep a lookout, whether fishing or not.

Although power-driven vessels and sailing vessels must keep out of the way of vessels "engaged in fishing", fishing vessels must, so far as possible keep out of the way of a vessel not under command or a vessel restricted in her ability to manoeuvre.

A vessel carrying certificates as a fishing vessel is only a "restricted" vessel when actually engaged in fishing. It is not restricted when its nets are on the surface or when it is on passage to or from fishing grounds.

Vessels are only considered to be engaged in fishing when fishing with nets, lines, or trawls or other fishing apparatus that restrict manoeuvrability, but does not include a vessel fishing with trolling lines or other fishing apparatus which does not restrict manoeuvrability.

(Source: Australian Transport Safety Bureau)

AQUACULTURE IN PAPUA NEW GUINEA

by Ben Ponia,
SPC Aquaculture Adviser
and
Augustine Mobiha
NFA Fisheries Management Adviser

Papua New Guinea (PNG) has a long history of aquaculture development. The early 1990s, however, saw a renewed interest in aquaculture with some interesting outcomes. In June 2002, Ben Ponia, SPC Aquaculture Adviser, accompanied Augustine Mobiha, PNG National Fisheries Authority Fisheries Management Adviser, on a visit through the country to view some of the aquaculture developments.

National Fisheries Authority (NFA): Port Moresby

The first stop was the National Fisheries Authority (NFA). Mike Batty, Managing Director, explained NFA's plans for subleasing its facilities on Nago Island for tourism development and for sustainable fisheries research and training, including prospects for aquaculture. There is a lot of government interest in sea cucumber aquaculture because the wild fishery is such an important component for coastal inhabitants' livelihoods. A quick trawl of the NFA library archives revealed that they hold about 170 titles relating to aquaculture, much of it unpublished reports, which are a gold mine of information.

Fish Farmers: Eastern Highlands

The Eastern Highlands Province has a population of around two million people or 38 per cent of PNG's total population. Most of the native freshwater fish fauna in the region has little nutritional or commercial value, hence the logic behind fish farming or restocking. The main fish of interest include rainbow trout, common carp and various species of tilapia.

The Departments of Agriculture and Livestock (DAL) within the national government and provincial governments do much of the research and extension work for aquaculture within some provinces while fisheries divisions undertake aquaculture related activities in other provinces. DAL, with assistance from the Japanese International Cooperation Agency (JICA), has also organised most of the training. A carp farming training course is run at the government-operated Highlands Aquaculture Development Centre (HAQDEC), in Aiyura. Occasional trout farming courses organised by DAL are also run at the privately operated Lake Pindi Yaundo Trout Farm in Mt Wilhelm.

DAL also runs a mobile "Wokabaut Skuls" training programme which has been quite successful. The wokabaut programme managed by DAL staff member Peter Minimulu has trained 400 to 500 farmers. Moreover, government aquaculturists have written excellent fish farming manuals for carp and trout.

Rainbow trout (*Oncorhynchus mykiss*) was introduced to PNG in the 1960s for the colonial angling fraternity. Many highlanders reside at high altitudes between 1300 and 1800 metres where the water temperatures of the streams range between 13°C and 17°C, which is the optimum temperature for farming trout culture. However, to reproduce trout, the water temperature has to be lower than 13°C. The only commercial trout hatchery is at the foot of Mt Wilhelm in the Chimbu Province (2280 metres) where water temperatures are 10°C. There is no indigenous species of edible fish in the temperate streams aside from eel or shrimp, so trout meat is considered a delicacy and an important food during social occasions.

Common carp (*Cyprinus carpio*) were introduced to PNG for subsistence farmers on account of their adaptability to harsh environments, disease resistance, omnivorous diet and fast growth rates. Carp spawn in waters above 18°C and so are distributed in both the PNG Highlands and Lowlands.

There are two species of tilapia (*Tilapia rendalli* and *T. mossambicus*) commonly found in PNG. *T. mossambicus* escaped from ponds in the Highlands and became well established in PNG's river systems, particularly the Sepik River. Tilapia is now one of the most important food sources in this area. Because of its high fecundity, however, this species of tilapia is not good for aquaculture. There is considerable interest in a new genetic strain of the Nile tilapia (*Oreochromis niloticus*) bred during a project known as "Genetic Improvement of Farmed Tilapias" or the GIFT project. GIFT tilapia grows up to 60 per cent faster than the most commonly farmed species of tilapia.

Group photo in Goroka with some of PNG's prominent aquaculturists. (Left to right) Charlie Availe (President of the Fish Farmers Association for Eastern Highlands), Ian Moeafi (Provincial Director of National DAL), Peter Minimulu (Aquaculture Officer for National DAL), Jacob Wani (Manager, Aquaculture and Inland Fisheries, NFA), Joe Kaposi (trout farmer), Augustine Mobiha (Fisheries Management Adviser, NFA), Farmudi (trout farmer)
[Photo: Ben Ponia]

DAL officers estimate there could be around 500 farmers in the Eastern Highlands Province and another 300 in the neighbouring Chimbu Province. Currently there is a project by ACIAR to assess the total number of fish farmers in the country. The preliminary estimate is 6000 farmers, most of whom are small-scale rural operators. The following are samples of some of the farms in the vicinity of Goroka township, in the Eastern Highlands.

Joe Kaposi (trout). Joe has utilised his DAL training to spawn and rear his own fingerlings. He would like to establish a low cost "bush" hatchery further upstream where the water is cooler. He reported that many residents along the stream have requested his trout fingerlings and that he could also sell his trout to local hotels. He also believes that local villagers will pay the extra money for such a delicacy, particularly for important social occasions.

Kameufa (trout, carp). Also nicknamed "A1" after the tinned fish brand, because he has such an extensive set-up. He concentrates mostly on farming carp but also has trout. He has a small bush hatchery where he spawns carp fingerlings and then distributes them. Kameufa has also built a few huts to house a training facility. He has recently run two courses on carp farming, assisted by DAL. Each course had up to 50 participants. He would also like to expand his training facilities.

Farmudi (mostly trout, also carp). This set-up is a good example of how fish farming can make use of steep sloping terrain that is unsuitable for raising livestock. Farmudi has a very ingenious design with ponds reinforced by concrete. He initially invested around several thousand Australian dollars to set up his operation and the farm is quite an important status venture, not to mention a very picturesque scene.

Kabiufa High School. The school has 900 students, many of are housed in the dormitories. It has its own agricultural farm and has now put aside a large reservoir for fish farming. Fish farming will be included as part of the curriculum with instructors from DAL.

Joseph Arapuso (carp). Joe has large plantations with different crops and is attempting to add value to the agricultural irriga-

Trout farms in the Highlands. Top left picture has a "bush hatchery" in the background. Top right and bottom pictures show the use of sloping terrain otherwise unsuitable for rearing livestock
[Photos: Ben Ponia]

tion system for fish farming. During our visit, new ponds were being constructed with a considerable financial investment into PVC for distributing water, and into gambion for reinforcing ponds. Other types of fish aside from carp (for example GIFT tilapia) may be more profitable for this type of investment.

Paul Gehamore (carp). Paul's operation highlights fish farming for family subsistence purposes. Carp rearing is integrated with the chickens he raises on his homestead. The fish are fed with scrap meal. Fish are harvested for important social occasions.

John Oumba (trout and carp). John has tried to set up his farm as a showpiece for paying visitors. However, he has been experiencing problems with fish feed to maintain his trout. The quality of the local feed (from Lae) is poor as it does not give good growth results. On the other hand, the Australian fish feed is quite expensive and is not profitable to use.

Most farmers identified the requirement of low-cost and high quality feed as a major bottleneck for fish production, particularly for the carnivorous trout. Research is required to identify local sources of feed rather than relying entirely on expensive imported products. Another problem inherent in the Highlands is the distribution of fish fingerlings due to poor road infrastructure and long distances. Subcentres for fingerling distribution and a larger network of hatcheries may assist in alleviating this problem.

Highlands Aquaculture Development Center (HAQDEC): Aiyura, Eastern Highlands

This is the prime freshwater aquaculture facility for PNG. It has about 40 ponds varying in size from 50 to 5000 m^2 with hatchery, research laboratories, feed mill and quarantine facilities. The centre's operations are funded by the provincial DAL and has also received support

Highlands Aquaculture Development Centre (HAQDEC) in Aiyura
[Photos: Ben Ponia]

from JICA. Mufuape Kine is the officer in charge.

Although the centre has plans and ideal facilities for research and extension, progress has been hampered by a lack of funding. There is potential for HAQDEC to link up with other facilities in the region (such as Nandruloulou Research Station in Fiji Islands) and to engage in regional collaborative research efforts, for example in fish feed formulation.

The HAQDEC centre routinely produces carp fingerlings to sell to fish farmers. In 1998 GIFT tilapia were also introduced to HAQDEC quarantine ponds and successive generations have been reared. HAQDEC staff are becoming convinced that GIFT tilapia are more superior aquaculture candidates than common carps and they may start to concentrate more on this species.

Yonki Lake Cage Culture Project: Yonki, Eastern Highlands

Yonki Lake is a man-made reservoir covering about 1000 ha. It was created as a large hydroelectric dam in 1991. The lake is at an altitude of 1200 metres so the water temperatures are relatively cool.

DAL has about 10 cages in the lake where different species of fish are being reared. These include common carp, GIFT tilapia, tor (*Tor putitora*) and Java carp (*Puntius gonionot*). It is hoped that the project will provide information on the best feeding and stocking rates for fish growth. DAL notes that the growth of GIFT tilapia is dramatically faster than other tilapia species they have encountered (*T. mossambicus* and *T. rendalli*).

Havini Vira who is overseeing the Yonki project described a mass mortality of fish which occurred last year. By the sound of things, this was caused by a lake turnover but another possible culprit could be leached cyanide from the abandoned gold mine located on the nearby hillside. Havini would like to do more intensive water quality monitoring.

As we drove away from Yonki along the main highway, we stopped to buy some fish (tilapia and tor) caught from Yonki Lake. These fish were held fresh and cooked (fried) on

Lake Yonki Cage Culture Project. Mr Havani Vira, officer in charge (far left) discusses the project with visitors
[Photo: Ben Ponia]

Roadside market on the Yonki Lake highway selling fish from the restocking project
[Photos: Ben Ponia]

the spot at the roadside where buses and cars can easily pull up. Business has boomed once the fish populations that had been restocked in the lake had become established.

Bismark Barramundi Ltd: Dilup Plantation, Sarang, Madang Province

Barramundi (*Lates calcarifer*) is an estuarine species of fish that inhibits coastal and freshwater systems. However, it requires saltwater to reproduce and therefore can be used in controlled restocking of the inland freshwater bodies. Barramundi

Barramundi farming in Madang
[Photos: Ben Ponia]

is a favourite with sports fishers and provides a fillet that is popular with restaurants and hotels. It is farmed widely in Asia and Australia.

The Bismark Barramundi farm was set up in 1998 by Ian Middleton, Managing Director. The farm's target for annual production is 200,000 fish at 1.5 kg size (i.e. 250 metric tonnes/yr). This is more than the entire catch from PNG's wild fishery (170 mt/yr). Incredibly, the annual target will be produced from just 12 female broodstock fish and will require the hatchery to produce about one million fingerlings. The hatchery, however, has already made single runs of 250,000 fingerlings, so this target can be easily attained.

In the grow-out phase the farm has about 120,000 fish (up to 2 kg in size) being raised in pontoons (4 m x 4 m) located in the adjacent bay. The bay is shallow enough to secure mooring lines but is well flushed by nearby oceanic currents. To farm 200,000 fish will require about 20 pontoons, each stocked with 10,000 fish. The Bismark company will give this opportunity for business to the neighbouring villages and special groups through the Family Farmer programme. These communities will acquire their own pontoons and raise the fish and then sell them back to the company.

Fish Farming at Gabsongkeg Village: Lae, Morobe Province

Johnny Soranzie from the National DAL Food Security Branch Research Centre at Erap, Lae, took us to Gabsongkeg village where there are 31 active farmers and 46 ponds. There are about 210 active fish farmers in nearby villages, mostly farming carp and Mozambique tilapia. The river tributaries in the area have few sources of fish protein, mostly stunted Mozambique tilapia. Therefore, fish brought down from the Highlands are in high demand and are sold out very quickly (about 4 kina for a 250 g fish). According to local knowledge, the river systems in the area rarely run dry so the water supply needed for farming is not a problem. Also, the water temperature ranges between 27 and 32°C, which is ideal for farming tropical species.

The following are samples of some of the fish farms we visited in Gabsongkeg village:

Easter Gidisa (carp). Easter has two ponds of 30 m x 12 m. Because her ponds are not fenced she has a problem with wandering pigs digging up her ponds. Nonetheless she was clearing the perimeter of her farm to expand the number of ponds. Easter has recently begun to sell her fish.

Jobbie Yaffom. Jobbie farms carp and tilapia. He uses his fish to feed his family of 15.

Elisa Yaffom. During our visit, Elisa only had tilapia in her ponds. Most of the feed she uses is unprocessed, such as termites (white ants) and household scraps. Pellet feed for carp has also been used occasionally.

Andrew Rueben. Andrew farms carp and tilapia. He also raises ducks with his fish farm.

Ben David. Ben has received some GIFT tilapia from DAL for trials. Ben thinks that GIFT tilapia have much faster growth rates and taste better than carp or Mozambique tilapia.

Carp and tilapia farms in PNG
[Photos: Ben Ponia]

Erap Research and Development Centre: Erap, Morobe Province

The Erap Centre is one of PNG's major government institutions for agricultural and livestock research and is run by DAL. The Erap Centre has just recently established its aquaculture research arm at the end of last year under the responsibility of Johnny Soranzie.

The aquaculture facilities include ten ponds, two of which are 24 m x 15 m, six are 10 m x 24 m and two are 56 m x 20 m. There is also a small on-site fish hatchery where it is planned to raise GIFT tilapia. Some of the other fish species targeted for research include *T. mossambicus*, *T. rendalli* and common carp. Bighead carp and puntuis are to be transferred from Aiyura. Johnny has plans to trial different feed formulations (maize, rice bran, barley, soya bean) and integrate fish farming with raising ducks. Aside from fish, the centre has an interest in the prawn *Macrobrachium rosenbergii*, which is indigenous to the local rivers. Johnny also runs training and extension workshops. The last three training sessions averaged around 50 participants each.

Mainland Holdings: Lae, Morobe Province

The Mainland farm raises crocodiles. It has the largest population of captive saltwater crocodiles anywhere in the world and it has about 350 large breeders and 20,000 crocodiles for harvest. This enterprise targets a specialised niche market—high quality leather merchants in Japan and France. Plans are afoot under the technical direction of Eric Langalet (farm manager) to integrate crocodile operations with fish farming.

The fish farming project has been five years in the making and the company has already made substantial investments into infrastructure, including a large filtration and re-circulating system to utilise the farm effluent for a series of raceways for fish culture. The farm has also established a fish quarantine facility because it plans to introduce a special strain of mono-sex tilapia (Y-Y males) from the Philippines. All-male tilapia systems are preferred mainly because they have faster growth rates than female fish, who divert excess energy into reproduction. The production line is being fine-tuned with trials using Mozambique tilapia, which also provides an opportunity for staff to become familiar in fish aquaculture.

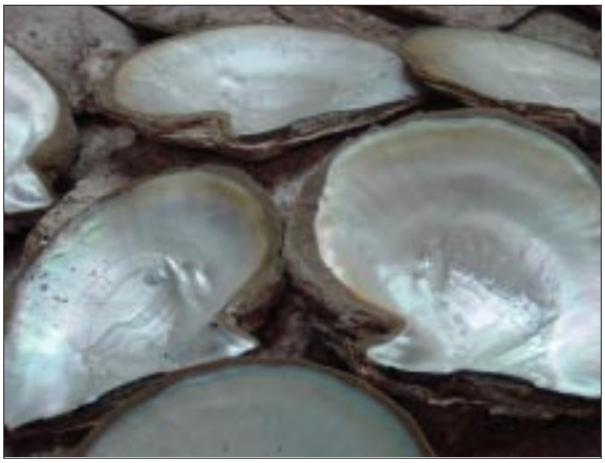
Milne Bay Pearls: Samurai Island, Milne Bay Province

The Milne Bay area was once a productive fisheries sector, mostly targeting snappers, pelagic fish and prawns. Today, diving for sea cucumber (sandfish) is probably the most important fishery although there is heavy fishing pressure. Free divers retrieve sea cucumber stocks from depths down to 20 metres and the annual fishing quota set by NFA was achieved within six months.

In the 1970s Milne Bay became well known for its cultured pearls through the efforts of one pearl farm that was centred around Pearl Island and owned by Dennis George. At present, Greg Silver, a local businessman, is trying to revive the industry by setting up a pearl farm on neighbouring Samurai Island. We were accompanied during our visit to Samurai Island by Onso Kelokelo, the head of Fisheries and Marine Resources for Milne Bay Provincial Government, and Steven Klembassa, the fisheries district head for Samurai Island.

Greg's farm is located on one of the small islets about 30 minutes from Samurai Island. The farm started about three years ago and from the preliminary seeding trials the indications are that the quality of pearls produced will be quite high. The farm has been having difficulty in building up the numbers of pearl shells using wild stocks. To address the shortfall in pearl oysters the company plans to establish a pearl hatchery on Samurai Island.

View from Samurai Island towards Pearl Island
[Photo: Ben Ponia]



Pearl farming in Milne Bay
[Photos: Ben Ponia]

GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING WORKSHOP IN COOK ISLANDS

by Wolf Forstreuter
SOPAC
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Background

In response to an outbreak of a shell disease on a pearl farm in Cook Islands, the Ministry of Marine Resources decided to monitor and manage the pearl farm development to avoid further disaster. As a first step detailed mapping of the lagoon and the pearl farms was done using geographic information systems (GIS) technology (see box below):

SOPAC held a workshop in May 2002 to train pearl farm operators in Cook Islands in how to use these maps in recording data collected from the pearl farms. The workshop was limited to seven people due to the heavy workload and the need to work on the Manihiki pearl farm data, which required the knowledge of the Ministry of Marine Resources. Six workshop participants are based in the Marine Resources Headquarters in Rarotonga and one participant is based in Manihiki.

The training

To establish a pearl farm database the pearl farm operators in Cook Islands have to understand:

a) the nature of GIS backdrop;

b) to utilise GIS backdrop;

c) to handle Microsoft Access;

d) to link Access tables to MapInfo spatial information;

e) to operate the required MapInfo modules;

f) to customise MapInfo using MapBasic programming language.

On the *first day* the general idea of GIS was explained and its relationship to global positioning systems (GPS), tabular data and remote sensing (RS). Two GIS applications were shown: a) the utilisation of GIS image backdrops for vegetation change detection and b) the customising of MapInfo for asset management of power utilities. During the second part of the day the participants learned about projection, spheroid, datum, scale and accuracy, with the aid of a PowerPoint presentation on the theoretical background and hands-on training.

During the *second day* the training focused on database handling and linking databases to MapInfo. Participants were introduced to Microsoft Access and created their own database, and learned to handle tables and forms and to link tables.

The main table was then imported to MapInfo and linked to map objects displayed on top of the GIS image backdrop. The access table content was used to create a thematic map. During the second part of the day the participants learned on-screen digitising and saw how MapInfo automatically applies the correct projection information by opening a new table in the backdrop mapper.

All participants practised drawing polygons on a GIS image backdrop without overlapping them and experienced that MapInfo creates with every new polygon a new record in the table. They also got to know the semi-automatic procedure of polygon area calculation. Finally the table was exported from MapInfo to analyse it in tabular database software.

The Manihiki pearl farm outlines were created by GPS survey, which is a time-consuming task. It was necessary to link the MapInfo table with tabular data

Mapping Manihiki Lagoon pearl farms

a) The bathymetry was mapped for the whole of Manihiki Lagoon employing SOPAC's multi-beam mapper.

b) A high-resolution satellite image (IKONOS) was purchased and rectified using DGPS road mapping and the bathymetry data.

c) A GIS layer was created containing all local names.

d) The outline of all farms were surveyed employing a hand held (GPS).

e) GIS layers such as IKONOS backdrop, farm outline and identification, historical names, etc.

f) A map showing the image as background and the bathymetry contour lines as vector information on top of the farm outlines, the historical names, the UTM grid and the latitude/longitude grid.

The picture shows the display of a farm search written by the workshop participants in MapBasic. The operator is requested to type the farm ID and the program displays the corresponding farm in red, centres the farm and zooms in.

stored in Access tables over a common field, rather than mapping the Access tables, to avoid any deletion of a farm outline polygon. The *third day* was used to explain and exercise this procedure starting with excising running queries in MapInfo.

After the training employing dummy data the real set-up of the Manihiki database started. Jointly main and secondary tables were established and linked to the MapInfo table containing the farm outlines. After the exercise PowerPoint presentations demonstrated:

a) the nature of digital images,

b) different image formats, and

c) geometric image correction as part of GIS backdrop production.

On the *fourth day* participants created thematic maps showing the information stored in the Access tables in the pearl farm database. They saw a PowerPoint presentation explaining:

a) the operation of GPS,

b) the procedure of differential correction employing a GPS base station, and

c) the variation of accuracy employing different GPS products.

During the second part of the day, a Powerpoint presentation provided a general overview of MapBasic. Hands-on training familiarised the participants with the software by writing small programs allowing communication between operator and software. Finally all participants wrote a program displaying the IKONOS image in MapInfo.

Day number 5 started with improvements on the Access side of the pearl farm database, where the participants learned how to enhance forms for optimised table input, edit and analysis, and then learned necessary background for understanding image backdrops. The first presentation focused on different types of GIS backdrop followed by an exercise simulating a problem in Manihiki where all participants:

a) digitised from image backdrop,

b) analysed the area and exported the tabular data into a letter written in Word,

c) added scale bar and thematic information to the MapInfo display, and

d) saved the display as a image file which then was imported to the letter.

PowerPoint presentations followed explaining:

a) different sensors for image data recording,

b) image pre-processing and enhancement necessary for the production of the Manihiki pearl farm map, and

c) steps to produce image maps and contour lines for Christmas Islands, Kiribati, employing Landsat satellite data.

The rest of the day was used to exercise MapBasic programming. An add-on to the MapInfo main menu was produced allowing the display and undisplay of the different Manihiki layers within one map window.

A further add-on allowed:

a) the automatic visualisation, centre and zoom-in of a farm, and

b) the automatic display of biannual pearl extraction on a thematic map where the access table content is still based on dummy data.

In the beginning of the *last workshop day* all parts of the database a) image display, b) the Access database, c) the customised MapInfo display were reviewed and discussed. Then, a PowerPoint presentation and following discussion explained different space-borne or high-altitude sensors and products available for Pacific Island countries. The second half of the day, presentations and discussions, concen-

trated on possible help a GIS&RS operator can get in Pacific Island countries such as, a) SOPAC's website, b) the regional GIS&RS newsletter, c) e-mail subscribing lists, for example GIS-PacNet, d) local GIS&RS user group meetings, e) additional workshops.

Results and Sustainability

Within six days the workshop explained very complex fields. This was only possible because the participants were highly interested and the group was small. All participants have a working copy of the jointly created parts in MapInfo, MapBasic and Access. In addition, a CD was provided for every participant containing the data created already in Suva such as the IKONOS GIS backdrop.

Participants need to continue to work on improving the database in order not to lose the newly acquired skills in Access and MapInfo handling and MapBasic programming. All participants are on the e-mail subscribing list GIS-PacNet and can get help if problems arise. In addition, a student currently taking a GIS course at the University of the South Pacific will be in touch with SOPAC to be involved in all pearl farm database improvements, as she will later be in charge of the database maintenance.

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Workshop participants from the Ministry of Marine Resources and Manihiki
[Photo: Wolf Forstreuter]

GRADING OF TUNAS FOR THE SASHIMI MARKET

by Michel Blanc,
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SPC, Noumea, New Caledonia

The following handout is provided to participants when workshops on the grading of tunas for the sashimi market are run for Pacific Island fish exports companies.

GRADING OF TUNAS FOR THE SASHIMI MARKET

the factors affecting price

1. Fat content

- ➡ Depends on species (bluefin > bigeye > yellowfin and albacore)
- ➡ Depends on water temperature (temperate waters > tropical waters)
- ➡ Depends on size (big adults > juveniles)
- ➡ Depends on sexual maturity (before spawning > after spawning)

  - ✔ *Fat content is of primary importance when targeting Tsukiji market (Tokyo): fat bigeye tunas are likely to attract good prices in Tokyo*
  - ✔ *Fat content is sometimes difficult to assess when grading from tail sample; look for whitish outside layer of fat, underneath the skin*

2. Meat colour

- ➡ Japanese consumers prefer dark red (bluefin) and bright red colours
- ➡ Bright red colour depends on species (yellowfin > bigeye > albacore)
- ➡ Bright red colour depends on size (big adults > juveniles)
- ➡ Bright red colour depends on handling (spiking + taniguchi + bleeding + quick chilling improves colour)

  - ✔ *Meat colour is of primary importance when targeting Osaka market: bright red yellowfin tunas are likely to attract good prices in Osaka*
  - ✔ *Grading from tail sample gives good information on meat colour:*
    brownish colour means poor quality….do not export that fish!
    Meat colour may change after being exposed to the air; a change from a bluish (dull) colour to bright red means good quality
  - ✔ *Neon lights alter colour so use sun light or torch light when grading*
  - ✔ *A simple technique for grading tunas by the colour: place tail samples on a white surface, leave for a while then observe and compare samples in torch light*

3. Burnt tuna syndrome (BTS) *('yake' in Japanese)*

- ➡ Meat discolouration + change in texture and taste, making the tuna unsuitable for sashimi consumption
- ➡ Caused by several factors including presence of lactic acid in muscle

- ➡ Proper on-board handling (spiking + taniguchi + bleeding + quick chilling) reduces the risk of BTS
- ➡ If tuna is landed dead on-board, risk of BTS is higher

  ✔ *BTS starts around the backbone, where temperature remains higher for a longer period*
  ✔ *A tuna can be burnt 'inside' although there is little or no sign of discoloration in the tail*
  ✔ *A 'rainbow sheen' in the meat is sign of lactic acid presence*

4. Body shape

A:165 cm 65 kg

B: 165 cm 75 kg

C: 165 cm 87 kg

- ➡ Skinny tunas have lower value than 'round-shape' ones
- ➡ Tunas A, B and C have the same length but different weights; the meat-to-waste ratio in fish C is higher than in fish B and A. If the three fish have a similar quality, buyers will pay a higher price for C.

5. Freshness

- ➡ Fish spoilage is a natural phenomenon
- ➡ Two types: bacterial and enzymic spoilage
- ➡ Effect of spoilage on meat: softer texture and 'putrid' smell
- ➡ Proper handling (especially quick chilling) extends shelf life
- ➡ Fresh chilled tunas can be stored up to 10–12 days in ice or refrigerated sea water before being exported

6. External appearance

- ➡ External appearance of tuna can impact substantially on the buyers' grading, thus on price
- ➡ Gaff marks in the body reduce value of tuna

- ➡ Branchline marks do not affect value
- ➡ Bites from cookie-cutter sharks do not affect price unless several bites on same fish
- ➡ Dry skin, bruises, scale loss reflect handling problems, thus reduce value of tuna

7. Presentation

- ➡ Each market has its requirements regarding presentation
- ➡ For Japan, tunas are sent head-on; the US market requires head-off tunas
- ➡ Some buyers have special requirements e.g. bleeding cuts on the tail, gonads left inside the gut cavity, taniguchi tool left inside the neural canal, dorsal fins left or cut off, etc.
- ➡ Gill covers should never be cut off on fresh chilled tunas; this presentation is specific to the frozen tuna trade

8. Parasites

- ➡ Several species of parasites can affect tuna (black-dot and white-worm types are common)
- ➡ Some species are dangerous to humans
- ➡ Presence of parasites has a big effect on price (tuna with parasites is hardly saleable)
- ➡ If parasites are seen on tail sample, it is likely the whole fish is infested….do not export that fish!

9. On-board handling

- ➡ The on-board handling process has a direct effect on tuna quality thus on market price
- ➡ Gaffing should be done through the head to avoid gaff marks in the body
- ➡ Tunas should be landed on a soft surface (foam pad) and killed quickly to avoid bruising caused by the fish thrashing around on the deck
- ➡ Killing by spiking the brain and destroying the spinal cord (taniguchi method) improves quality:

  - ✔ *shelf life is extended*
  - ✔ *risk of BTS is reduced (faster chilling)*
  - ✔ *colour of meat is improved*

- ➡ Bleeding by cutting through blood vessels on both sides improves quality:

  - ✔ *risk of BTS reduced (blood toxins are drained off)*
  - ✔ *meat appearance is improved (no blood marks)*
  - ✔ *shelf life is extended*

- ➡ Chilling the tuna quickly improves its quality:

  - ✔ *risk of BTS is reduced*
  - ✔ *shelf life is extended*
  - ✔ *ice slurry is the most efficient chilling system*
  - ✔ *on large tunas, up to 24 hours are required to drop core temperature to 0°C*
  - ✔ *if refrigerated sea water or slurry is used, tunas should be wrapped in 'mutton-cloth' bags to avoid external damage and bruising from the fish rubbing against one another*

➡ During unloading, tunas should be handled gently and grasped by the head; twisting or bending the fish may damage the muscles (meat gapping)

10. Other factors

➡ A number of other factors can affect the price of your tuna
➡ The market situation

✔ *fluctuates seasonally and daily (e.g. higher prices are paid in Japan during end-of-year celebrations when consumption is high)*
✔ *competition with domestic tuna fishers (e.g. best season to export tunas to Australia is April/May = off-season for local fishers)*

➡ The economic situation

✔ *tuna consumption in Japan is linked to the country's economic situation; if poor, consumption and price drop*

➡ The reputation of the exporter

✔ *reputation is especially important on the Japanese market*
✔ *it is often a reputation (good or bad) given to the exporting country as a whole rather than to the company itself*

➡ Other events can impact on tuna prices, e.g. in Japan:

✔ *the Kobe earthquake in 1995*
✔ *seafood poisoning outbreaks*

KOUMAC HOSTS THE 2002 PRACTICAL FISHING COURSE

by Michel Blanc,
Fisheries Education and Training Adviser
SPC, Noumea, New Caledonia

Is there, in our region, a fisheries course more popular than the SPC / Nelson Polytechnic Fisheries Officers Training Course? From SPC's point of view certainly not! But even senior personnel in Pacific Island fisheries divisions agree, and the consensus is that the course is, 'the ideal training for our extension officers'.

Between 1979 and 2001, 265 Pacific Islanders from 18 countries and territories have undergone training in Nelson, at the New Zealand School of Fisheries. This year, a further 10 trainees completed the Nelson component of the course on Monday, 27 June. After 18 weeks at school, it was time to put the theory into practice and go catch some fish, and big ones if possible!

Before flying from their home country in January none of the trainees had ever heard of Koumac and the Northern Province of New Caledonia, all except Lale from Tuvalu who had lived in Noumea when he was a teenager and his father Satalaka worked at SPC. Koumac, a small town of 3000, began its history at the beginning of the 20th century when chrome mining took off in the area. Located nearby a lagoon abundant with fish, catching emperor fish, coral trout and spanish mackerel was a part of locals' life. But in 2001, fishing took another dimension in Koumac with the upgrading of the marina, the building an HACCP-compliant fish plant and, even more noticeable, the arrival of the first tuna longliners. Behind these innovations were a few men and women who firmly believed that industrial fishing was the way to create jobs and make money. Northern Province politicians facilitated the project, Koumac's mayor made the council's financial and human resources available, and Claude Favy took the big risk. Their efforts are to be praised. Their collaboration made the dream come true, the Pêcheries de Nouvelle-Calédonie company was born. Now operating ten 16-metre fresh tuna longliners, PNC is the second largest fishing company in New Caledonia, after the Noumea-based Navimon.

The idea of running the 2003 fishing module in Koumac germinated at SPC last March and was confirmed after a one-day site visit later on, when everyone involved with course preparations realised that Koumac was the perfect place to hold the course! It has a modern and safe port for training vessels; ice, bait and fuel are available; a brand-new plant for processing the catch, a FAD nearby, overseas markets through PNC, high standard accommodations, total support from the local community and institutions, plenty of fish ... and no night-clubs. Doesn't this sound like the ideal venue for a practical fishing course?

Upon their arrival, the trainees and Nelson module coordinator Brian Fossett were split in two groups. Seven trainees jumped in two minibuses hired by the Training Section and made the five-hour drive to Koumac while the remaining three went down to Noumea where they got straight into the job of loading training vessel FV *Dar Mad* under the direction of Lucky, the vessel skipper, and Velio, the chief engineer. Lucky and Velio have been associated with the operation of the practical module since the mid-90s when the course was hosted by New Caledonia.

When FV *Dar Mad* arrived at Koumac on Wednesday night, the other two training vessels were already on site. Our fleet consisted of FV *Le Crabe*, a six-metre, wooden boat owned by the New Caledonia School of Fisheries (EMM), the FV *Breith Atao*, a six-metre aluminium vessel hired from a local fisher, both for small-scale fishing activities, and FV *Dar Mad*, the 11 metre catamaran from the Service de la Marine Marchande et des Pêches Maritimes for demonstrating industrial-type fishing techniques

Having spent the next day rigging the three boats and making some gear, the trainees could not wait any longer to have a taste of Koumac by sea. The warm-up took place on Friday onboard FV *Dar Mad* only, as mechanical problems prevented FV *Le Crabe* to go out and FV *Brieth Atao* was not yet ready. In fact, that first trip on FV *Dar Mad* produced the lowest catch of the course, but this did not put down trainees' confidence. Despite the strong winds, they knew calm weather and good catches would be coming next.

The second and third weeks of the course were focused on bottom fishing. All three boats did that, fishing at different depths and locations and using a range of techniques. On FV *Dar Mad*, the highlight was two consecutive, amazing catches of red snapper (*Etelis carbunculus*) and

the course record, in the snapper category, for a 23-kg fala. Steve Beverly and the trainees will always remember the sight of these strings of beautiful fish floating up to the surface during the longline hauling process. But the small boats did very well too, despite fishing shallower and using hand-reels (Alvey type). Great catches of bottom fish were recorded with the usual mixture of snappers (gold-band – *Pristipomoides multidens*, yellow-tail – *P. flavipinnis*, pink – *P. filamentosus*), groupers (*Epinephelus* spp.), jobfish (silver-jaw – *Aphareus rutilans*, green – *Aprion virescens*) and even an odd 16-kg dog tooth tuna (*Gymnosarda unicolor*) caught by Nare from Vanuatu. Sia, the only female trainee this year, quickly became addicted to striking and hauling fish from the deep. For her, the personal highlight is undoubtedly a course record in the grouper category, with a 26-kg Malabar grouper (*Epinephelus malabaricus*). For our apprentice fishers, the work did not stopped at the fun of landing fish. The catch had to be processed to market specifications (i.e. gilled and gutted). Some preferred to do this at sea on the way back from fishing grounds, while others enjoyed the chilling comfort of PNC's brand new processing plant. The end result was the same, an ultra fresh, perfectly handled product that surely has been enjoyed by consumers.

FAD fishing and trolling was done using the small boats, although results varied. The FAD, moored at about six nautical miles from the Koumac pass, was not in a 'tuna mood' during the practical module. Despite trolling and setting a couple of vertical longlines at each visit, trainees didn't even catch one skipjack! Nobody really complained about the lack of tunas as the FAD produced plenty of adrenaline when the mahi mahi (*Coryphaena hippurus*) were around. And Nare got the biggest one, a male of 22 kg. The early morning troll along the barrier reef gave the opportunity to demonstrate the rigging of natural baits (pilchards) with ganged hooks. At first, some trainees thought the more expensive a lure is, the better….surely, they are now convinced there is nothing like a properly rigged bait for catching the big ones with sharp teeth. Wahoos, spanish mackerels, barracudas, dog tooth and giant trevallies, all lost a few mates during the SPC course!

At the end of week three, the course had provided excitement and new skills to all, but tuna longlining was still to come. Three trips were made on FV *Dar Mad*, under the supervision of Steve, Lucky and Velio. Overall, catches were excellent (the CPUE for the three trips was 0.73 kg per hook, which is 50% higher than the regional average). Most importantly, trainees are now familiar with the monofilament longline technique, on-board handling procedures, and they even witnessed the tagging of a 55-kg bigeye tuna. It was too good to be true and something nasty had to spoil the final week! This was a mechanical breakdown on FV *Dar Mad* which prevented the trainees from experimenting with swordfish longlining. This was a pity as the whole group was excited about doing the night trips for catching the 'pork of the sea'. Never mind, three privileged trainees made the return trip to Noumea with FV *Dar Mad* and again took part in something new: the deployment of an experimental FAD rigged with 10-mm polypropylene rope and 350 m of stainless steel cable. This FAD will be closely monitored over the next few months by FV *Dar Mad* and SPC staff.

The BBQ on Friday, 28 July put an end to six months of training. Our 10 Pacific Island students came to realise they would have to farewell each other the next

The SPC/Nelson course under review

Following a request from two of the main course donors – the New Zealand government and the Commonwealth Secretariat - an external review of the training programme that was launched in 1979 will be undertaken within the next few weeks.

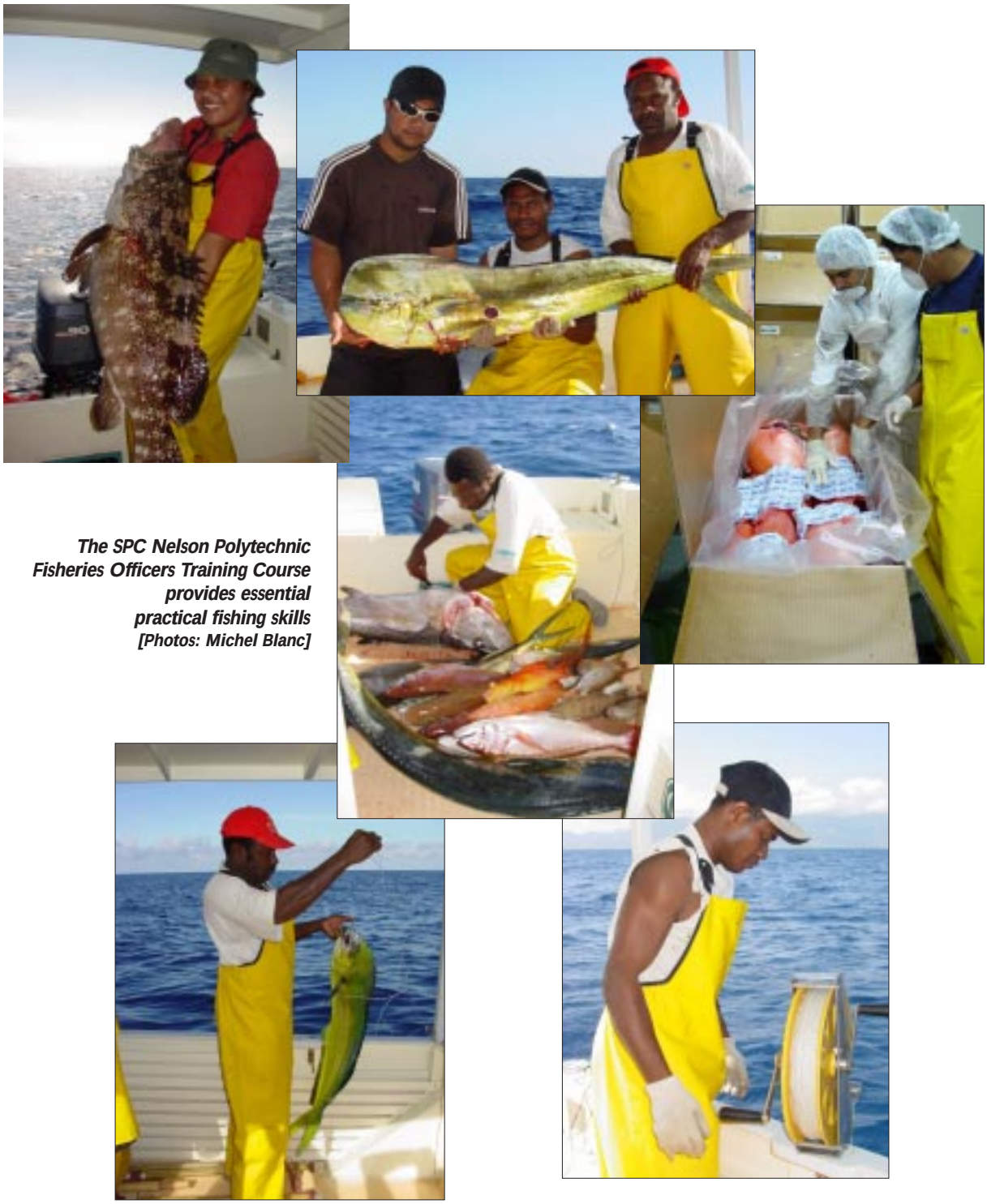
A consultant with proven experience in Pacific fisheries and training programme evaluation will be recruited to assess the impact of the course and assess the future of fisheries officer training in the region. It is expected that the consultant will travel to Noumea to meet with staff of the Coastal Fisheries Programme, and to Nelson to inspect the New Zealand School of Fisheries and talk with tutors. Chief Fisheries Officers in the region will receive a survey questionnaire and two or three countries will be visited for direct feedback from both ex-trainees and senior fisheries personnel.

A report, available in November, will be forwarded to fisheries administrations and course donors and future funding of the course will depend on the review outcomes.

If you are contacted in the context of this exercise, please provide the consultant with all the assistance required. It is important that your thoughts on this popular course are taken on board.

day. A small town in northern New Caledonia will remain forever in their memories, not only for the fishing skills learnt but also for lots of great experiences….kava tasting, indoor soccer, petanque, mountain climbing, chrome mining and more!

The SPC Fisheries Training Section wishes good luck to the 2002 students. We also thank all the institutions and individuals involved in both the Nelson and practical fishing modules. From SPC's point of view, Koumac proved to be an ideal venue for the best group of trainees in many years. Let's hope the donor community will continue to see the benefits of such a great training course.



The SPC Nelson Polytechnic Fisheries Officers Training Course provides essential practical fishing skills [Photos: Michel Blanc]

SECOND INTERNATIONAL FISHERS FORUM

The Western Pacific Regional Fishery Management Council intends to host the Second International Fishers Forum (IFF2) in Honolulu, Hawaii, 19-22 November 2002. In November 2000, New Zealand hosted the IFF1, which focused on methods to solve the incidental catch of seabirds by longline fishing gear. IFF2 will build on the efforts made by the participants at IFF1, and will also include discussions on sea turtle biology and behavior, and on reducing and minimising the harmful effects of interactions between sea turtles and longline gear.

There are currently about 18,000 longline vessels (demersal and pelagic) operating in the Pacific Ocean, and the total fleet size is being augmented by expansion of fleets in South and East Asia, the Pacific Islands, and South and Central America. There are about 2,800 longline vessels operating in the Atlantic Ocean, 200 in the waters surrounding the Antarctic Continent, and 300 in the Indian Ocean. The expansion of longline fishing effort will likely lead to increases in the incidental catches of seabirds and sea turtles. Consequently, there is a need to increase awareness and to seek solutions to these problems. Fishermen need to be part of the solution.

The primary mission of the forum is to convene an international meeting of fishermen to address possible solutions to incidental bycatch of sea turtles and seabirds by longline fishing gear. The event is free to all Longline Fishermen!

The objectives of the meeting are to:

(1) increase the awareness of fishermen that incidental longline catch of seabirds and sea turtles may pose a serious problem to these populations and to the continued operations of longline fishing;

(2) promote the development and use of practical and effective seabird and sea turtle management and mitigation measures by longline fishermen;

(3) foster an exchange and dissemination of information among fishermen, scientists, resource managers, and other interested parties on the use of mitigation measures, and the development of coordinated approaches to testing new measures;

(4) promote the development and implementation of collaborative mitigation research studies by scientists, fishermen, resource managers, and other interested parties; and,

(5) build on first International Fishers Forum (IFF1) to encourage continued progress and new participants.

For more information on this forum, please contact the Western Pacific Regional Fishery Management Council, 1164 Bishop Street, Suite 1400 Honolulu, Hawaii 96813; Tel: +1 808 5228220; Fax: +1 808 5228226; E-mail: info.wpcouncil@noaa.gov

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