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FISHERIES
Newsletter

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IN THIS ISSUE

Vanuatu Maritime College's instructors showing the use of a spare sail as a good alternative means of propulsion

Secretariat of the Pacific Community
Prepared by the Information Section of the Marine Resources Division
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FIRST HEADS OF FISHERIES MEETING

The 1st Heads of Fisheries Meeting (HOF) was held at SPC headquarters from 9 to 13 August 1999, bringing together 79 participants from 22 SPC member countries and territories and 25 international or other organisations.

The HOF Meeting, formerly called the Regional Technical Meeting on Fisheries (RTMF), provides the only opportunity for those responsible for running Pacific Island government fisheries services from all SPC member countries and territories to meet and discuss aquatic resource issues of regional importance.

The Meeting also reviews the work of SPC's Marine Resources Division, enabling it to keep its work programme, the largest in SPC, relevant to the evolving needs of its Pacific Island members. The guidance provided over the years by successive fisheries meetings has been an essential element in developing the many activities that are undertaken by the Marine Resources Division.

The Meeting was interesting and productive, covered a wide range of topics and provided important guidance for SPC's future work in fisheries. As always, much business was conducted outside the meeting room, and many delegates benefited from the opportunity to establish personal contacts with representatives of other countries, territories, institutions and organisations.

During the course of the first HOF, the following recommendations or statements were agreed by Pacific Community island member representatives to be included into the record of discussion, for the guidance of the Secretariat of the Marine Resources Division and / or the benefit of other SPC or international processes:

- After discussing at some length the prospects and problems of the expansion of commercial *Eucheuma* farming, the Meeting agreed that a regional study to analyse the economics of seaweed farming in the Pacific region should be commissioned. The study should focus on the analysis of economic returns from seaweed farming compared to other cash-earning activities common in Pacific communities, and include an analysis of different marketing options for farmed seaweed.

- The Meeting pointed out the continued high importance of establishing national and territorial responses to the requirements by many importing countries for certification systems covering marine product export trades, and urged the Marine Resources Division to develop appropriate linkages with

Some participants at the First Heads of Fisheries Meeting

certificatory authorities and sources of potential assistance to members in developing their own certificatory systems and standards, in particular to seek further opportunities to train island national inspectors to certify fish and fishery products according to HACCP (Hazard Analysis and Critical Control Point) and other appropriate principles. The Meeting welcomed the intention expressed by the representative of the USA to convey the aspirations of the meeting to the appropriate authorities within the USA, and encouraged major fish importing countries to include appropriate officials in their delegations to the next HOF.

☞ Recalling the considerable discussion of regional aquaculture needs and priorities that had taken place at the 1998 SPC fisheries meeting or 'Mini-RTMF', and emphasising the even more urgent need for the aquaculture investments being made by members to be supported by effective networking at the regional level, the Meeting strongly re-endorsed the 'Regional Aquaculture Strategy' put forward in 1998 to guide regional institutions in coordinating the efficient provision of future aquacultural advice and assistance to Pacific Community island member countries and territories, and further re-endorsed the 1998 agreement that:

SPC be urged not to slacken its continued efforts to obtain the resources necessary to implement an Aquaculture Programme in January 2000 in order to complement the aquaculture capabilities of national aquaculture projects, USP, and ICLARM-CAC and relevant specialisations of other projects, with efficient outreach, extension, member consultation and clearing-house activities;

To further lend weight to this identification of a major gap in regional support to members, the Meeting requested the Director to convey this recommendation in his report to the SPC Committee of Representatives of Governments and Administrations, for broader attention.

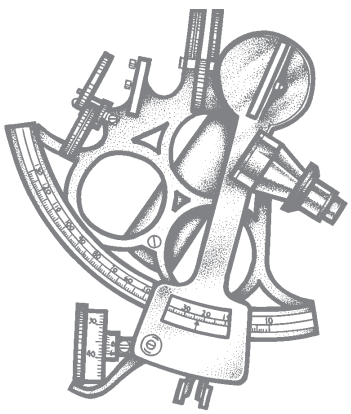
☞ The Meeting, noting that the work programme of the Reef Fisheries Assessment and Management Section would have greater capacity, through the availability of donor funding, for scientific assessment, urged the Section to keep seeking the means to maintain its capacity for providing practical management advice on a wide range of reef fisheries, and encouraged the Division to be proactive and motivational in the development of reef fishery management capacity in member countries and territories.

☞ SPC member countries and territories, pointing out the need to build effective local capacity to cope with the management of the expanding live reef fish trade, and to strengthen the information base for management, directed the Secretariat to continue to seek the means for implementing its part in the Regional Live Reef Fishery Strategy endorsed by the 1998 SPC fisheries meeting, and supported the proposal for a regional Live Reef Fish Initiative being prepared by the Secretariat in collaboration with the International Marinelife Alliance (IMA), The Nature Conservancy (TNC) and the World Resources Institute (WRI).

☞ The Meeting agreed that the SPC Marine Resources Division assist FFA (Forum Fisheries Agency), and collaborate with the Forum Secre-tariat, to compile marketing data on fresh, frozen and value-added tuna products, as well as non-tuna products, including contacts within these markets to assist member countries and territories in marketing of marine products. It was noted that additional funding would need to be identified for a significant level of assistance to be provided by SPC.

☞ Whilst being fully in support of practical approaches to the problem of safety at sea, the meeting recalled Output 6 of the 1998 'Mini-RTMF', and pointed out the continued problems being faced in the reconciliation of international maritime standards and local realities. The Meeting re-emphasised the need for adequate consultation with fisheries authorities during the process of drawing up maritime legislation. The Meeting suggested that coordination at the regional level might be improved by the Maritime Programme physically joining the Marine Resources Division.

☞ The Meeting discussed at length the possible future involvement of the Oceanic Fisheries Programme in the



provision of scientific information and advice to the proposed Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific and the implications of such activity for member countries. Although details of such an arrangement remain to be resolved, it was agreed that OFP involvement in the provision of such activity would enhance the value of scientific support for member countries and should be supported, provided:

- that the delivery of existing or additional services to member countries would not be compromised;
- that additional scientific advisory work for the Commission be undertaken only if additional resources are made available for such work; and
- that periodic review of OFP work be undertaken to ensure that the needs and interests of member countries are being fully accommodated.

☞ The Meeting directed that the Marine Resources Division seek resources to provide practical assistance to member fisheries and quarantine authorities to set up, or build capacity in, aquatic quarantine capabilities and regulation of marine species introductions. This capacity should also be built into any future SPC Aquaculture Section or Programme.

☞ The Meeting noted the growing problem of marine debris, and its detrimental effect on navigational safety, nearshore environments and marine organisms, and encouraged SPC to continue to work with SPREP with a view towards addressing this intersectoral problem in the Pacific Community region.

☞ Whilst discussing future directions for the Capture Section for consideration during the SPC internal review of the Section, the Meeting particularly highlighted the need for new experiments to be conducted on FAD buoy designs and mooring configurations to reduce the cost and increase the life of these units as this was still an important, although costly, development area in many Pacific Island countries and territories. The Meeting recognised that the SPC currently advised and assisted with the deployment of locally funded FADs, and that dedicated funding would need to be located to undertake any experimental work in member countries.

☞ The Meeting drew attention to the need to either continue

The Meeting was interesting and productive, covered a wide range of topics and provided important guidance for SPC's future work in fisheries.

or initiate gamefish catch and effort data collection in member countries, and for the Marine Resources Division to assist in compiling, archiving and analysing this information. The Meeting suggested that this data be available to scientists and managers under similar conditions of confidentiality to the existing SPC commercial fisheries database.

- ☞ Recalling Recommendation 14 of the previous full meeting of SPC Fisheries Heads (RTMF 26 of 1996), the Heads of Fisheries Meeting agreed to convene again in 2000, funding permitting, and asked the Director to circulate an update in the new year on progress with meeting arrangements.

- ☞ The Meeting, wishing to retain the opportunity for reflective discussion of issues arising from written member country and territory presentations, and for measured consideration of the Marine Resources Division work programme, agreed that the next HOF meeting agenda include a more limited range of special themes.

- ☞ The Meeting agreed that Sectional reports to the next HOF be based on outputs rather than activities, and that the reporting format clearly identify which outputs are the result of collaboration and cost-sharing between sections.

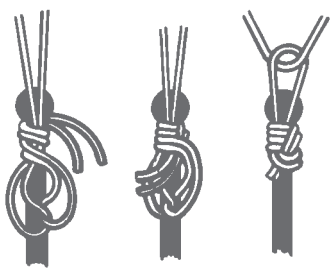
Note: The issues highlighted here are in no particular order and do not constitute a full prioritisation of the work programme of the SPC Marine Resources Division. They are presented separately in this way because they are issues which required particular consensus agreement in plenary, or the attention of authorities or partners outside the scope of the Meeting. A context within which to judge the prioritisation of issues is provided by the Record of Discussion of the Meeting, which also provides additional guidance to the SPC Marine Resources Division work programme.

■ CAPTURE SECTION

Activities

Masterfisherman William Sokimi started work with the Capture Section just before the end of the July–September quarter. William has had a wide range of experience on the sea. He has been captain and fishing master on a number of longline vessels in Fiji.

In addition, he has served as mate on inter-island ferries and tugboats. More recently William was an instructor at the Fisheries and Nautical Training Centre in Marshall Islands and a Masterfisherman Consultant with the National Fisheries College in Kavieng, Papua New Guinea.



William's background includes studies at the Fiji School of Maritime Studies where he sat for Grade 4 Master, 2nd Mate Pacific Islands, Grade 3 Mate, and Grade 3 Masters (Master Unlimited—Fishing) tickets.

He also attended the first SPC / Nelson School of Fisheries Regional Course on Vessel Operation Management and Electronics Aids for Commercial Fishing Skippers in 1998.

Before William started his duties as Masterfisherman at SPC he attended the 1st Heads of Fisheries Meeting in August of this year as an observer. He started on his first official assignment in Samoa during September. On the way to Samoa, William stopped off for one week in Fiji to assist the Fisheries Training Section in producing a video called *Rambo Goes Deep Sea*, concerning safety aboard longline boats. William offered technical advice and helped to re-write the script. While in Samoa he will complete a longline fishing project working with Fisheries Division's F / V *Tautai Matapalapala*, which was started by former SPC Masterfisherman Peter Watt in April of this year. William is a welcome addition to the Capture Section and the Coastal Fisheries Programme.

Masterfisherman Steve Beverly spent two weeks in July in Fiji working with the Fisheries Training Section conducting a workshop on tuna handling and grading at Celtrock Holdings' Suva plant. The workshop included lessons in tuna grading and a practical session on on-board tuna handling.

Similar workshops have been conducted throughout the region jointly by the Capture Section and the Fisheries Training Section. What made this workshop different was that SPC recruited a professional

fish cutter from Tahiti to demonstrate quarter-loining techniques used in Tahiti for export marketing of frozen albacore (see story on p. 8). The whole process was videotaped by SPC's Regional Media Centre. The results will be edited into an instructional videotape on fish cutting. In addition, Steve demonstrated how to cut tuna into sashimi and how to make home-made surimi from tuna offcuts. This process was also videotaped. Both the fish cutting and the sashimi videotapes will soon be available for distribution.

After the workshops Steve spent some time with two local shipbuilders in Suva, Shipbuilding Fiji Ltd (SFL) and Bluewater Craft. SFL recently completed a 25-metre longline vessel for Gilles Leboucher of Armement Coopératif Polynésien in Tahiti, F/V *Oiseau des Isles* (Figure 1). SFL is completing another similar vessel for Tahiti, which will make a total of five such longliners built in Fiji for French Polynesia.

Bluewater Craft has three 10-metre deep bottom snapper boats under construction (Figure 2) at their yard in Lami, just outside Suva. The design was planned as a replacement for the ageing FAO 28-footers that were very popular in Fiji years ago. Bluewater Craft has introduced some new techniques in boat building to Fiji.

The owner of the company, Chris Tsantikos, is a naval architect. He uses computerised drawing and plate cutting techniques for laying out his designs. The computer-generated outlines of all the cuts are sent to an Australian company that does the cutting with a computer-guided machine.

The finished plates are then shipped back to Fiji for fitting and welding, which is done by Bluewater Craft's crew of craftsmen. The process is faster and less expensive than the traditional ways of building a steel boat, and the finished product is better. Bluewater Craft hopes to produce 15-, 18-, and 21-metre fishing boats, in addition to their 10-metre design.

After returning from one month of leave in the US (mid-August to mid-September), Steve assisted the Fisheries Training Section conduct two one-day workshops on fish handling and grading at the Department of Marine and Wildlife Resources in Pago Pago, American Samoa.

Steve also spent some time looking into a possible longer term Masterfisherman project for American Samoa. There are over 25 'alia' catamarans and two medium-scale longline vessels licensed for longline fishing in American Samoa's EEZ.

With two Hawaiian Airlines flights going directly to Honolulu each week, there is a good opportunity for a domestic fresh chilled export longline fishing to expand. Most fish are now being sold to the two canneries in Pago Pago.

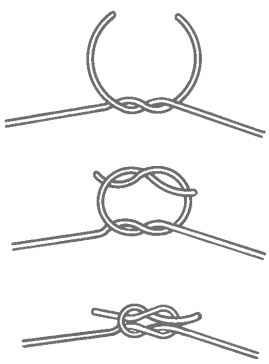
Fisheries Development Adviser Lindsay Chapman attended the second Asia-Pacific Conference

Figure 1: F/V *Oiseau des Isles*

Figure 2: Ten-metre deep-bottom fishing vessels under construction

and Exhibition for the Commercial Fishing Industry (6–8 July) in Cairns, Australia.

The Conference covered a range of topics including: fisheries management in Australia; environment and conservation issues including bycatch; legal issues in the fishing industry; education and training for the fishing industry; quality assurance in seafoods; value adding with a focus on tunas; fishing gear and techniques (mainly prawn trawling and droplining for tropical bottomfish); the latest innovations in fuels, oils engines, propulsion systems, vessel design, construction and procurement; and fisheries beyond Australia.



Lindsay presented a paper entitled Development assistance for small-scale domestic offshore fisheries in Pacific Island countries and territories, which summarised the work undertaken by the section over the last 20 years.

The Exhibition brought together a wide range of marine suppliers from Australia and New Zealand. The equipment on display ranged from diesel engines, oils and filters to tuna longline gear, bottom-fishing reels and prawn trawling gear to the latest vessel electronics. The new slipyard in Port Moresby, PNG, was also represented.

In mid-July, Lindsay went to Palau for two weeks as part of the collaborative team from FFA, SPC, Forum Secretariat and C-SPODP II, providing input to the development of a Tuna Management Plan for Palau. Lindsay's role was to conduct a study on the 'Development options and constraints including infrastructure and training needs within the tuna fishing industry and support services in Palau'. A report of this work was provided to the Canadian consultant, Chris Jones, who was coordinating the input and development of the Plan under the supervision and guidance of the local Consultative Committee and FFA.

The month of August was taken up with preparation for, and the running of, the 1st Heads of Fisheries Meeting (HOF). The English version of the technical manual *Deep-bottom fishing Techniques for the Pacific Islands—A Manual for Fishermen* was also completed for the meeting and distributed. The French version of the same manual was released in September. The report on 'Assistance to the National Fisheries College, Kavieng, New Ireland Province, Papua New Guinea' was also published and distributed during this quarter.

The last quarter of 1999 and early 2000 look to be a busy time for the Capture Section with several official requests for technical assistance already received as well as a lot of interest being shown.

Fish cutting workshop held in Suva demonstrates quarter-loining of albacore tuna

SPC Fisheries Training Section and Capture Section jointly conducted a national workshop on fish handling and tuna grading at the Celtrock Holdings plant at Muaiwalu Jetty in Suva, Fiji during July 1999.

Similar national and regional workshops have been held in other SPC countries and territories. The difference is that in the July workshop in Suva, quarter-loining of albacore was added to the normal workshop curriculum. There has been keen interest in the value-added market for albacore quarter-loins after the success of French Polynesia's export fishery had been reported in *Fisheries Newsletter* # 85 ('Tuna longline takes a different turn in French Polynesia').

The French Polynesia fishery targets albacore tuna, which are quarter-loined, wrapped in clear-wrap, and blast frozen on board several 25-metre longline vessels. The finished product is then shipped to US and EU markets under HACCP certification. In 1998 over 5000 tonnes of albacore tuna were processed into quarter-loins which were shipped out of Tahiti—about half went to US and half went to Europe.

Ian Chute, General Manager of Celtrock Holdings in Fiji, requested the workshop and specifically asked if someone could be brought from Tahiti to show Fijian fish processors how they do quarter-loining. SPC Fisheries Education and Training Adviser Michel Blanc contacted Vini Vini LP (Tahiti) who were glad to lend the services of their number-one fish cutter, Frédéric Chung Shing, otherwise known as Coco. Michel taught the workshop participants about the Japanese fish market and tuna grading principles and practices, while Masterfisherman Steve Beverly demonstrated proper on-board handling techniques.

Steve also demonstrated how to cut sashimi tuna and how to make home-made surimi with tuna offcuts. The big interest, however, was in Coco's demonstration of the quarter-loining process. Besides several enthusiastic fish cutters from Celtrock Holdings, there were participants from Ocean Trader (Fiji), Agape Fishing Company (Fiji), and Fiji Fisheries Division at the workshop. Pita Mourin and Maggie Maillet, who have a fishing business and fish market in Noumea, New Caledonia, sat in on the workshop as observers.

SPC's Regional Media Centre in Suva videotaped all of the fish cutting exercises during the workshop. The Centre's Video Producer / Trainer Aren Baoa supervised the video productions. Copies of the videos should be available soon for interested fisheries departments, fishermen, and fish processors and marketers. In the meantime, the photographs presented here will give some idea of what's involved in quarter-loining an albacore tuna.

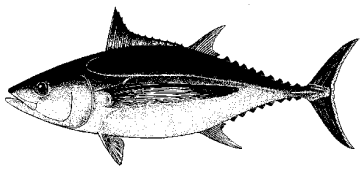
One of the unique things that Coco and the others in Tahiti do when they quarter-loin an albacore is that they hang the fish by the tail for the initial cuts to remove the head and the half-loins from the frame. In Tahiti this is usually done on the longline boats, which stay out at sea for several weeks at a time.

The albacore are cut, wrapped, and frozen at sea, ready to be exported in freezer containers to US and EU markets. Coco does most of his cutting on shore, however, at the Vini Vini LP (Tahiti) plant in Papeete. The process is the same except that Coco's quarter-loins are destined for local markets and are usually cut into steaks by restaurants and shops for retail sale. Coco has been cutting fish in Tahiti for over ten years. He says that it would take over one year for a newcomer to become proficient at quarter-loining tuna to market specifications.

The fish usually come to the cutter gilled and gutted, or 'G&G'. On the longline vessels the tuna are often headed as well, and enter the boat's processing room from the deck as 'H&G' fish. The fish are then hung by the tail on a hook that is suspended from the ceiling or overhead.

To do this, a tail-rope must be choked around the tail of the fish, forming a loop. Some of the fish cutters in Tahiti actually prefer to cut the half-loins away while the fish is lying on the cutting table, particularly if the weather is rough and the boat is rocking. The hanging method is the one most used by the fish cutters in Tahiti, however. The basics are the same and the end result is identical.

The first thing after hanging the fish is to remove the head, if this hasn't already been done. Actually, the head, pectoral girdle and pelvic girdle are removed in one piece. This is accomplished in four cuts using a large serrated knife. One of the pectoral fins is used as a handle to steady the fish while the cuts are made.



The first cut is just behind the pelvic fins going at a 45 degree angle downwards. The same cut is done on the two pectoral fins. Lastly, a chopping cut is made on the top of the head going down to the level of the spine. As this cut is made, the head is snapped away from the frame by pulling on one of the pectoral fins (Figure 1). The frame with two half-loins is left hanging for the next cuts.

The dorsal and anal fins and finlets are then cut away (Figure 2). This is also done with the large serrated knife. For the dorsal fins and finlets, this is pretty much a straight cut that removes the fins and finlets but not much flesh. The fins and finlets are pulled away with one hand in one long strip as they are cut. The second dorsal fin is used as a handle in this case. When the anal fin and finlets are removed, the belly flap is also cut away at the same time. The anal fin is used as a handle until the cut reaches just to the gut cavity. Then the strip of fin and finlets is pulled while the belly flap is cut away on either side. The fins are all discarded but the belly flap is retained and usually sold separately on shore or given to the crew on the boats.

Figure 1: The head is removed in four cuts.

Figure 2: The dorsal and ventral fins are cut away.

After the fins and finlets have been removed, the half-loins are cut away from the frame down to the backbone, but not all the way. A filleting knife is used for this cut (Figure 3). This knife is also sometimes called a fish splitter. Care is taken that the cut is as close to the bone as possible.

The next step is to insert a meat hook into the half-loin going right into the lateral line (the middle line on the side of the fish). The meat hook should not penetrate the good flesh but should be stuck into the area where there is dark muscle and pin bones, about one-third of the way down from the tail end of the fish, but pointing upwards. The large serrated knife is then used to cut through the pin bones while the

meat hook is used to pull the half-loin away from the frame at the same time (Figure 4). The half-loin is then gently laid on a clean cutting-board on a table. The process is repeated for the half-loin on the other side. The frame should be clean with no flesh left on the bones (Figure 5).

Figure 3: Cuts are made to the backbone.

Figure 4: The half-loin is cut from the frame.

Figure 5: There is very little flesh left on the frame.

Figure 6: Skin is cut from the half-loin.

A skinning knife is then used to remove the skin from the half-loin. This is done with the skin side facing up. The skin is cut away in pieces, not all at once. Each piece is held in one hand and pulled away as the knife slices as close as possible under the skin (Figure 6).

The skinned half-loin is then turned over on the table and separated into two quarter-loins using the skinning knife (Figure 7). The pin bones and all dark muscle are then cut away from each quarter-loin (Figure 8), again using the skinning knife.

Figure 7: The half is split into quarter-loins.

Figure 8: Pin bones and dark muscle are cut from the quarter-loin.

Figure 9: A perfect quarter-loin ready for wrapping and freezing

Rib bones and any leftover belly lining are cut away from the lower quarter-loin. It is important to cut away all of the dark muscle (sometimes called the bloodline) without removing any white flesh. This takes lots of practice and must be done with care. The result is four perfect quarter-loins ready for retail sale or for wrapping and blast freezing (Figure 9). A good fish cutter like Coco can get yields of 50 per cent from an albacore tuna, and he can do the whole job in less than three minutes.

After Coco demonstrated his skills to everyone, he trained several of the workshop participants in how to properly quarter-loin an albacore (Figures 10 and 11). Just one week after the workshop, Ocean Trader (Fiji), who have a plant in Pacific Harbour, reported that they had started using the techniques they had learned from Coco, with surprising results: they were getting 5 per cent greater yields than they had been getting using their old methods.

Figure 10: Coco shows one of the workshop participants how to do it.

Figure 11: Ocean Trader's fish cutter at work on an albacore

COMMUNITY FISHERIES SECTION

From July to September 1999 the Community Fisheries Section continued its work in the areas of information and training.

Heads of Fisheries Meeting

The Community Fisheries Section reported to the 1st Heads of Fisheries Meeting (HOF), held in August, on its past, present and future activities. Support for the work of the Section was high, especially from those countries in which the Section has completed baseline surveys or workshops. Several countries expressed interest in the Section carrying out studies that assess the impact of women's harvesting techniques on the inshore marine resources.

At present the Section documents the activities rather than the impact of women in fisheries. A strategy and work programme for future impact assessments is now being considered.

Information

Training manuals

The French version of the manual *Setting Up a Small-Scale Business: A Guide for Women in Fisheries* is ready for printing and should be distributed in November 1999.

The *Community Fisheries Manual* has been completed and is currently in production. The manual aims to provide both fisheries resource users and managers with information on how to effectively work together in managing fisheries on a community basis. The target groups are national fisheries workers, non-government organisations and those involved in community development. A draft version of the manual was used at a SPREP workshop on Community-based Marine Protected Areas, held in Palau, 11–15 October 1999.


Women in Fisheries

INFORMATION BULLETIN

Contents

Women in Fisheries Information Bulletin

Issue #5 of the *Women in Fisheries Information Bulletin* has been produced and is due to be distributed in English in October and in French in November 1999. Articles in Issue #5 cover: the work of the Section in Tuvalu, Wallis and Futuna, New Zealand, Federated States of Micronesia and Fiji; news from around the region (Marshall Islands, Kiribati, Nauru, Solomon Islands, New Caledonia, Wallis and Futuna, Fiji, Tonga, Samoa and Australia); news from outside the region (South-East Asia, Africa, South America and Europe); and publications.

Issues 1 to 5 of the Bulletin are available on the world wide web. They can be found under Newsletters of the Coastal Fisheries Programme at:

http://www.spc.org.nc/coastfish

National assessments

The report, 'An Assessment of the Role of Women within Fishing Communities in the Republic of Palau' was completed and distributed in August 1999.

Assessment for Pohnpei, Federated States of Micronesia (FSM)

At the request of the FSM National Government the SPC Community Fisheries Officer Lyn Lambeth was in Pohnpei from 22 July to 7 August 1999 to undertake a field survey on the role of women in fisheries and to attend the 5th FSM Women's Conference (2–6 August).

Working with the FSM National Women's Interest Officer and the National Fisheries Section, the SPC Community Fisheries Officer spent the first two weeks of the visit to Pohnpei in a series of meetings with people directly or indirectly involved with fisheries activities.

These included representatives of National and State Government departments, business, banks, community development workers, women's groups, non-government organisations and churches. A number of visits to villages were also undertaken, as well as some 'hands-on' experience of fishing and col-

Net fishing, Pohnpei, FSM

lecting of marine resources with men and women of Pohnpei.

During the final week of the visit the SPC Community Fisheries Officer and her counterpart from the National Fisheries Section, Conservation and Management Officer Estephan Santiago, attended the 5th FSM Women's Conference.

The two officers gave a joint presentation on the work of the SPC Community Fisheries Section and the FSM National Fisheries Section, provoking a lively and interesting discussion on women in fisheries amongst the conference participants. The Conference also gave the SPC officer an opportunity to talk with women from all four states of FSM to gain an insight into the special circumstances and needs of each state.

Work is continuing on the full report on fishing communities and the role of women in fisheries activities in Pohnpei. The report will make recommendations on ways of assisting small-scale fisheries activities in Pohnpei and will propose a programme for further training of those involved. Direction for further work in Kosrae, Chuuk and Yap will also be given in the report.

Collecting curryfish intestines for bait, Pohnpei, FSM

Training

Female community workers from around the Pacific learn fisheries skills in Fiji

How to make a fish smoker was one of many skills that women studying at the SPC Community Education Centre (CETC) in Fiji learnt during a two-week fisheries course from 20 September to 1 October 1999. As of this year, the trainees undertaking the seven-month course for a Certificate in Community Development Studies will be offered a course in fisheries skills. The two-week fisheries module has been developed by SPC's Community Fisheries Adviser working in collaboration with USP's lecturer in Post-harvest Fisheries.

The module included practical skills training in sustainable harvesting techniques, gear technology, seafood processing and preservation, and marketing. Apart from learning how to market seafood and develop a community fisheries programme, the trainees were expected to make and test fishing gear, assess the quality of seafood, and process and preserve various marine resources using a variety of processing equipment.

TRAINING SECTION

A tool for calculating longline profitability

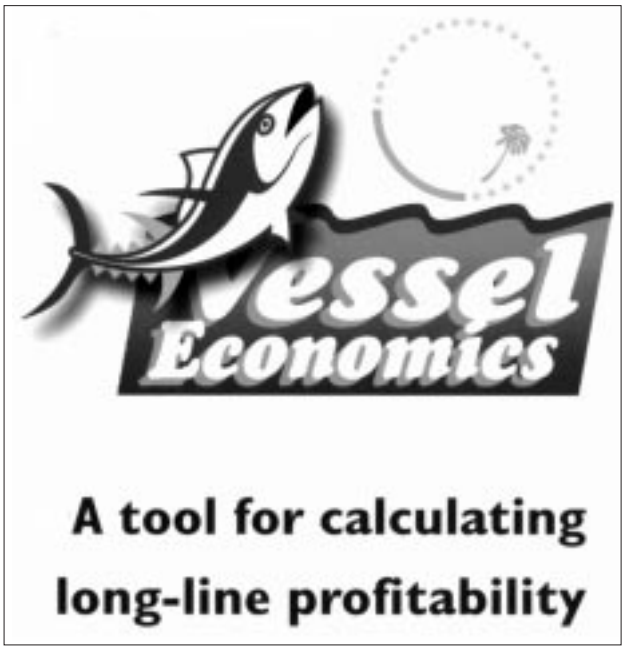
With funding assistance from the United Nations Development Programme (UNDP), the Fisheries Training Section has produced, and will soon distribute, computer software designed as a tool to understand and manage the financial aspects of longline vessel operations.

The programme will be useful to vessel skippers, owners, company managers, fleet managers and any others who have an interest in the economics of longlining. It gives a quick and accurate indication of vessel profitability and can immediately calculate profit variations caused by changing parameters in vessel operation.

The programme is particularly interesting in the teaching situation where it can be used to compare the vessel income with fixed and variable costs and give the cash flow and profit/loss figures. With this achieved, the programme user may then alter any parameter in vessel operation and the software will instantaneously show how this change affects the profit. By this means, the key factors and the most effective ways of increasing profitability are demonstrated.

The software was developed by Ivanhoe Associates, a New Zealand-based computer company, with technical advice from Alastair Robertson and staff of SPC Fisheries Training Section. The software, with an instruction manual, will be distributed shortly.

If you are interested in obtaining this computer programme, you should contact staff of the SPC Fisheries Training Section.



Tuna handling workshops in American Samoa

Following a request for assistance made at the 1st Heads of Fisheries Meeting in Noumea in August 1999, SPC Masterfisherman Steve Beverly and SPC Fisheries Training Adviser Michel Blanc spent a few days in Pago Pago during the last week of September. The purpose of the visit was to train local fishers and fish retailers in the handling and grading of sashimi-quality tunas.

Two workshops were run at the Department of Marine and Wildlife Resources (DMWR), following the programme and training methodology used at similar workshops in other countries and territories.

Morning sessions covered the sashimi concept, on-board handling, and grading factors, while afternoon sessions focused on hands-on demonstration and practice of on-board handling and cutting of sashimi slices. A total of 40 participants attended the workshops, mostly fishers (28) with some boat owners, fish retailers, company managers and staff of DMWR.

There are currently 26 active longliners in American Samoa, most of them being Alia catamarans built and purchased in neighbouring Samoa. The catch is presently sold either on the local market for fresh fish or to one of the two canneries in Pago Pago.

Some local entrepreneurs are keen to start exporting tunas to sashimi markets overseas and are encouraged to do so by DMWR Director Ray Tulafono. By looking at the key factors to successful longline operations for the marketing of chilled

sashimi-grade tunas, it appears that American Samoa has all the elements in place for such a development: one of the most sheltered harbours in the Pacific, deep enough to accommodate all types of fishing vessels, direct passenger and cargo flights to Hawaii and the West coast of mainland USA, two canneries that can absorb a large volume of by-catch, straightforward access to US markets and a strong interest amongst fishers and entrepreneurs in catching and exporting fish to overseas markets.

Masterfisherman Steve Beverly showing the right way to cut sashimi slices

Part of the Alia fleet in Pago Pago

Expert assistance to Fiji seafood industry

As a follow-up to the regional course on seafood business operations and management for Pacific Island women (12 April to 7 May 1999), SPC Fisheries Training Section contracted a Seafood Technology expert to visit two companies in Fiji. Ms Cushla Hogarth, tutor at the New Zealand School of Fisheries, spent one week at Ocean Trader in Pacific Harbour (19–23 July), then four days at Celtrock Holdings, ex-Feeders Seafood (27–30 July).

At Ocean Trader, Ms Hogarth worked alongside the company's Quality Control Officer Ms Archana Ben, who had attended the regional course in New Zealand. In a limited time frame, Ms Ben and the company manager, Ms Lisa Stone, received assistance in the following areas:

- Hazard Analysis and Critical Control Point (HACCP) Plans: the HACCP Plans for Ocean Trader's existing seafood products (dried tuna jerky and hot smoked fish products) were reviewed and suggestions made for improvement.
- Standard Sanitation Operating Procedures (SSOP): SSOPs were reviewed for water treatment and testing, conditions and cleanliness of food contact surfaces, cross contamination, toxic chemicals and pest control. SSOPs were also developed for personnel control and repairs and maintenance.
- Good Manufacturing Practices (GMP): a GMP on product recall was developed.
- Product Coding: a suitable form of product coding was discussed with the aim of further refining identification of smoked, sliced and dried batch codes.
- Specifications: raw material and product specifications for all products were developed and will be used to control product quality.
- Staff Training: a brief training session on personal hygiene and food safety was conducted for staff of Ocean Trader.

The Seafood Technology expert also developed HACCP Plans for potential new products and processes. Some technical recommendations were also made for the improvement of Ocean Trader's premises.

At Celtrock Holdings, Ms Hogarth ran a three-day HACCP training programme for nine staff of the company. The curriculum of the United States Food and Drug Administration (USFDA) was followed and a class example of chilled, headed and gutted tuna destined for the

Ocean Trader's processing room

Packing smoked tuna for export

USA was used. Participants then developed their own HACCP Plan — either chilled, vacuum-packed tuna loins or canned tuna. All nine participants gained a good insight into the concept of HACCP and received a Certificate of Attendance for their efforts.

The opportunity was taken to review the October 1997 Celtrock HACCP Plan and some changes were made. The Celtrock Sanitation Standard Operating Procedures were also reviewed and suggestions made for improvement.

Celtrock's new canning facility was visited and some suggestions made on the standard of construction and process controls to meet FDA requirements.

The Fisheries Training Section believes that the short-term placement of experts can successfully assist Pacific Island seafood businesses to meet the requirements of importing regions such as North America and Europe. The managers of seafood companies wishing to receive similar assistance should contact the SPC Fisheries Training Section.

The filming of the new video on fishing boat safety

This short SPC video, entitled *Rambo Goes Deep-Sea*, is designed to highlight the everyday dangers of working on board a commercial fishing vessel, or more specifically a longline vessel. In this training video on fishing boat safety, humour is used to highlight the situations. The video takes a character, Rambo, previously developed in the *Better Safe than Sorry* video on small boat safety, and introduces him to the risks faced on a bigger commercial vessel.

Pasifika Communications Ltd was hired to produce the new video and it was directed by Pasifika's Glen Hughes. The filming took place in Fiji. The SPC Fisheries Training Section agreed to charter the vessel F/V *Miss Oahn* from Saheb holdings for the purpose of shooting the video. As the majority of the scenes needed to be filmed at sea, the boat was chartered with the skipper and crew to operate and manoeuvre the boat safely. Pasifika Communications was able to organise the same actor Isimeli (Rambo) as for the previous video. The skipper and crew were often used as background talent.

I had the task of supervising and assisting in the filming of this new video. I requested the assistance of William Sokimi (Masterfisherman) from the Capture Section and it was a great experience for us both to be involved. Our plan was to strictly follow the initial script.

However, we had to rearrange some of the scenes to suit the situation on board the *Miss Oahn* and also to get around several other factors. William, with his knowledge and experience of longline fishing techniques, provided valuable assistance. He was also among familiar faces. As he personally knew the skipper and crew, we were able to get their full support.

The filming of the scenes went successfully and by the end of the week all the required scenes were shot. It was a great pleasure to work with Glen Hughes and his team.

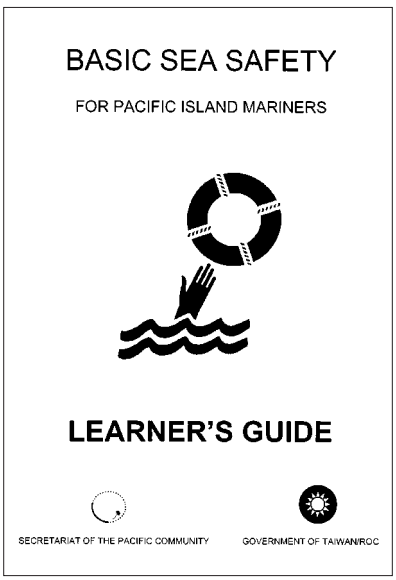
Pasifika Communications will need one to two weeks to complete the editing and we hope to receive the first copy of the video soon for our last comments and changes. The SPC Fisheries Training Section will advise training institutions and fisheries organisations on the availability of this new SPC video.

New course materials available

In July 1999, Mr Grant Carnie, acting CEO at the Australian Fisheries Academy, spent two weeks in Noumea to undertake a consultancy for the SPC Fisheries Training Section.

The purpose of this consultancy was to write the curriculum and produce the resource materials for two courses that would complement the certification structure for Pacific Island mariners as developed by the SPC Maritime Programme early in 1998. Following recommendations made at recent regional maritime meetings, the Fisheries Training Section had identified funding to develop the Basic Sea Safety and the Restricted Class 6 Master/Engineer certificates. Both certificates are for the crew of small vessels (fishing vessels below 15 metres; trading vessels below 20GT) operating in near-shore waters (<200nm).

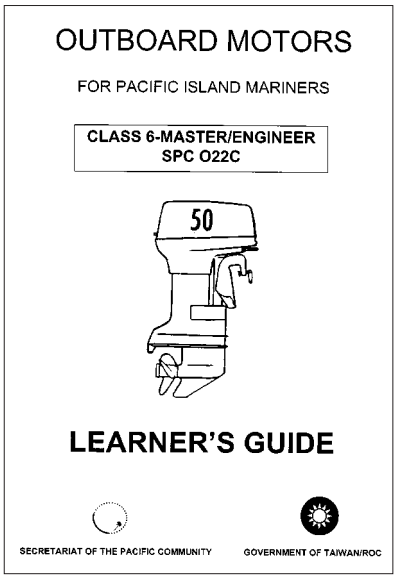
The Basic Sea Safety certificate covers the minimum safety skills required by the crew of small vessels. Its delivery, very hands-on, will take three to five days, depending on local circumstances and the equip-



ment available. It is envisaged that the Basic Sea Safety certificate will become a statutory course for the crew of small vessels, in most countries in the region. The curriculum is very similar to that of the Australian Elements of Shipboard Safety and has already been adopted by Samoa.

The course materials developed in August include a user-friendly Trainer's Guide with Learning Outcomes, Assessment Guidelines, Delivery Guidelines and Overhead Transparencies and a Learner's Guide which summarises the course content with a series of drawings.

The Restricted Class 6 Master/Engineer certificate is a modular course intended for the skippers of small vessels. It is a lower version of the Full Class 6 certificate developed by the SPC Maritime Programme in 1998. The new modules are the Restricted Nautical Knowledge (SPC 021B), the Diesel Engineering (SPC 022B) and the Outboard Motor (SPC 022C). Each module includes a Trainer's Guide and a Learner's Guide, as for the Basic Sea Safety certificate.



Through the production of these new modules and certificates, the intention of the Training Section is to increase the range of options available to national maritime authorities when developing their small-vessel legislation.

The course materials will soon be copied onto CDs and their distribution to maritime authorities and training institutions is scheduled for December 1999. The first Restricted Class 6 certificate course will be run in November 1999 at Lautoka, Fiji, for tourist boat operators of Viti Levu.

The course curriculum and resource materials will be reviewed at the next meeting of the Association of Pacific Islands Maritime Training Institutions and Maritime Authorities, in March 2000.

Funding proposals approved by Taiwan/Republic of China

The Government of Taiwan/ROC has recently given SPC its approval for the funding of a series of proposals submitted in early 1999. Of these proposals, two originated from the Fisheries Training Section.

The first project proposal, amounting to US$40,000, is a repeat of the regional course on vessel operation management and electronic aids which was run jointly by SPC and the New Zealand School of Fisheries in February 1998. This second Skippers' course, scheduled for April 2000, will soon be advertised by the Section. It will be two weeks in duration and will be run in Nelson, New Zealand.

The second project consists of training activities in seaweed farming site surveys and demonstration farms. The project will start early in 2000 and will last for approximately one year. The funds available for this project are USD35,000. The above good news shows the commitment of the Government of Taiwan/ROC towards fisheries training activities in the region.

Third regional course for managers of medium-to-large size fisheries enterprises

In the eleventh issue of the SPC *Fisheries Education and Training Information Bulletin*, the Training Section included an article on the Second Regional Workshop for Fisheries Enterprises Managers. The article provided some background information on the course and detailed the different subjects covered over the two weeks. It was also mentioned that the Training Section received a grant from the Government of Taiwan/ROC to enable the operation of the third managers' course during the second half of 1999. The third managers' course has now been completed and in addition to the grant from Taiwan/ROC, the Governments of France and Australia, as part of their annual contribution to the SPC Fisheries Training Section, have contributed partial funding towards the 1999 course.

From 18 to 29 October 1999, 13 managers of Pacific Islands fisheries enterprises attended the workshop which was tailor-made to their needs by the New Zealand School of Fisheries in Nelson. The participants, of whom four were women, were from FSM, Guam, Palau, Solomon Islands, PNG, Nauru, Fiji, Kiribati, Vanuatu and Cook Islands.

It was a successful course and the participants were easy to work with. They were very forthcoming and were constantly asking questions. They also helped each other, especially when working in small groups. The tutors from NZSOF and guest speakers were again excellent.

For more information on our enterprise management training initiatives, contact the Fisheries Training Section in Noumea.

A new dimension to fisheries training in FSM

Following the Government of FSM's decision to re-open the Micronesian Maritime and Fisheries Academy (MMFA) in Yap, under the umbrella of the College of Micronesia (COM), SPC Fisheries Training Adviser made a visit to Pohnpei in August to meet local fishing industry representatives, MMFA newly appointed Director and COM Director of Vocational Education. The main purpose of this visit was to advise MMFA / COM on their future organisational structure and course programmes while identifying areas where SPC could assist.

On his first day in FSM, SPC Fisheries Training Adviser took part in a meeting organised by MMFA / COM and attended by the managers of the five Pohnpei-based commercial fishing companies — Micronesian Longline Fishing Company (MLFC), National Fisheries Corporation (NFC), Caroline Fisheries Corporation (CFC), Pacific Foods and Services Inc., and Pacific Longlining and Supplies.

This meeting was useful in putting MMFA / COM staff in contact with private sector representatives. It also pointed out the main deficiency in FSM's domestic fishing industry — the lack of local involvement (on the 27 domestic fishing vessels operating from Pohnpei, only 45 deckhands and one skipper are FSM nationals).

A quick assessment of industry representatives' concerns revealed that the lack of qualified local engineers and the absence of a pool of Micronesian fishing deckhands are major constraints to the harmonious development of the FSM tuna fishing sector.

Based on the above findings and following further meetings with representatives of FSM fisheries administration, Japanese International Cooperation Agency (JICA) and Overseas Fishery Co-operation Foundation (OFCF) offices in Pohnpei and with a couple of fisheries consultants, SPC Fisheries Training Adviser drafted a training strategy for MMFA / COM for the period 1999–2002.

The main points in this strategy are the development of an apprenticeship training scheme for cadet engineers, the delivery of a series of pre-sea safety and fishing courses for crew of long-liners and purse-seiners, watch-keeping rating courses for the fishing and maritime industry, and Class 6 courses for master / engineers of small vessels.

It is also suggested that an instructor position be left vacant to hire external expert tutors for the running of short-term training courses or workshops in areas outside MMFA's expertise (Hazard Analysis and Critical Control Point — HACCP, quality management systems, seafood processing, resource management and conservation etc.). As for the training of the few officers of FSM-flagged merchant vessels, it is advised to seek scholarship opportunities to undertake studies at overseas institutions. Finally, SPC sees a priority in the acquisition of a suitable training vessel for MMFA in Yap.

The Government of FSM is making a major funding commitment to revive the only maritime and fisheries training institution in the country. Being placed under the umbrella of the College of Micronesia, the school is now part of the US educational system, which may offer financial as well as operational advantages.

The SPC Fisheries Training Section is committed to assist MMFA's second birth in any way it can. Section staff will stay in close contact with MMFA's new Director, Matthias Ewarmai, and COM Director of Vocational Education, Gary Robertson.

SPC Fisheries Training Specialist, Terii Luciani, will travel to Pohnpei at the end of November to help MMFA staff plan their initial pre-sea safety and fishing course.

OCEANIC FISHERIES PROGRAMME

Technical progress in fish tagging: archival tags

For fish stocks to be properly managed, the information from tagging data and catch and fishing effort analysis must be as accurate as possible.

Until recently, fish tagging consisted of attaching a numbered tag to each fish, releasing the fish at sea and then waiting for them to (possibly) be recaptured. This method makes it possible to determine the mean growth rate of a fish between the time it was released and its recapture (time at liberty), to assess its natural mortality and the stock exploitation rate, and, finally, to obtain an indication of possible movements during this time period.

Invaluable as it may be, this information does not give any indication of the fish's behaviour or rhythm of activity, for example when it eats, what depth it may be found at, whether or not the depth varies during the day and, finally, what the real route taken by the fish was while at liberty, as it may have made several trips between the release and recapture points.

The bigeye tuna in the Pacific is a good illustration of the critical need to obtain very precise details on a species' behaviour and ecology. The yellowfin tuna is the main species sought (target species) by longline fishing fleets operating in the tropical Pacific Ocean. Most catches, which generally consist of fish weighing more than 20 kg, are for the Japanese sashimi market, where they attract very high prices. The total value of longline catches in the central and western Pacific Ocean is estimated at US$700 million annually.

Purse-seine fleets also catch yellowfin and bigeye tuna and these catches have significantly increased since artificial floating rafts have come into more frequent use.

The overall growth in catches, as well as the decline in yield per unit of fishing effort for bigeye tuna recently recorded by longliners, has raised the concern of the scientific community. Scientists have, therefore, tried to better understand the movements of this migratory species — movements which are linked in part to variations in environmental parameters such as the water temperature and oxygen content.

Understanding these movements will make it possible to better interpret variations in longline catch rates, in particular, and to formulate correct theories which will be integrated into stock management models.

Archival tags, in comparison with numbered tags, provide an opportunity to collect detailed information about tunas' horizontal and vertical movements over a long period of time.

An archival tag consists of a group of resin-encased electronic components about the size of a disposable cigarette lighter, which can be carefully inserted into an incision in the fish's abdominal cavity. At set time intervals (say, once a minute) the

Archival tag being inserted in the fish's abdominal cavity

sensors record water temperature, the fish's internal temperature, the depth and the ambient light (the sensor for this is located on an antenna which remains outside the fish).

These data will be recorded for several years and stored in an electronic memory which will be downloaded into a computer after the fish has been recaptured, in order to provide a very detailed individual profile of the fish's movements through time and space in response to environmental stimuli.

Initial experiments on southern bluefin tuna have demonstrated the effectiveness of archival tags, about 12 per cent of which have been recovered after being placed in fish.

In October 1998, the SPC Oceanic Fisheries Programme participated in a bigeye tuna tagging cruise in the Coral Sea. This cruise, carried out in collaboration with CSIRO / Hobart using European, Taiwanese and Australian funding and with the assistance of an Australian longline fishing fleet, allowed the placement of 98 archival tags in 98 bigeye tuna. It is planned to tag a total of 200 fish. Most recaptures will probably take place off the east coast of Australia, but it is possible that the tuna may migrate throughout the entire tropical western Pacific. It should be noted that a large reward (US$500) is being offered to anyone who returns one of these tags to SPC and / or CSIRO.

Eighteenth Session of the Coordinating Working Party on Fishery Statistics

The Eighteenth Session of the Coordinating Working Party on Fishery Statistics (CWP) was held from 6 to 9 July 1999, hosted in Luxembourg by Eurostat, the Statistical Office of the European Communities. Twenty- eight participants representing 11 member agencies, including SPC, and 2 non-member agencies, attended the session. Member agencies represented at the meeting included:

- Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR);
- Commission for the Conservation of Southern Bluefin Tuna (CCSBT);
- Food and Agriculture Organization of the United Nations (FAO);
- Indian Ocean Tuna Commission (IOTC);
- International Commission for the Conservation of Atlantic Tunas (ICCAT);
- International Council for the Exploration of the Sea (ICES);
- International Whaling Commission (IWC);
- Northwest Atlantic Fisheries Organization (NAFO);
- Organisation for Economic Co-operation and Development (OECD);
- Secretariat for the Pacific Community (SPC); and
- Statistical Office of the European Communities (EU / Eurostat).

Non-member agencies represented at the meeting included the Inter-American Tropical Tuna Commission (IATTC) and the Southeast Atlantic Fisheries Organization (SEAFO), which is in the process of being established.

The CWP has as its purpose to:

(a) keep under continuous review the requirements for fishery statistics for research, policy-making and management;

(b) establish standard concepts, definitions, classifications and methodologies for the collection and collation of fishery statistics; and

(c) make proposals for the coordination and streamlining of statistical activities among relevant intergovernmental organisations. The CWP also provides informal direction to the work of the Fishery Information, Data and Statistics Service (FIDI) of the FAO Fisheries Department.

The CWP is not particularly well known in the fisheries departments of SPC member countries and territories. But through the standards that it has established and through the direction it gives to FAO, which requests that most SPC members report their fishery statistics under FAO's FISHSTAT system, the CWP has had an impact on the statistical work that those national fisheries departments undertake.

At its first session in May 1960 in Bergen, Norway, the CWP was called the Continuing Working Party on Fishery Statistics in the North Atlantic Area. The establishment of the CWP was the result of recommen-

dations made at the Expert Meeting on Fishery Statistics in the North Atlantic Area, which was held in September 1959 in Edinburgh, Scotland, and attended by 70 participants from 14 countries and international agencies.

In addition to identifying basic requirements for fishery statistics, proposing common definitions for fishery statistics, and recommending that the CWP be established, the 1959 meeting also recommended that observer programmes be undertaken to collect data on discards at sea. The recent development of observer programmes in the tuna fisheries of our region was foreseen by the fisheries statisticians in Edinburgh 40 years ago!

The original members of the CWP were the governments of Canada, the Federal Republic of Germany, Iceland and the United Kingdom, and three intergovernmental agencies, — FAO, ICES, and NAFO's predecessor, ICNAF (International Commission for Northwest Atlantic Fisheries).

At the sixth session in February 1969 in Copenhagen, Denmark, the name was changed to the Coordinating Working Party on Atlantic Fishery Statistics and the membership was modified to include only the intergovernmental agencies. By the time of the fifteenth session in July 1992 in Dartmouth, Canada, membership had widened to include several other intergovernmental agencies concerned with fishery statistics in the Atlantic.

Furthermore, in order to explore the possibility of expanding the mandate of the CWP beyond the Atlantic, one agency from outside the Atlantic, namely SPC, was invited as an observer.

The expansion of the mandate and membership of the CWP beyond the Atlantic was fully implemented at the seventeenth session in March 1997 in Hobart, Australia, when the CWP, now the Coordinating Working Party on Fishery Statistics (without the 'Atlantic' in the name), met under new statutes, and SPC and IWC were accepted as members. The process continues and at the eighteenth session in July 1999, IOTC and CCSBT also became members of CWP.

The agenda at the eighteenth session covered a wide range of issues, including changes in agency programmes in fishery statistics; harmonisation among agency databases; exchange and dissemination of information and statistics by agencies; integrated fisheries monitoring; definition of nationality of catch; major fishing area boundary modifications; statistical implications of the precautionary approach; elasmobranch statistics; fishery trade data; socio-economic indicators for fisheries; fisher statistics; landing value statistics; and fishing fleet statistics, vessel data and vessel monitoring systems.

A presentation was made by Bill Edeson, FAO's Legal Officer, who reviewed the legal status of definitions of the 'nationality of the catch' and the related responsibility for the collection and provision of data. His analysis reinforced the point that under various international agreements, and particularly the UN Implementing Agreement, flag states are responsible for providing catch and effort data, regardless of where they fish.

FAO reported on the five-year, Japanese-funded project known as the Fisheries Global Information System (FIGIS), which will integrate most FAO fisheries databases. Core components will include those related to species / stocks / resources; fisheries; statistics; trade and production; and vessels. Non-core components will include high seas registration; GlobeFish; aquaculture information; aquatic animal pathogens and quarantine; and aquatic sciences and fisheries abstracts.

There was a demonstration of various software developed by the agencies. Tim Lawson, SPC Fisheries Statistician, demonstrated the OFP's Catch and Effort Query System (CES) by producing tables and maps of tuna fisheries in the western and central Pacific. Adele Crispoldi, FAO's Senior Fishery Statistician, demonstrated FishStat Plus, a new, much improved Windows version of FAO's FishStat, which is used for extracting annual catch estimates from the FAO database on CD-ROM.

SPC offered to hold the next session, CWP–19, in Noumea and the offer was gratefully accepted. SPC will thus become the first new member to host the meeting. The tentative dates are from 9 to 13 July 2001.

CONGRESS PASSES BAN ON SHARK FISHING

The House of Representatives passed a resolution (H. Con. Res. 189) today (1st November 1999) to 'promptly and permanently end' shark finning—the wasteful and destructive practice of slicing off a shark's fins and discarding its carcass at sea in waters off United States.

The effort to ban finning has been spearheaded by Rep. Randy Cunningham (R-CA) and forcefully supported by Chairman Jim Saxton (R-NJ) and Reps. Wayne Gilchrest (R-MD) and Bruce Vento (D-MN). While the practice is illegal in federal waters of the U.S. Atlantic, shark finning is expanding significantly in the Central and Western U.S. Pacific.

During debate, Cunningham quoted Ms. Sonja Fordham, Center for Marine Conservation, indicating that the conspicuous lack of protection for Western Pacific sharks represents a glaring gap in otherwise relatively sound U.S. shark policy.

Fordham further noted, 'The rampant finning off Hawaii in particular threatens to undermine the U.S. leadership role in raising global awareness of the plight and special conservation needs of sharks.'

(Source: Ocean Wildlife Campaign)

A FARM BELOW THE WAVES

An aquaculture experiment puts a cage filled with a traditional island delicacy 40 feet beneath the ocean's surface.

A school of 70,000 *moi*, also known as Pacific threadfin or *Polydactylus sexfilis*, is maturing in an underwater cage moored in the waters off Ewa, an experiment that scientists hope will prove the potential of an entirely new kind of aquaculture in Hawaii.

The use of cages that float on the surface is common in aquaculture across much of the world including salmon fisheries in Norway and Chile, and sea bass and sea bream fisheries in the Mediterranean, for example.

But few have experimented with cages that remain entirely submerged, invisible from the surface and protected from waves.

'This is U.S. technology', said Michael Chambers, a marine biologist with the Oceanic Institute, a non-profit marine research laboratory based at Makapuu Point on Oahu. The institute is conducting the project in association with the University of Hawaii Sea Grant Program.

The Sea Station cage was developed by Ocean Spar Technologies of Bainbridge Island, Washington. Ocean Spar engineers helped install the cage and the firm donated the mooring equipment, said Ocean Spar Pacific representative Rick Gaffney.

It uses a framework of steel pipe connected by a super-strong synthetic mesh, and is moored by four huge anchors to a sandy bottom in 100 feet of water. The top of the 50-foot-tall structure is 40 feet below the surface. A steel tube runs around its perimeter, which is 80 feet wide.

The shape of the cage is two wide cones connected at their flat ends. Researchers call it biconical. It's kind of like two giant '*opihi*, stuck foot-to-foot.

Last April the Oceanic Institute pumped 70,000 *moi* fingerlings into the cage. The fish are fed daily through a tube that divers snag and bring to the surface. Divers are able to enter the cage through a zipper in the mesh.

A crew is on hand about eight hours a day. One of the duties of the divers is to scrub marine growth off the mesh.

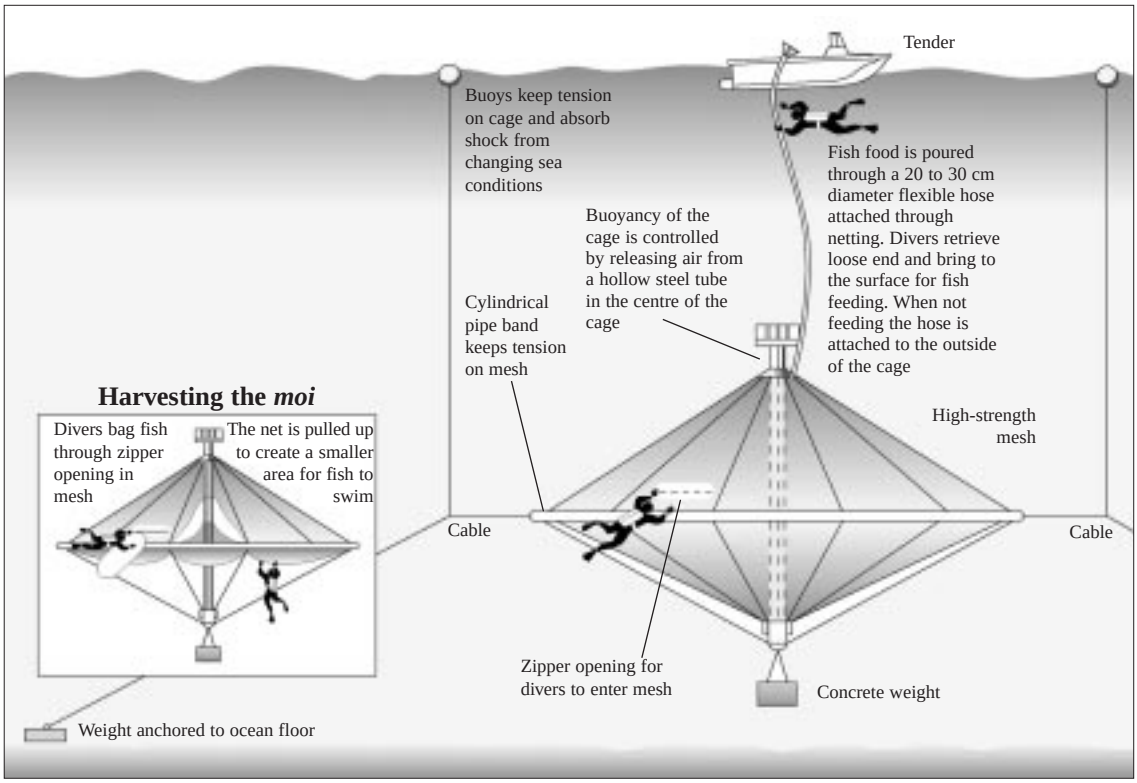
Hawaii Sea Grant Program director Charles Helsley said that while there are challenges, such as maintaining the structure, there also are benefits. 'On land, aquaculture can have a fair amount of pumping cost, and wastewater disposal problems. And in the immediate coastal areas there are a number of regulations that restrict what you can do', Helsley said.

One issue is whether a confined school of fish creates a plume of waste down-current from the cage.

'Part of the purpose of this is to find out whether we can measure any pollution. So far we can't find any', Helsley said. 'In this situation, dilution seems to be the solution to pollution.'

The *moi*, or Pacific threadfin, was selected primarily because it is a fish that Oceanic Institute knows how to produce in large numbers, and which researchers thought might do well in the cage.

Moi normally live in the surf zone, so scientists are trying to determine how they'll do in a



Underwater fish farm

cage that keeps them 40 to 90 feet below the surface. They appear to be doing fine, Helsley said.

If the technical problems are overcome, the next issue is whether the researchers can market the fish outside Hawaii. They don't want to compete with local fishpond, raceway or backyard aquaculture ventures. While *moi* is regarded as a delicacy in Hawaii, it is not well known elsewhere.

Helsley said the programme has identified fish wholesalers on the Mainland and in Asia who will take *moi* on consignment. Divers are expected to begin harvesting the fish in about two months, when they weigh about a pound.

Chambers said there are costs associated with a research programme that a commercial operator wouldn't face. He said he estimates a commercial grower could produce up to 150,000 *moi* in a cage the size of the Sea Station off Ewa, at US$2 to US$3 per one-pound fish.

'Ultimately,' Helsley said, 'other high-value species, such as *papio*, *kahala* and the snappers—*onaga*, *'ehu* and *'opakapaka*—might make more sense. But more research still is needed on how to grow these species in captivity.'

(Source: *The Honolulu Advertiser*, 30 August 1999)

FISHERIES PROJECT GIVES RESOURCE MANAGEMENT CONTROL TO VILLAGE

Village communities in American Samoa will have more control of their marine environment in the future, thanks to the Community-based Fisheries Management Project, an initiative of the Department of Marine and Wildlife Resources.

For the past two years, DMWR has conducted surveys and interviews with community leaders about traditional management of the marine environment and its resources (e.g. fish). In addition, DMWR convened workshops on resource conservation with *pulenu'us*, fishermen, fish market vendors and other interested parties.

Those activities helped guide DMWR's plans for phase III of the programme, and to identify which villages will participate in phase III.

In selected villages, DMWR will convene meetings with traditional leaders and other members of the village community to discuss the creation of village-based marine conservation regimes.

DMWR will facilitate these discussions and will provide training and technical assistance.

The community fisheries management project is designed to integrate traditional practises with resource management through the establishment of community-based marine protected areas.

DMWR Acting Director Alofa Tuaumu said this innovative approach reflects 'a genuine effort by the department to have village people become motivated and actively involved in the sustainable utilisation and management of local marine resources.' He added that a community-based initiative is the best approach to rational resource management and said that similar projects have proven successful in other Pacific Islands.

The community-based Fisheries Management Project is designed to provide villagers with a 'direct participatory role in the administration of their own inshore marine resources and to decentralise enforcement and management procedures,' according to DMWR's Chief Biologist Tanielu Su'a.

Su'a added that to ensure full participation, village people will be trained in the fundamentals of resource management and monitoring. 'They will also learn about management responsibilities as well as benefits emanating from this project, some of which will include the availability of abundant stocks of fish and invertebrates, and improved coral reef areas and overall marine environment conditions.'

Su'a said villagers will be trained to carry out coral reef surveys and marine resources assessments, and to make informed and wise decisions on how to handle detrimental influences on the nearshore marine environment.

Furthermore, each village will develop regulations that reflect its unique situation in and will be responsible for the enforcement of such regulations.

According to the chief biologist, the outcome of this project will include a resource atlas, and management and regulations procedures which should reflect the village commitment in the entire process of sustainable management.

In recognition of the vital role education plays in the successful implementation of this project, DMWR's Information and Education Division will develop public awareness materials and coordinate training workshops for participating villages.

Workshops will equip villagers with basic knowledge about management and conservation, fish biology and species identification, coral reef ecology, data collecting and reporting, and other critical issues relevant to resource management.

DMWR believes the project will require the participation of every sector in the village community, e.g. traditional leaders, women, youth, *aumaga* and fishers. The challenge facing the department is to motivate everyone to embrace the concept and to become actively involved in resource conservation.

The community-based Fisheries Management Project is a component of DMWR's Fisheries Investigations 5-year Plan. Financial support comes largely from a federal grant. The South Pacific Regional Environment Programme (SPREP) has indicated that it will assist with some funding as well.

(Source: *Samoa News*, 16 August 1999)

UTILISATION OF TRANSGENIC FISH IN DEVELOPING COUNTRIES: POTENTIAL BENEFITS AND RISKS

DNA recombination and gene transfer technology now allow the transfer, hereditary transmission and expression of specific DNA or gene sequences in fish. Preliminary results obtained with these transgenic fish have shown exceptional performances in some cases, especially when growth hormone genes were transferred. Use of these high-performance, transgenic fish is likely to significantly augment aquacultural production capacities in developing countries and increase revenues to poor aquaculturalists.

The growth rate of certain transgenic fish was multiplied by a factor of 10 under laboratory

conditions. The most convincing results are obtained on fish which have not previously undergone selection operations, something which should be of particular benefit to developing countries.

Fish such as carp and tilapia appear to be good candidates for these applications. The potential increases in production and productivity linked to transgenic applications could decrease pressures to destroy the ecosystem for food production, relieve overexploitation of natural stocks and discourage the introduction of exotic species.

The use of transgenic fish for aquaculture is in its initial stages and may well develop over the next few years. However, a certain number of issues must be dealt with before commercialisation of transgenic products can be considered, e.g. public information, environmental risks and food security. Improved transgenic fish resulting from recombinant DNA technology undoubtedly pose no greater threat than fish which have been genetically improved through traditional selective reproduction techniques. It is, however, necessary to gather certain environmental and socio-economic data.

Exporters of fish and other aquatic animals must be warned that in the USA, and probably in other countries, most trangenic products are covered by legislature on medications and are considered unapproved products. For that reason, they are likely to be seized or rejected upon entry into the territory if they are examined and identified by Inspection Services. HACCP plans must take into account the use of transgenic aquatic species.

(Source: *Bibliomer,* No. 7, September 1999)

■ TUNA 2000 BANGKOK

Organised by INFOFISH, the Sixth World Tuna Trade Conference—TUNA 2000 will be held from 25 to 27 May 2000 in Bangkok, Thailand.

Since the last gathering of the world tuna industry at TUNA '97 BANGKOK, significant changes have taken place in the tuna world. Erratic landings of skipjack and yellowfin tuna during the past one and a half years in particular, have jolted the international market. The major tuna industry players, the USA, the EU and Japan, are reviewing marketing policies and imports. The recent comeback of a leading US buyer in Asia is a reflection of these new directions.

Highlighting the important aspects of this environmentally sensitive industry, TUNA 2000 will focus on:

- Tuna resources, supplies and prices;
- Recent trends in the US canned tuna market and import patterns;
- Economic recession and tuna consumption in Japan;
- Shifting supply sources in European markets and ACP privileges;
- Emerging markets in Asia and in Latin America;
- Private label products vs supermarket brands;
- Innovation / convenience / luxury / premium products;
- Advances in processing technology;
- Eco-labelling and conservation;
- Future of tuna culture; and
- Responsible fishing and Codes of Practice.

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SURVEY OF THE NAMOUI FISHERIES RESERVE IN NIUE

by Pierre Labrosse [1], Being Yeeting [1] and Brendon Pasisi [2]

Introduction

The island of Niue is located in the South Pacific ocean at latitude 19° south and longitude 169.5° west (Figure 1). It is an elevated former tropical atoll with a surface area of 258 sq. km and a circumference of about 65 km. It is dish-shaped, with a height of about 60 m at the edge and 30 m in the centre.

Niue is small and its natural resources are therefore limited. Various crops, such as fruit, vegetables, vanilla and taro, are grown on the plateau. Niue does not have a lagoon. The coast is surrounded by a narrow fringing reef, running into a reef slope which descends to more than 1000 m some 5 km from the coast. The reef area has been estimated at about 620 ha (Dalzell et al., 1993). Half of Niue's fisheries production comes from the fringing reef, with an estimated yield of 9.3 t/sq.m/year (Dalzell et al., 1993). The reef is an important source of fish and molluscs for island residents.

At the request of the Government of Niue, SPC conducted an assessment of resources with potential for subsistence consumption and/or sale at a coastal site in Namoui which had recently been declared a marine reserve. This survey was part of the ICFMaP (Integrated Coastal Fisheries Management Project) funded by the United Kingdom. It can be used as a starting and reference point for a longer term resource monitoring system.

The Namoui site was not made into a reserve in response to any proven situation of overfishing or of human damage to the habitat. This decision should rather be seen in the context of a precautionary approach designed both to protect the resources of certain coastal areas from fisheries activities and to preserve overall biodiversity as a heritage for the benefit of future generations. Namoui can be considered a fisheries reserve (Richer de Forges, 1998).

The Namoui Marine Reserve is located south of Makapu Point (Figure 1). Its total water surface area to the 50 m isobath is 27.67 ha (DJLS, Government of Niue, pers. comm.). A second site was included in the survey for other comparative fisheries studies to be possible in the future.

This site was located at Avatele, north of Tepa Point (Figure 1). Sampling required two weeks of work in Niue (from 25 November to 8 December 1998) and required a team of two people accompanied by the head of

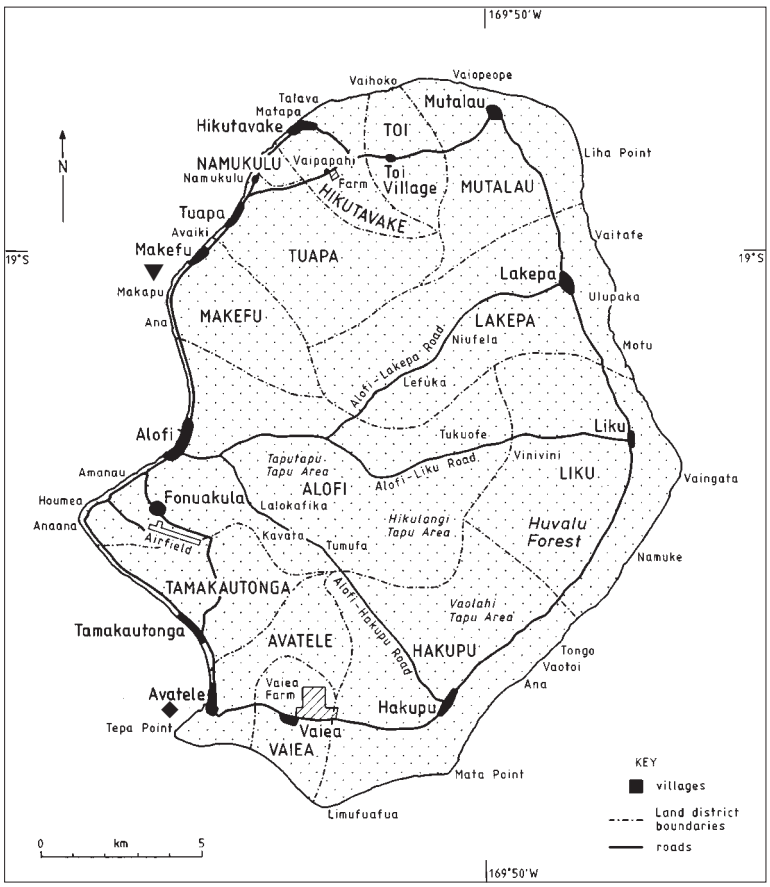

Figure 1: Map of Niue: location of the Namoui Marine Reserve (▼) and the Avatele site (◆)

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the local fishery service. The sub-intertidal area was sampled by underwater visual censuses and the intertidal reef flat by the quadrat survey method (at the Namoui Marine Reserve site only). The species to be surveyed were chosen in consultation with the Niue Fishery Service. A total of 24 underwater visual censuses and 10 quadrats were carried out. They made it possible to:

1) prepare an inventory and status report on species (demersal fish species and invertebrates) with potential for subsistence consumption and / or sale, and / or those of major ecological importance;

2) carry out a survey of the habitat and related living organisms;

3) analyse the main structures of demersal fish communities;

4) formulate a programme to monitor the Reserve's resources.

Sampling techniques

Visual diving censuses

The underwater visual censuses were distributed in such a way as to cover the sub-intertidal reef flat and slope, with a minimum sampling frequency of two dives every 0.2 miles.

The populations were studied using the so-called 'line-transect' method (Buckland et al., 1993). At each site, a 50 m transect was marked out by five ten-metre measuring tapes. Two divers, one on either side of the transect, conducted visual surveys (Figure 2). They noted all commercial fish seen. For each observation, they identified the species concerned and estimated the number of specimens (n) and the size and perpendicular distance (d) of the fish from the transect. The selected invertebrates were identified and counted along a strip 6 m wide, i.e. extending 3 m to either side of the transect.

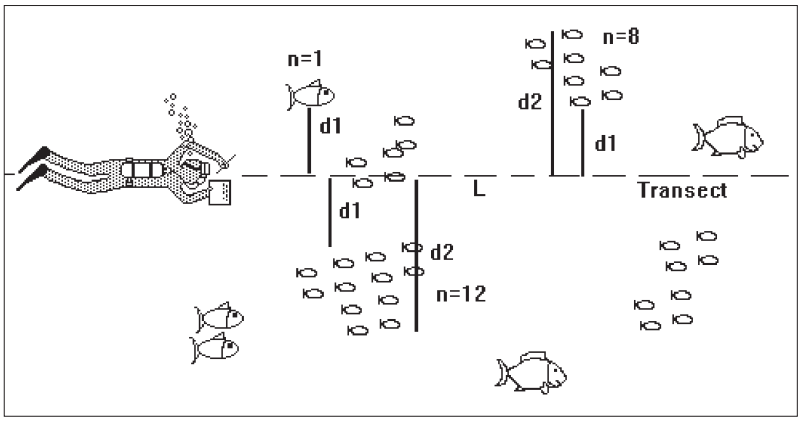

Figure 2. Underwater visual censuses (L= length of transect, d1= distance of the fish from the transect, n= number of fish)

The environmental characteristics of each transect were noted. Once every metre, one of the two divers recorded the composition of the substrate encountered vertically from the 50 m line, i.e. mud, fine sand, coarse sand, rubble, blocks, rocks or coral heads (Table 1).

In the same way, the observers noted the types of living organisms covering the substrate (i.e. stringy algae, brown algae, green algae, Alcyonaria, coral).

Quadrats

The location of quadrats was chosen in such a way as to cover the entire intertidal reef flat. However, the part bordering the low tide mark could not be surveyed due to the waves.

The quadrats measured 5 m square and each therefore demarcated a surface area of 25 sq. m. In each, the observers identified and then counted the organisms targeted by the study, i.e. polychete worms, drupes, sea-cucumbers, trochus, thorny oysters (spondylidae), and rapa snail (*Rapa rapa*).

Table 1. Granulometric scale used during surveys

Name	Description
Mud	Particles < 0.063 mm in size
Fine sand	Particles 0.063 to 0.25 mm in size
Coarse sand	Particles 0.25 mm to 2 mm in size
Gravel	Particles 2 mm to 1 cm in diameter
Debris	1 to 5 cm in diameter
Small blocks	5 to 30 cm in diameter
Big blocks	30 to 100 cm in diameter
Rock	Rock of organic or non-organic origin
Coral head	Coral head more than 1 m in diameter
Slab	Hardened horizontal layer

Structure of fish populations

General data

A total of 103 fish species belonging to 19 families was observed, 79 of which showed real potential for marketing and/or subsistence consumption. The other 24 species were included on the basis of special ecological interest [3] or an apparently significant abundance.

The number of species per transect and the density were similar in scale at both the study sites (Table 2). Overall, the mean biomass values observed in the Namoui Reserve were among the lowest reported for fringing reefs in the Indo-Pacific region (Table 3). On the other hand, the values at the Avatele site were among the highest— clearly higher than those at the Namoui Reserve—which probably means differences in mean specimen weights (Table 2). At the scale of the two biotopes studied, there were no significant differences in the parameters considered between the two sites (Table 2). The total stock of species with potential for home consumption and/or sale could be estimated at about 15 tonnes for the Namoui Reserve site.

Principal families

The most diversified families were the Acanthuridae (22 species in all), Chaetodontidae (16), Scaridae (13), Labridae (12) and Serranidae (8). This pattern recurred almost identically in both the sites and biotopes studied. The highest mean density and biomass values at both sites were observed in Acanthuridae (surgeon fish), with, respectively, 0.14 specimens/sq. m (37% of total density) and 26 g/sq. m (30% of total biomass) (Tables 4 and 5).

The same was true at the Marine Reserve with 0.14 specimens/sq. m and 26 g/sq. m and at Avatele with 0.25 specimens/sq. m and 74 g/sq. m.

Other families showed lower values. In terms of density, the most significant other families were, in descending order, the Serranidae (grouper, cod), Chaetodontidae (butterfly fish) and Mullidae (red mullet). In terms of biomass, the most significant families were Scaridae (parrot fish), Serranidae, Chaetodontidae and Lutjanidae (snappers). The five largest families

Table 2. Total number of sites and species, mean number of species per transect, density, mean biomass and total stocks obtained at the sites and biotopes studied (figures in italics indicate the confidence interval at a threshold of 5% on either side of the mean)

Biotope zone	(1) Namoui Reserve			(2) Avatele			Total
	Slope	Reef flat	Total	Slope	Reef flat	Total	(1) + (2)
Number of sites	8	8	16	4	4	8	24
Number of species	75	62	86	66	55	76	103
Number of species/transect	30 *3.5*	27 *3.1*	30 *2.5*	36 *5.6*	29 *3.6*	30 *4.2*	30 *2.3*
Density (specimens/sq. m)	0.35 *0.125*	0.29 *0.146*	0.32 *0.096*	0.59 *0.14*	0.43 *0.14*	0.5 *0.1*	0.37 *0.07*
Biomass (g/sq. m)	55.3 *19.53*	54.4 *26.77*	53.8 *16.18*	193.1 *45.88*	127.1 *42.82*	154.9 *31.11*	82.1 *16.15*
Total stock (tonnes)	-	-	15 *4*	-	-	-	-

Table 3. Fish density (specimens/sq. m) and biomass (g/sq. m) estimates for some fringing reefs in the Indo-Pacific region. The figures cover all species, unless otherwise indicated. (*) = only commercial species

Location	Type of environment	Density	Biomass	Source
Namoui Reserve (Niue)	Fringing reef	0.32 *	54 *	This study
Avatele (Niue)	Fringing reef	0.5 *	155 *	This study
Eastern lagoon, Northern Province, New Caledonia	Islands	0.52 *	231 *	Letourneur et al., 1997
Western lagoon, Northern Province, New Caledonia	Fringing reef	0.43 *	270 *	Labrosse et al., 1997
Northern lagoon, Northern Province, New Caledonia	Fringing reef	0.54 *	339 *	Labrosse et al., 1996
Hawaii	Fringing reef	3.1	106	Brock et al., 1979
Chesterfield	Fringing reef	2.0/3.2	37/43	Kulbicki et al., 1990
Australia	Fringing reef	7	92	Williams & Hatcher, 1983

(3) In particular, this involved species from the Chaetodontidae family, i.e. butterfly fish (16 species surveyed), which, in general, are strongly linked to coral cover of the substrate (Bouchon-Navarro & Bouchon, 1989) and which can be considered an indicator of the reef's health.

Table 4. Mean densities (in specimens/sq. m) of fish families from both sites and biotopes studied (figures in italics indicate confidence interval at a threshold of 5% on either side of the mean)

Family	(1) Marine Reserve			(2) Avatele			Total
	Slope	Reef flat	Slope + Reef flat	Slope	Reef flat	Slope + Reef flat	(1) + (2)
Carcharinidae	0.0001	0.0002	0.0001 *0.001*	0.0007		0.0003	1.10^{-4} *1.10^{-3}*
Holocentridae	0.0142 *0.019*	0.0028	0.0075 *0.0094*	0.1483 *0.0687*	0.0075	0.0774 *0.0368*	0.007 *0.0009*
Serranidae	0.0453 *0.0179*	0.0403 *0.0181*	0.0427 *0.013*	0.0461 *0.0245*	0.029 *0.0208*	0.0373 *0.0167*	0.043 *0.013*
Carangidae	0.0002	0.0003 *0.0013*	0.0002 *0.0008*	0.0014 *0.0059*	0.0014 *0.0045*	0.0013 *0.0036*	2.10^{-4} *8.10^{-4}*
Lutjanidae	0.0117 *0.0193*	0.0104 *0.0222*	0.0109 *0.0146*	0.0269 *0.0264*	0.0105 *0.0122*	0.0183 *0.015*	0.011 *0.015*
Caesionidae	0.0005	0.0166 *0.0013*	0.0085 *0.0023*	0.008 *0.0048*		0.004 *0.0024*	0.009 *0.002*
Haemulidae	0.0002		0.0001	0.0053		0.0027	8.10^{-5}
Lethrinidae	0.0054 *0.009*	0.0031 *0.0102*	0.0042 *0.0068*	0.0056 *0.0072*	0.0032 *0.0047*	0.0042 *0.0047*	0.004 *0.007*
Mullidae	0.0592 *0.0087*	0.006 *0.005*	0.0326 *0.0058*	0.0189 *0.0125*	0.0195 *0.0073*	0.0146 *0.0096*	0.033 *0.006*
Kyphosidae		0.0004 *0.0027*	0.0002 *0.0014*	0.005	0.0016 *0.0033*	0.003 *0.0082*	2.10^{-4} *0.001*
Chaetodontidae	0.0477 *0.0188*	0.0297 *0.0114*	0.0365 *0.012*	0.0724 *0.0329*	0.0345 *0.0151*	0.0518 *0.0195*	0.037 *0.012*
Pomacanthidae	0.0015 *0.0034*	0.001 *0.0019*	0.0012 *0.002*	0.0012 *0.0064*	0.0004	0.0008 *0.0032*	0.001 *0.002*
Pomacentridae	0.0217		0.0108		0.0033 *0.0162*	0.0017 *0.0081*	0.011
Cirrhitidae	0.0042 *0.0028*	0.0059 *0.0032*	0.005 *0.0024*	0.0116 *0.0097*	0.0025 *0.0023*	0.0063 *0.0057*	0.005 *0.002*
Labridae	0.0062 *0.0044*	0.0057 *0.004*	0.0058 *0.0041*	0.0091 *0.0112*	0.0042 *0.002*	0.0066 *0.0061*	0.006 *0.004*
Scaridae	0.0143 *0.0094*	0.0137 *0.008*	0.139 *0.0086*	0.0238 *0.0156*	0.0093 *0.0148*	0.0162 *0.0121*	0.014 *0.009*
Acanthuridae	0.1218 *0.0366*	0.1578 *0.0684*	0.1384 *0.0463*	0.207 *0.0714*	0.3043 *0.1119*	0.2545 *0.0666*	0.138 *0.046*
Zanclidae	0.0003 *0.0011*	0.0023 *0.0032*	0.0013 *0.0017*		0.0013 *0.0028*	0.0007 *0.0014*	0.001 *0.002*
Balistidae		0.001 *0.0004*	0.0005	0.0012 *0.0062*		0.0006 *0.0031*	5.10^{-4}

accounted for more than half of total biomass.

In general, there were no significant differences between the density values recorded for reef flats or slopes for the principal families surveyed (Table 4).

The situation was, however, clearly different for biomass. Except for Lutjanidae, mean biomasses were greater on the slope than on the reef flat for the principal families (Table 5).

Principal species

Twelve species alone accounted for 49% of total density and 57% of total biomass. They belonged to the Acanthuridae (4 species), Scaridae (2), Serranidae (2), Holocentridae (1) (soldier fish), Lutjanidae (1), Mullidae (1) and Chaetodontidae (1) families.

The highest abundance levels were recorded for *Ctenochaetus striatus* (orange-dotted tang), *Acanthurus nigricans* (grey surgeon fish with yellow marks), *Myripristis murdjan* (big-eyed myripristis), *Cephalopholis urodeta* (flag-tailed cod) and *Acanthurus lineatus* (clown surgeon fish with blue lines) (Figure 3). Only two significant differences were recorded and they concerned *Acanthurus nigricans* and *Myripristis murdjan*, for which densities were clearly higher at Avatele than at the Namoui Reserve (Figure 3).

In terms of biomass, the best represented species differed from those recorded as making the main contribution to density, which could reflect differences in mean specimen weights.

To the species *Ctenochaetus striatus*, *Acanthurus nigricans*, *Myripristis murdjan* and *Acanthurus lineatus* should be added two other species, *Macolor niger* (black and white snapper) and *Scarus microrhinos* (gibbous parrot fish) (Table 5).

In contrast to density, for most of the principal species recorded, significant differences did exist in terms of biomass between the two study sites, particularly with regard to the six most fre-

Table 5. Mean biomass (in g/sq. m) of fish families from the two sites and biotopes studied (figures in italics indicate the confidence interval at a threshold of 5% on either side of the mean)

Family	(1) Marine Reserve			(2) Avatele			Total
	Slope	Reef flat	Slope + Reef flat	Slope	Reef flat	Slope + Reef flat	(1) + (2)
Carcharinidae	1.665	3.252	2.001 *0.075*	12.233		6.117	2.001 *0.075*
Holocentridae	2.760 *0.220*	0.134	1.415 *0.077*	13.740 *2.896*	2.484	8.381 *1.260*	1.415 *0.076*
Serranidae	7.678 *0.261*	4.353 *0.188*	6.018 *0.159*	8.699 *0.336*	4.130 *0.198*	6.379 *0.191*	6.018 *0.159*
Carangidae	0.060	0.445 *0.017*	0.260 *0.007*	25.409 *2.305*	1.976 *0.141*	10.617 *0.600*	0.260 *0.007*
Lutjanidae	2.990 *0.137*	2.998 *0.206*	2.981 *0.116*	15.398 *1.084*	6.509 *0.432*	10.852 *0.544*	2.981 *0.116*
Caesionidae	0.038	1.318 *0.027*	0.678 *0.034*	1.677 *0.137*		0.838 *0.049*	0.678 *0.034*
Haemulidae	0.057		0.028	5.438		2.719	0.028
Lethrinidae	1.305 *0.079*	0.708 *0.054*	1.001 *0.048*	2.199 *0.147*	0.977 *0.041*	1.538 *0.064*	1.001 *0.048*
Mullidae	1.998 *0.057*	0.769 *0.025*	1.376 *0.033*	3.538 *0.203*	4.064 *0.107*	2.893 *0.118*	1.376 *0.033*
Kyphosidae		0.156 *0.008*	0.078 *0.003*	6.668	0.926 *0.053*	3.141 *0.267*	0.078 *0.003*
Chaetodontidae	5.845 *0.161*	1.927 *0.031*	3.698 *0.064*	8.867 *0.289*	2.974 *0.078*	5.834 *0.122*	3.698 *0.064*
Pomacanthidae	0.690 *0.038*	0.345 *0.016*	0.503 *0.019*	1.040 *0.088*	0.618	0.835 *0.046*	0.503 *0.019*
Pomacentridae	0.300		0.149		0.645 *0.097*	0.322 *0.035*	0.149
Cirrhitidae	0.232 *0.008*	0.449 *0.015*	0.338 *0.008*	1.429 *0.073*	0.284 *0.010*	0.756 *0.027*	0.338 *0.008*
Labridae	0.808 *0.015*	0.615 *0.010*	0.721 *0.011*	3.547 *0.064*	2.307 *0.010*	2.942 *0.027*	0.721 *0.011*
Scaridae	6.884 *0.140*	6.360 *0.141*	6.503 *0.128*	20.963 *0.718*	12.488 *0.769*	16.390 *0.529*	6.503 *0.128*
Acanthuridae	21.916 *0.621*	30.162 *1.540*	25.816 *0.890*	61.879 *3.828*	86.575 *5.587*	74.034 *3.216*	25.816 *0.890*
Zanclidae	0.030 *0.001*	0.240 *0.011*	0.134 *0.004*		0.196 *0.011*	0.098 *0.003*	0.134 *0.004*
Balistidae		0.177	0.090	0.398 *0.034*		0.199 *0.011*	0.090

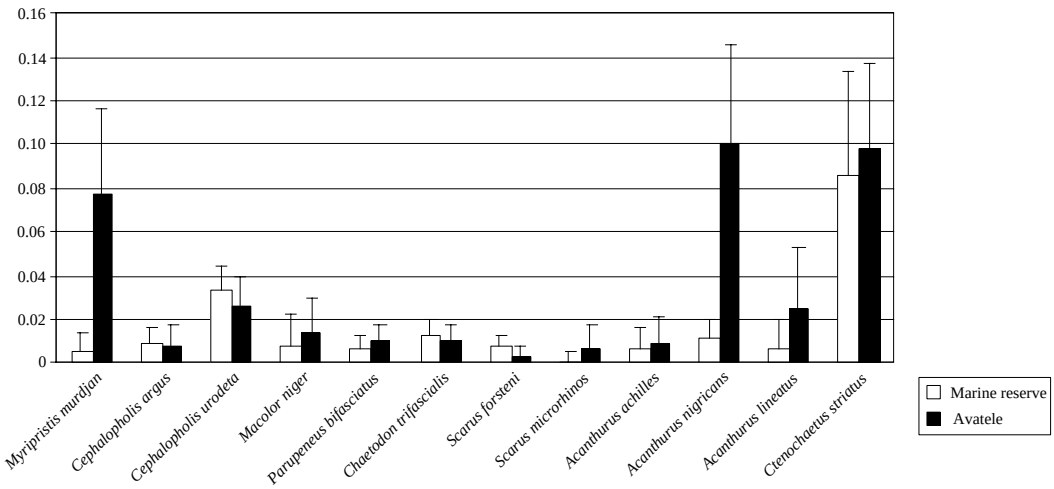

Figure 3. Mean densities (in specimens/sq. m) for the principal fish species at the two study sites (vertical bars indicate the confidence interval at a threshold of 5% on either side of the mean)

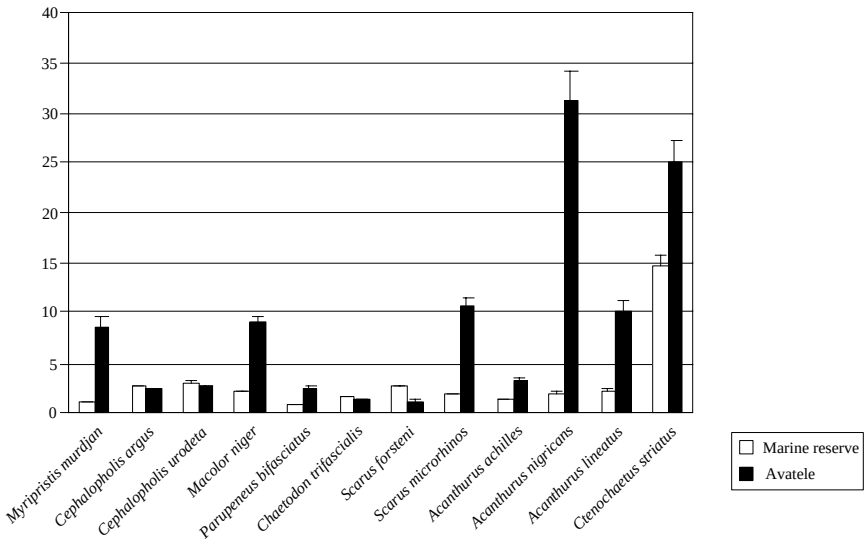

Figure 4. Mean biomasses (in g/sq. m) for the principal fish species at the two study sites (vertical bars indicate the confidence interval at a threshold of 5% on either side of the mean)

quently encountered fish, for which biomasses were higher at Avatele than at the Marine Reserve. An identical situation was found with *Parupeneus bifasciatus* (two-barbed goat fish) and *Acanthurus achilles* (red-spotted surgeon fish) (Figure 4).

The mean specimen sizes and weights for certain species showed statistically significant differences at the two study sites (Table 6). The values observed for *Myripristis murdjan* were higher at the Namoui Reserve than at Avatele. In contrast, other species had mean specimen sizes and weights which were higher at Avatele than at the Marine Reserve. These were *Macolor niger*, *Acanthurus achilles*, *A. nigricans* and *Ctenochaetus striatus* (Table 6).

Demographic and trophic structures

Study of the demographic and trophic structures did not show any significant differences between the populations of the Namoui Reserve and those of the Avatele site.

Table 6. Mean sizes (in cm), and weight (in g) for the principal fish species at the two study sites (the figures in italics indicate the confidence interval at a threshold of 5% on either side of the mean)

Species	Mean size (cm)		Mean weight (g)	
	Reserve	Avatele	Reserve	Avatele
Myripristis murdjan	19.33 *1.90*	14.70 *2.64*	208.61 *46.87*	108.29 *68.96*
Cephalopholis argus	24.73 *1.20*	25.12 *1.37*	291.48 *45.30*	290.18 *51.42*
Cephalopholis urodeta	16.75 *0.62*	17.67 *0.87*	92.15 *10.78*	104.09 *17.69*
Macolor niger	24.33 *0.70*	30.34 *2.79*	272.08 *22.31*	652.35 *163.67*
Parupeneus bifasciatus	16.11 *1.89*	20.50 *1.77*	128.74 *32.68*	232.98 *58.27*
Chaetodon trifascialis	14.07 *1.15*	13.88 *1.90*	124.27 *27.19*	125.15 *52.05*
Scarus forsteni	24.56 *0.89*	24.06 *2.07*	361.98 *41.80*	347.58 *85.12*
Scarus microrhinos	43.19 *4.67*	39.86 *4.71*	1867.12 *553.88*	1720.52 *602.22*
Acanthurus achilles	17.38 *1.95*	23.17 *1.36*	199.95 *51.22*	362.13 *47.97*
Acanthurus nigricans	17.04 *1.25*	21.01 *0.85*	181.54 *30.89*	313.42 *27.16*
Acanthurus lineatus	22.61 *1.07*	24.25 *0.77*	332.26 *47.93*	405.82 *34.87*
Ctenochaetus striatus	17.35 *0.61*	19.91 *0.92*	172.06 *15.64*	254.88 *26.50*

Except for small fast-growing species, which were very under-represented (as they had been under-sampled), other demographic categories showed a relatively high percentage of total diversity. This suggests that these populations maintain a good balance between several demographic strategies characterised by medium- to long-expected life spans. Small- and medium-sized fish with average life spans and rapid growth accounted for significant percentages of density (about 40%) and biomass (about 50%).

Analysis of the trophic structures showed a clear predominance of micro-herbivorous fish in terms of both density and biomass. They were four to five times more frequent than macro-carnivores or piscivores. Species from other trophic categories accounted for only a small percentage of density and biomass.

Invertebrate populations

Intertidal zone

A total of eight species or groups of species was considered. The highest densities were observed for polychaete tube worms and rapa snail (*Rapa rapa)* (Table 7). Other species or groups of species showed values which were much lower.

Sub-intertidal zone

A total of three categories of invertebrates was considered, i.e. Diadema sea urchins, sea-cucumbers and giant clams. With sea-cucumbers, 98% of the specimens recorded were from the species *Holothuria atra*. Of the giant clams, only the species *Tricnada maxima* was observed. In general, the densities calculated for sea-cucumbers and giant clams were much lower than those reported by Dalzell et al. (1993) (Table 8).

It is, however, difficult to interpret these differences as the methods used in each study differed. It is nevertheless likely that fishing pressure can at least partially explain these results.

Habitat

Overall, the mean characteristics of the substrate were similar whatever the site or biotope sampled. The substrate was mainly composed of a hard bottom with a high percentage of rock (more than 80%).

The overall living-organism cover was about 50%. A relative similarity existed between the sites and biotopes. Living organisms were mainly composed of small branching corals. Of these, tubular coral was the dominant type on the reef slopes. Stony coral and large branching coral accounted for smaller percentages.

The Namoui Reserve is one of the areas on the west coast of Niue which was particularly hard hit by Cyclone Ofa in 1990 (Dalzell et al., 1993). All living branching coral was destroyed at that time. It should be noted that, in less than 10 years, coral recolonisation has been significant and relatively homogenous throughout the site.

Conclusions and prospects

This study yielded an assessment of resources at the Namoui Marine Reserve, and, to a lesser degree, at the Avatele site. The differences observed suggest that the two sites are subject to different influences (e.g. fishing pressure, environmental conditions).

The main contribution of this work is the use which will be made of its results as part of a larger monitoring programme. This programme should include similar sampling projects based on comparable methodologies at regular intervals (every three years) or in the event of specific occurrences (e.g. accidental disturbances). This monitoring programme should make it possible to:

Table 7. Densities (in species/ha) of species or groups of species surveyed on the intertidal reef flat

Organism	Density
Tubeworms	1.460
Drupa morum	0.108
Drupa ricinus	0.040
Holothuria atra	0.076
Spondyls	0.056
Rapa rapa	1.132
Limpets	0.020
Trochus	0.016

Table 8. Densities (in specimens/ha) for invertebrates or groups of invertebrates surveyed. The figures in italics indicate the values reported by Dalzell et al. (1993) at the same sites

	Diadema sea urchins	Sea-cucumbers	Giant clams
Marine Reserve	13	6 *(69.00)*	15 *(282.00)*
Reef flat	4	8	17
Reef slope	21	4	13
Avatele	29	17 *(15.56)*	54 *(265.81)*
Reef flat	50	0	83
Reef slope	8	33	25
Total	18	10	28

(1) carry out comparisons in space (i.e. between sites) and time;

(2) better identify the impact of fishing activities (by establishing a link with fisheries data) and measure the 'reserve effect' at the Namoui site;

(3) assess the consequences of certain natural disturbances, principally those linked to cyclones and tropical storms.

In relation to the latter aspect, the implementation of the monitoring programme should provide an opportunity to put into place appropriate methodologies for assessing coral regeneration and recolonisation by various organisms, which either serve as resources or play the role of biological indicators, such as fish from the Chaetodontidae family.

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VANUATU MARITIME COLLEGE — A BUSY YEAR AND AN EXCITING FUTURE

by Caroline Nalo [1]

Vanuatu Maritime College was only founded a year ago but it is already bustling with life under the direction of its dynamic Chief Executive Officer, Captain Ken Barnett, who was appointed in February 1999. Captain Barnett is by no means new to the Pacific Islands—he has headed maritime training institutions in Kiribati, Papua New Guinea and Tuvalu and so will be well known to many Island seafarers.

The College is situated in the town of Luganville on Vanuatu's largest island, Santo, and was formerly the Fisheries Training Centre. Its mandate is to 'provide quality training for seafarers and fishers at all levels to improve employment opportunities in the maritime and fishing industries and enhance safety at sea'. However, before any training could be done, the College had to be ready to provide it—and this has involved an immense amount of hard work over the past six months.

First, staff, most of them ni-Vanuatu, had to be recruited. The College team now consists of:

- Consultant Senior Engineering Instructor, Chris Gee — an engineer with plenty of Pacific experience and a familiar figure to those who own and work on Vanuatu inter-island ships;

- Engineering Instructor, August Fred—holds a 300 BHP Marine Engineer's ticket and has had overseas training in Solomon Islands, New Zealand and Finland; worked for the Marine Department and for private firms;

- Volunteer Senior Nautical Instructor, Joseph Dryburgh —an Australian citizen hailing originally from Ireland, with sea experience dating back to the Second World War;

- Catering Instructor, Kelvin Talo—experience as Chief Steward on vessels working internationally, and in hotels;

- Fishing Instructor, Nare Wolu—holds various fishing certificates and a Mate II qualification; worked for the Fisheries Department for 10 years;

- Boat Skipper, Soti William—Grade 5 Master's and other marine certificates; worked as Captain of government ships and was Nautical Instructor and then Head of the Marine Training School;

- Fitter / mechanic, Tom Lorrend —Mechanic 1st Class, 300 BHP Engineering Certificate and Grade 5 Engineering Certificate; worked for the Ports and Marine Department, private companies in Vanuatu and PNG, and the Vanuatu Hydrographic Unit;

- Office Manager, Caroline Nalo—worked for Department of Lands and, as Chief Editor, for SPC; responsible for day-to-day administration and accounting;

- Administrative Assistant, Sharon Bulesali—worked for private firms and for the Vanuatu National Council of Women;

- Groundsman, George Warren —holds a coxswain's certificate and is a good fisherman; responsible for keeping the College grounds and buildings in good order;

- Cook, Walter Coty—worked as cook aboard overseas vessels and in local resorts; seafarers enjoy his cooking;

- Cleaner, Anna Shem—keeps the inside of the College squeaky clean.

Once people were on hand, the College facilities had to be brought up to scratch. From May to November, building teams were hard at work renovating the six staff houses, the three existing classrooms and accommodation for visiting instructors. They also refurbished a large existing building which now contains an engineering workshop and classroom, did up the student dormitories, enlarged the ablutions block and student kitchen, and built a student laundry.

At the same time, staff were busy with the two College vessels. *Etelis* and *Evolan* are now ready to play their part, with *Etelis* to be used for practical fishing instruction in rural villages and *Evolan* for training

(1) Office Manager, Vanuatu Maritime College

Fish handling workshop in Tanna

seafarers. In mid-November, the Council of Ministers approved the addition to the College fleet of the *Euphrosyne*, which in pre-Independence times was used by British Resident Commissioners as a touring vessel. *Euphrosyne* is to be on loan to the College for two years, with the College responsible for repairing and maintaining it. This will provide an excellent opportunity for seamen and engineers to have hands-on experience in ship renovation and seamanship.

Any training institution needs to be well equipped. College staff became a familiar sight at the wharf and airport cargo sheds as they collected life rafts and life jackets, fire-fighting equipment, distress flares, kitchen equipment, office furniture, computers, engineering tools and many other essential items. In the meantime, curriculum development proceeded apace. The Vanuatu Maritime College provides take-home notes to all students attending its courses, so that they can refresh their memories and look up essential information when they go back to work. At the moment all course notes are in English, but there are plans afoot to translate them into Bislama as soon as time and funds permit.

Finally, in August, the College was ready to conduct its first safety and survival course—one of six to be held in 1999. Each course takes between 12 and 15 students, this number being small enough for all students to receive individual attention from instructors and to participate fully in practical exercises. As this article went to press, the College was running three courses: a Safety and Survival Course, an Engineering Course on engines of less than 75 kW, and a Master's Course for masters of small ships under 20 tonnes.

All students successfully completing a course receive a certificate attesting that they have been trained in accordance with the requirements of the 1995 amendments to the International Convention on Standards of Training, Watchkeeping and Certification (STCW '95). These amendments come into force on 1 February 2002 and require that all seafarers be appropriately trained before that date.

Vanuatu is a nation of many islands, and inter-island ships carrying cargo outwards and kava and copra into Santo and Vila are the islands' lifeline. For this reason, the Vanuatu Maritime College is currently giving priority in its training to seafarers serving aboard inter-island ships.

And they value the opportunity to receive it. Each day, more seafarers are in the College office completing application forms, while over a shell of kava at night, those who are attending courses can be heard recounting what they have learnt and commenting on the value, especially, of the practical parts of the training. One was even overheard saying 'We have all these life jackets on board, but I had no idea how to use them until yesterday'!

Staff, too, have been given the opportunity for further training. All staff attended a Safety and Survival Course, with two being the first ni-Vanuatu women ever to gain a Safety Certificate. The Fishing Instructor was given three weeks of training at the New Zealand School of Fisheries, with funding provided by SPC. Several of the instructors and the Office Manager attended a course for teachers of HIV/AIDS information, organ-

Righting a life raft

ised and funded by SPC and held at the College, with other participants from Vanuatu and four from Solomon Islands. The Catering Instructor returned in November from a two-month attachment to the Hospitality Section of the National Institute of Technology in Port Vila. Funds for training and development in 1999 came from two sources: the recurrent budget, funded by the Vanuatu Government through the Departments of Ports & Marine and Fisheries, and the capital budget, funded by a levy on the Vanuatu Shipping Registry.

Fire-fighting practicals

The year 1999 has been mainly one of 'tidying-up' and preparation. What are the plans for the future? In 2000 the College will continue to concentrate on training of inter-island seafarers (it is believed there are between seven and eight hundred of them), with Safety and Survival Courses running right through the year and increasing emphasis on training in engineering, seamanship and navigation at various levels.

Training for rural fishers will also begin in 2000. Already the College has received a request from Torba Province (the Banks and Torres Islands, probably the most isolated of all Vanuatu communities) for men and women on four different islands to be trained. This type of practical training in their home environment will help villagers to increase their catches both for home consumption and for sale. Modules offered will teach skills in boat repair, engine repair and maintenance and net mending, as well as different fishing techniques.

Further into the future, the College will be embarking upon the exciting challenge of training ni-Vanuatu seafarers for employment as deck, engine-room and catering ratings aboard vessels trading internationally. Interest in this type of training has already been expressed by ship-owners as far afield as Japan and India. Other potential students are the 300 or so ni-Vanuatu fishermen working aboard overseas fishing vessels. Contacts with the Vanuatu Fishermen's Association indicate a sizeable likely demand from its members.

Further development of the College facilities is also planned. A

grant has been made available by AusAID for construction of a fire-fighting simulator; construction began in late November.

Recently the National Development Commission approved a three-year investment programme. It includes an engine-room simulator, a cargo-handling simulator, dangerous goods storage, additional classrooms, more student accommodation and staff housing, repairs to the College jetty and pontoons, dredging of the channel leading to the College, and buoy moorings and navigation aids. Several donors have already shown interest in the programme.

The weather looks set fair for the Vanuatu Maritime College.

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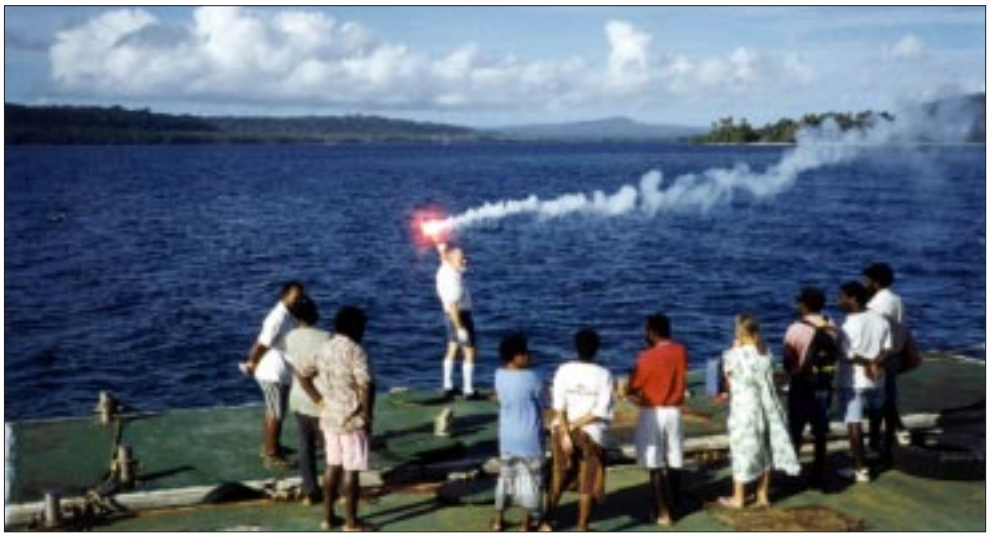

Demonstration of the correct use of pyrotechnics at the Vanuatu Maritime College

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