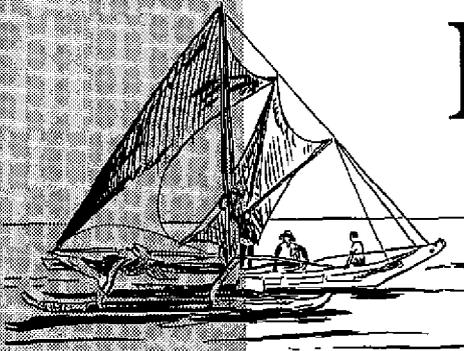


FISHERIES

Newsletter



NUMBER 73
APRIL — JUNE 1995

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Dar Mad, the New Caledonian fisheries boat, sails away for a night at sea targeting swordfish, during the practical module of the SPC/Nelson Polytechnic fishing course



South Pacific Commission
Prepared by the Fisheries Programme Information Section
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■ RESOURCE ASSESSMENT SECTION

SPC runs fisheries management workshop

A two-week Workshop on the Management of Pacific Island Inshore Fisheries was held between 26 June and 7 July at SPC headquarters. The workshop was mainly for the benefit of Government fisheries and marine resources managers in SPC member countries, but was also an opportunity for specialists from many parts of the world to discuss the current status of this discipline. The management of coral reef fisheries, particularly invertebrate fisheries, is a subject that is particularly prone to differing interpretations at the present time.

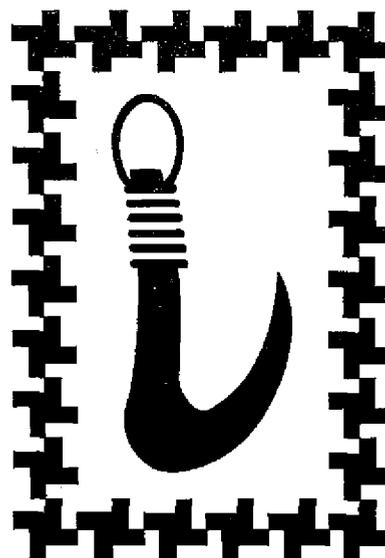
This was an attempt to provide Pacific Island fisheries managers with a clearer vision of the current options, advantages and pitfalls of the various management tools available to them. For example, marine protected areas are widely promoted by some people for the maintenance of sustainable fisheries in adjacent areas, whilst others claim that individual transferable quotas are the universal panacea. What measures are most relevant to Pacific Island social systems and fishery resources?

The workshop was organised by the SPC's UK-funded Integrated Coastal Fisheries Management Project and Pacific Island national nominees' attendance costs were covered by the UNDP Regional Fisheries Support and National Capacity Building Programme, jointly administered by SPC and FFA.

Additional participants were funded through SPC by the Australian Centre for International Agricultural Research and the Government of France

and SPC is further greatly indebted to all the organisations and individuals who were able to arrange their own participation in the meeting. In total, over 100 people took part over the two weeks, tabling over 100 original papers.

It cannot be claimed that the workshop achieved its ultimate goal of completely clarifying the types of management measure that should be applied to different Pacific Island fisheries, but it was certainly a very worthwhile exercise for all concerned.



Far more information was submitted than had originally been imagined possible, and discussion was always vigorous, but it almost requires another workshop to draw firm conclusions from the various topics considered.

However, the workshop succeeded in its aim of bringing together the new generation of Pacific Island fisheries managers to learn from each others' experiences and assess the relative strength of the ideas of dif-

ferent experts. It will have great relevance for the direction of future fisheries management-related research and development in the region.

SPC was able to hear the views of its member countries and territories, both individually and regionally, and now has a better idea of where to concentrate its fisheries management advisory efforts.

The papers tabled at the workshop will be published with minimal editing, as a limited number of manuscript volumes, for the benefit of SPC's list of deposit libraries.

The keynote addresses on each management option covered by the agenda will be revised and edited into a somewhat slimmer volume for wider distribution, and should be at the printers before Christmas. Although the workshop was not intended to formally agree any priorities for regional action, a number of points that arose during the meeting were endorsed in the final session:

1. A special interest group and newsletter on live fish export fisheries (including both fish for food and organisms for aquaria) will be set up under the SPC Fisheries Information Project. Bob Johannes and SPC will collaborate to edit the first issue;
2. One of the priorities for research in support of the improved management of live serranid export fisheries is a practical estimate of the percentage of the stock that can be sustainably harvested.

3. In view of the likely dependency of recruitment and replenishment of some reefs and reef-fisheries from distant areas, the regional importance of different 'sinks' and 'sources' of larvae needs to be assessed on a national basis;

4. A priority for research is the development of rapid appraisal techniques to assess the potential and status of coastal fisheries stocks in general. The following are major needs:

(a) The development of basic estimates of the area of fishing grounds ('suitable habitat' or 'biotope') for different species in each Pacific island;

(b) The collection of existing and new information on catch rates and yields of different species under different levels of fishing pressure, using different gear, in different areas, to improve indicative baseline information on the way that stocks respond to exploitation;

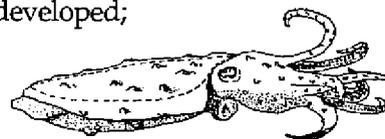
5. All marine species introductions and transfers to or from Pacific Islands should be based on the guidelines agreed by SPC member countries and territories at the 1994 Regional Technical Meeting on Fisheries and endorsed by the 34th South Pacific Conference (and available from SPC). In all cases the precautionary principle should guide decisions, and in all cases the onus should be on the introducer to meet all the costs incurred by the national Government in making a decision whether or not to allow an introduction;

6. For largely export fisheries, such as trochus and beche-de-mer, a comprehensive and up-to-date source of intelligence is needed on the status and forecast for their markets, particularly in East and South-East Asia. This trade seems to be too small for international agencies to devote much effort to it, but is extremely significant to many of the small nations of the Pacific and thus to regional agencies;



7. There is a need for a regional organisation to consider maintaining a register of international entrepreneurs and operators engaged in exporting marine products from the Pacific Islands, to improve the ability of national fisheries managers to appraise the likely compliance of companies engaged in commercial coastal fisheries;

8. The possibility of developing a set of regional seafood quality standards should be investigated, and an appropriate plan of action for introducing modern quality assurance procedures for Pacific Island exports, such as Hazard Analysis and Critical Control Point (HACCP) or Quality Management Program (QMP) should be developed;



9. When the sustainable management and development of coastal fisheries are being addressed, the broader management aspects need also to be taken into consideration, preferably within the general framework of the integrated coastal management concept. Some of these broader aspects include, but are not limited to:

(a) Habitat degradation or destruction;

(b) Coordination and cooperation with other sectors (including Government, the private sector and local communities);

(c) The major role that women play in carrying out coastal fisheries in the Pacific Islands, and thus the need to assess their catches, take into account their impacts, and harness their knowledge and community decision-making potential;

(d) The concepts of co-management and governance;

10. Pacific Island fisheries managers should always consider the possibility of including the complete ban in their armoury of management tools, particularly if pre-emptive action can be taken in time to stop people investing in equipment. Types of ban might include:

(a) A ban on the use of any kind of underwater breathing apparatus for certain types of fishing;

- (b) Banning the use of fishing methods that damage or reduce the carrying capacity of the environment;
- (c) A ban on certain commercial export fisheries, particularly those that take the

same species as a local food fishery. Local subsistence nutrition, and the development of foreign exchange earnings through non-extractive uses of resources, may be a better national economic option.

The SPC Integrated Coastal Fisheries Management Project wishes to thank all those who took part in the workshop, with special gratitude to those who came from the other tropical small-island regions—the Caribbean and the Maldives.



Participants in the SPC/FFA Workshop on the management of South Pacific inshore fisheries

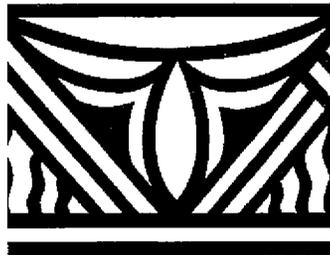
Fisheries statistical data collection in Western Samoa reviewed

During May the Inshore Fisheries Scientist (IFS), Paul Dalzell, visited Western Samoa as part of a two-phase assignment designed to assist the Fisheries Division of Western Samoa with the collection of fisheries statistical data.

The first phase of this assignment was conducted in March by one of the Offshore Fisheries Programme's Programmer and Research Officers (PRO), David Burgess, who devoted most of his time to assessing the data processing and computer needs for

the Fisheries Division. The second phase was directed more towards observing the process of data collection and recording and suggesting modifications and improvements to the methods employed.

Western Samoa is among the smaller countries of the South Pacific and has limited natural resources, with the economy dependent on tourism, remittances from Samoans overseas, and, until recently, exports of taro to New Zealand.



Fishing is one of the few income-earning opportunities open to most Samoans. Although there has been a shift in dietary preferences towards western foods, particularly in the urban areas, fish is still one of the main staples,

particularly reef and lagoon fish caught within the coastal margin. The development of fisheries continues to be a priority activity for Western Samoa.

The Government recently initiated the Fisheries Extension and Training Project, supported by Australian aid, to improve the standard of living for Western Samoan fishers and their families, and to increase the supply of sea food. It is therefore imperative that greater attention be paid to reporting the amount of fish landed in Western Samoa and increasing the accuracy of the present monitoring systems.

Most fisheries data collected in Western Samoa refer to fishing activity around the main island, Upolu. Although this is not the largest island, Savai'i being larger in area, it is the most populated, containing about 70 per cent of the population. Fisheries staff based in Apia, the capital, regularly conduct the following data collection activities

Inshore surveys: conducted at Apia fish market on inshore species of fishes and invertebrates;

Offshore surveys: conducted at Apia fish market on catch

which can be classed as offshore species (i.e. large pelagic and deep-slope fish) and is taken by commercial fishing boats based in or near Apia.

Landing site surveys: conducted at Apia fish market for commercial fishing vessels based outside Apia but selling their catch at the Apolima jetty;

Road-side surveys: conducted along the main road out of Apia to the international airport at Faleolo for road-side sales of fish and other sea foods, including molluscs and beche-de-mer;

Outlet surveys: conducted at stores and restaurants around Apia to look at the volume of fish and sea foods traded through retail outlets.

Some sampling is also conducted on Savai'i, but the amount of fish caught is much smaller than on Upolu and sampling only takes place at the main urban centre of Salelologa.

Following a week spent observing these various activities, the IFS was able to make several recommendations about the sampling routines. Given that these have been in place for a number of years, he thought that rather than changing the basic methods, it would be

more appropriate to refine the procedures so that more information would be collected.

Although the basic methods employed by the Fisheries Division to estimate volumes of fish sold through various outlets (such as the market, road-side and retail stores) are essentially sound, there are several key areas that need improvement. For example, collection of effort data is presently confined to the offshore fishery and needs to be expanded to inshore fishing activities.

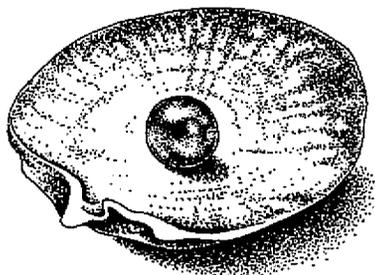
Further, all data collection activities are conducted between Monday and Friday. This does not take into account the large volume of fish and seafood traded at the Apia market early on Sunday morning to cater for family meals following morning church services, which are a traditional feature of Samoan life.

These and other issues were addressed in a report drafted following the IFS' return to Commission headquarters. The report also included new sample forms to be used by the Fisheries Division and a manual for catch data entry and reporting from a Microsoft Access database designed by PRO. 

■ INFORMATION SECTION

Fisheries Information Adviser attends Pearls '95

Pearls '95 followed on from Pearls '94, which took place in Hawaii in May 1994. Five hundred participants came from throughout the Pacific region and all over the world to participate in this event, sponsored by the International Pearl Association (IPA).



The International Pearl Association was set up in November 1993. Its purpose is to serve as an international forum for scientific, technical and business leaders in the world pearl industry and to coordinate their consideration of problems and issues affecting pearl production; to establish an interna-



tional grouping within which to exchange ideas and information to provide a showcase for the various pearl products from all pearl-producing nations; to develop trade and consumer education and promotional programmes to improve the image of pearls to rival other gems, and to increase public awareness, interest and demand for pearls.

Following the success of Pearls '94, Pearls '95 was supposed to be held in Hawaii on the island of Maui in May 1995. However, the Conference had to be cancelled at the last minute and the exhibitors who had already registered (at least those who were informed) were invited to come to Las Vegas in June for the holding of Pearls '95.

It seems that the last-minute postponement of the conference did not go down at all well with the exhibitors, and less than ten people registered. In fact, Pearls '95 turned out to be much more than an auction sale.

About US\$ 15 million of pearls were to be sold, but the insurance companies only insured

the lots for about US\$ 2 million. According to Richard Torrey, editor of *Pearl World* magazine, organising an auction may not be the best way to promote the pearl industry; it lowers the quality of the pearls and gives the impression that producers simply want to get rid of their pearls at any price (especially when the prices are artificially 'inflated' in relation to market prices, in order to allow large discounts to be offered). Pearls '96 is supposed to be held in Hong Kong and we hope that this time exhibitors will show up and the quantity and quality of pearls presented will be satisfactory.

But all is not bleak in the kingdom of the pearl. At the same time as Pearls '95, the gigantic Jewellers Circular Keystone (JCK) Show was held. Among the 2,300 exhibitors, there were 160 companies displaying pearls. According to Richard Torrey, wholesale prices have dropped 20 to 25 per cent in relation to prices three or four months ago. This tendency is especially marked for the lowest-quality products; the high-quality products are still only available in limited quantities and, as demand is high, prices do not vary.

Some exhibitors were a bit disappointed by the lack of enthusiasm on the part of some buyers, but as one of them pointed out: 'The point of the game is to be there and to show your best-quality pearls; if people don't

buy now, they will remember us and, later, they will become our clients.'

One of the exhibitors who attracted my attention was displaying very high-quality fresh water pearls from China in the 3.5 to 4 mm diameter range. These pearls are obtained without inserting a nucleus (only a piece of the tissue from the mantle). The final product is a pearl made of 100 per cent nacre.

The price, however, is slightly higher than that of traditional freshwater pearls (with nucleus) from China. It should be noted that the technique of producing 100 per cent nacre pearls is just beginning (this year 200 momme were produced, accounting for about 750 g), but experts predict a bright future for this type of product, even if they think that the maximum size of such pearls will remain limited in the immediate future.

Although Pearls '95 was disappointing, the JCK Show allowed me to meet the major players in the area of distribution and sales. The contacts made there will, I hope, allow us to have more detailed information about the pearl industry and to understand the world pearl market better. More information will be provided in the next issue of the *SPC Pearl Oyster Information Bulletin* (to be published at the end of 1995).



Creation of two new Special Interest Groups

Our readers are now quite familiar with the Special Interest Group concept. Since their inception in 1990, these groups have built up momentum and become very popular in the re-

gion. The principal means of communication in each group is an information bulletin. This includes a list of the group members and their work, news about projects in the region or

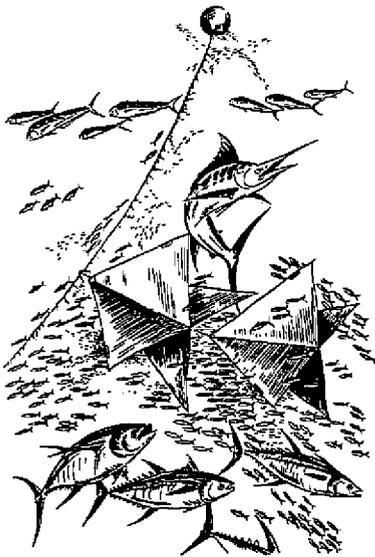
interesting activities being conducted elsewhere in the world, summaries of the regional scene as viewed by SPC Fisheries Programme officers during their travels, bibliographic data (in-

cluding recent acquisitions by SPC and the other member organisations of PIMRIS) and extracts from relevant publications, especially those translated from French or Japanese.

The Fisheries Programme's Information Section has recently taken the initiative of creating two new Special Interest Groups on the following topics:

Fish aggregation devices

This topic appeared on the initial questionnaire which was sent out in 1988. Another questionnaire went to interested parties in June in order to better define the subject areas which should be covered by this new group.



They include: developments in FAD technology/materials, FAD fishing techniques, FAD programme planning, FAD site-survey techniques and equipment, FADs and the law, FADs for large-scale commercial fisheries, FADs for small-scale commercial and subsistence fisheries, fish behaviour in association with FADs, improving FAD efficiency, social and economic effects of FADs, inshore and baitfish FADs, low-

cost FADs for subsistence fisheries, and paying for FAD programmes.

If you would like a copy of the questionnaire or more information about this new Special Interest Group, please contact the SPC Fisheries Information Officer (Fax: (687) 263818 or E-mail: tbap@bix.com [Attention: A. Desurmont]).

Live reef fish and aquarium fish exports

During the FFA/SPC Workshop on Inshore Fisheries Management in the South Pacific (see page 2) the participants expressed interest in the establishment of a Special Interest Group on exporting living marine resources (for the food market or as aquarium fish).

Fishing companies in Hong Kong, Singapore and Taiwan supply live reef fish to restaurants in these countries and to the rest of South-East Asia.

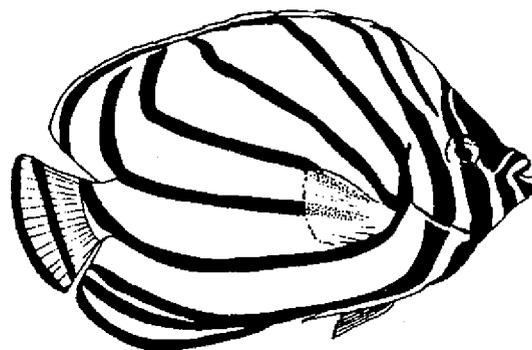
These companies traditionally fish in the waters of Indonesia and the Philippines, but some have recently extended their activities westwards beyond the China Sea, into the Indian Ocean and to the east of Palau and Papua New Guinea towards Tuvalu, as well as south of the Great Barrier Reef of Australia. Others also hope to fish in Solomon Islands and Fiji (see the article by A. Richards in *Fisheries Newsletter* No. 67).

At first glance, it would seem that the export of live reef fish could offer the inhabitants of remote islands a precious source of income without threatening fish stocks; however, problems can appear (fishing techniques which are detrimental to the environment, risk of social conflict, etc.).

As can be seen, this type of export is likely to involve several island countries and territories in the near future. The creation of a Special Interest Group will help the flow of available information and make it easier to assess the advantages and disadvantages of this kind of export.

Dr Bob Johannes, well known to the readers of the *Fisheries Newsletter*, has agreed to become the technical coordinator of this new group (at least for the section concerning living marine resources for human consumption). We are currently looking for a coordinator for the aquarium fish section.

The first issue of this group's information bulletin should come out before the end of the year. If you're interested in this new group and would like to send information, please contact the SPC Fisheries Information Adviser (Fax: (687) 263818 or E-mail: tbap@bix.com [Attention: J.P. Gaudechoux]).



FITA attached to Nelson Practical Fishing Module, 1995

The Fisheries Information and Training Associate (FITA), Henry Yule, spent three weeks on attachment to the recent Nelson course practical fishing module held at Touho, Northern Province of New Caledonia.

He was mainly involved with practical training in the different fishing gear and the methods used. The fundamental reason for his attachment was to familiarise him with the gear and methods used, and to pro-

vide him with on-the-job experience in the administration of the course arrangements. The Fisheries Training Section felt that such training would help Mr Yule with new skills and experiences.

Mr Yule found himself quite interested in some of the fishing methods, especially deep-bottom longlining and sword-fishing at night. He stressed that the gear preparation had not been anticipated in the course, of

which it was probably an important component, and assumed that lack of time might be the reason.

He was not comfortable during the first week on board, but later found it most interesting, and would like to acknowledge all those who made arrangements for him to take part, together with the course trainers.



A new fisherman is born!! Henry (on the right) is now ready to brave the rough seas...

■ CAPTURE SECTION

Offshore Fisheries Development Project funded into fourth year

It was confirmed in May that the United Nations Development Programme (UNDP)-funded Offshore Fisheries Development Project would continue into its fourth and final year. This is in line with the

original design of this project, which focuses on promoting Pacific Island offshore fishing efforts by supporting fish aggregation device (FAD) and medium-scale tuna fishing programmes.

Completion of the project had been in doubt in the face of UNDP's global budgetary restrictions.

However, in response to the heavy demand for the project's

services and expressions of support for its continuation from SPC members, UNDP has been able to allocate sufficient funds to ensure that the project can continue to operate until August 1996, although with a reduction in activities.

It is expected that during the final year the project will provide field support to emerging tuna longline fishing enterprises, consolidate national FAD programme planning and implementation ability, and distribute technical papers and manu-

als on FAD technology and tuna fishing.

Details of the project's work and services can be obtained by contacting SPC's Fisheries Development Adviser. 

A four-way partnership sees two new FADs deployed in Wallis and Futuna

The fisheries services of Wallis and Futuna and New Caledonia, the French Navy, and SPC's Fisheries Programme Capture Section recently joined forces to rig and deploy two new FADs for the Territory of Wallis and Futuna.

Lacking staff experienced in FAD work and a vessel capable of FAD deployment, Wallis and Futuna has been able to call on New Caledonia's fisheries service for assistance in designing moorings and rafts, on the French Navy to make a vessel available for deployments, and

on SPC to supervise the deployments and train local staff.

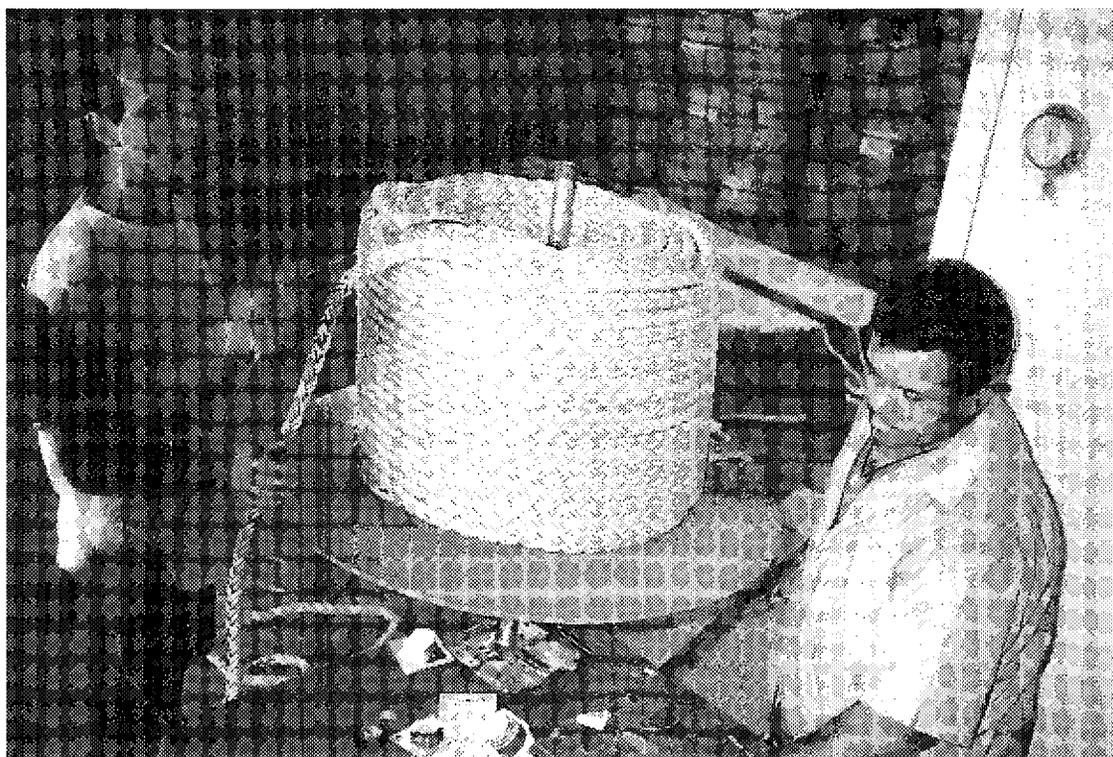
The materials for the two new FADs, provided under a grant-in-aid from Japan, were first delivered to New Caledonia, where SPC staff checked that all was to hand and organised shipping to Wallis by courtesy of the French Navy.

SPC then enlisted the services of Philippe Simoni, masterfisherman with New Caledonia's fisheries service on attachment SPC, to travel to Wallis in company with SPC's Fisheries De-

velopment Officer Satalaka Petaia to supervise the rigging of the FADs and at the same time train local staff in these techniques.

Once the moorings and rafts were completed, a second French naval vessel, the P. 400-class *La Glorieuse*, called at Wallis, collected the FADs, along with the Wallis and SPC staff, and set out for the deployment sites.

These sites had been previously surveyed by an SPC FAD technician by echo-sounding and global positioning system navi-



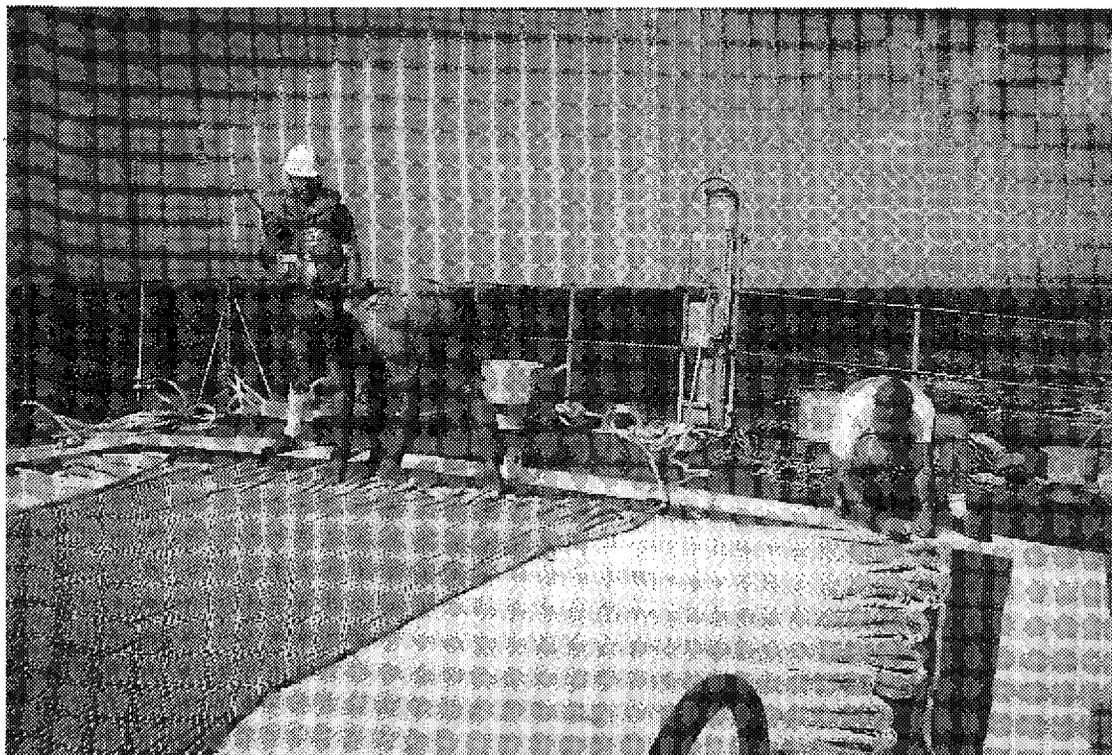
Philippe Simoni and Petelo Mafutuna uncoiling the polypropylene rope, using a 'turn-table' made from an office chair...

gation, and the naval vessel was thus able to relocate them with great accuracy.

Careful preparation, the ease of relocating the FAD sites and the skilled navy crew meant that both FADs could be deployed in a single day, even though the

two sites lie some 120 miles apart. In contrast to the usual, and recommended, practice of deploying anchor last, these FADs were set by releasing the anchor first and allowing the mooring line to pay out from where it had been carefully laid out on the after-deck. This tech-

nique was used because if the raft was deployed first, the large vessel would tend to tow, and thus strain, the mooring line. *La Glorieuse*'s highly skilled crew and the vessel's lifting gear allowed this to be done efficiently and safely. 



Daniel Tahimili and Philippe Simoni carefully laying out the mooring ropes on the after-deck of *La Glorieuse* before FAD deployment

American Samoa completes new FAD series

After deploying three FADs with SPC assistance during 1994, American Samoa's Department of Marine and Wildlife Resources sought further help to complete the planned seven-FAD series in May this year. Deployment of the four remaining FADs had been delayed because of the loss of skilled staff, in particular the lack of a boat captain familiar with FAD site-survey techniques.

While SPC's Capture Section currently has no masterfisher-

man on staff, it was able to arrange to engage the services of Western Samoa's Senior Fisheries Officer, Savali Time, to assist with American Samoa's programme. Savali Time is an experienced FAD technician who attended SPC's first Sub-regional FAD Skills Workshop in 1994. SPC was able to provide a deep-water echo-sounder on loan for this work.

The FADs deployed by American Samoa make use of both the aluminium catamaran raft, long used in the Samoas, and the

SPC-developed Indian Ocean-style raft, which comprises a string of small surface floats rather than a single large raft. High-quality mooring ropes and hardware were purchased from Continental and Western Corp. in the USA. 



■ POST-HARVEST SECTION

During the important and successful regional Workshop on the Management of South Pacific Inshore Fisheries (page 2), one full day was set aside to discuss how post-harvest fisheries technology can contribute to the inshore fisheries management process. In a keynote address the SPC Post-harvest Fisheries Adviser outlined the relevance of post-harvest technology to the fisheries management process.

If inshore fisheries resources are to be exploited effectively, whether for subsistence or commercial purposes, it is important for that portion of the resource which is still exploitable following resource management input to be utilised fully; handled, distributed, processed and marketed without loss or waste; and processed to the best-quality standards available. This is the only means of ensuring that harvested catches are exploited to their full potential, either to feed the local people or for commercial purposes.

The introduction of fisheries management regimes often leads to a change in the way that a particular resource is allowed to be utilised. Restricting the volumes of catches by whichever management regime is introduced (such as closed season, size limits or quotas) usually results in lower incomes for those who rely on that resource.

To help them maintain their income, those affected need to be advised about different ways to utilise the lower volume of resource that they are allowed to harvest, or provided with opportunities to exploit other resources. If they are not given this advice and support, they

may attempt to circumvent the introduced resource protection measures.

Post-harvest fisheries therefore have the important role of helping countries to utilise their catches effectively, minimise waste and losses, and help mitigate the economic effects of management intervention. This is true for subsistence fisheries, local commercial fisheries and for exporters of seafood products.

Post-harvest fisheries activities that are considered to have a role in many fisheries management plans and procedures include:

- ☛ Establishing product standards and grading systems, and introducing modern quality assurance procedures for all exported seafood products;
 - ☛ Improving market and trade intelligence to help plan and develop appropriate production and marketing strategies.
- To help present the case, a number of specialists in various fields were invited to present papers. Craig Davis, Seafood Biochemist from the International Food Institute of Queensland, DPI, Australia, gave a talk on value-adding in the seafood industry.
- He described methods for utilising resources more fully by turning material that the seafood industry often discards into valuable products.
- He described how sharks can be more completely utilised by turning the cartilaginous backbone into a dried, fine powder which is used in health products.
- Other examples mentioned were processing of fish swim bladders into a material for clarifying wines and beers, and turning waste lobster and
- ☛ Providing advice on handling and processing of oceanic resources, following management intervention to divert harvesting activities away from over-exploited inshore resources;
 - ☛ Investigating and extending value-adding processing of conventional inshore fisheries products, and identifying new/alternate products that can be made from resources that are currently under-exploited or not exploited, e.g. pharmaceutical products, health products, non-food products, etc;



shrimp heads into valuable extracts (chitin and astaxanthins).

Fatima Ferdouse, Trade Promotions Division at INFOFISH, provided up-to-date information (volumes and prices) about products that are commonly exported from the Pacific. She also discussed new trends in the Asian region that will result in increasing demands (plus higher prices) for marine products from the Pacific.

Vance McEachern, Chief, Quality Management Program, Department of Fisheries and Oceans, Canada, presented an

important paper on HACCP (Hazard Analysis Critical Control Point). This is a new issue for Pacific Island countries and territories, and created a strong response from their representatives at the workshop.

HACCP is a modern quality assurance system that has become the food industry standard in many parts of the world. Legislation already in place in the European Community, and to be introduced in the USA in early 1996, will compel domestic and overseas seafood processors wishing to market products in these trading blocks

to have a HACCP system in place before their products will be accepted.

To explain more about HACCP, a paper that was presented at the workshop by Vance McEachern is reproduced in this issue of the *Fisheries Newsletter*. In the next issue, James Movick, Pohnpei Fisheries Corporation, will describe how a Pacific Island fish processing company is coping with the implementation of a modern quality-control system. 

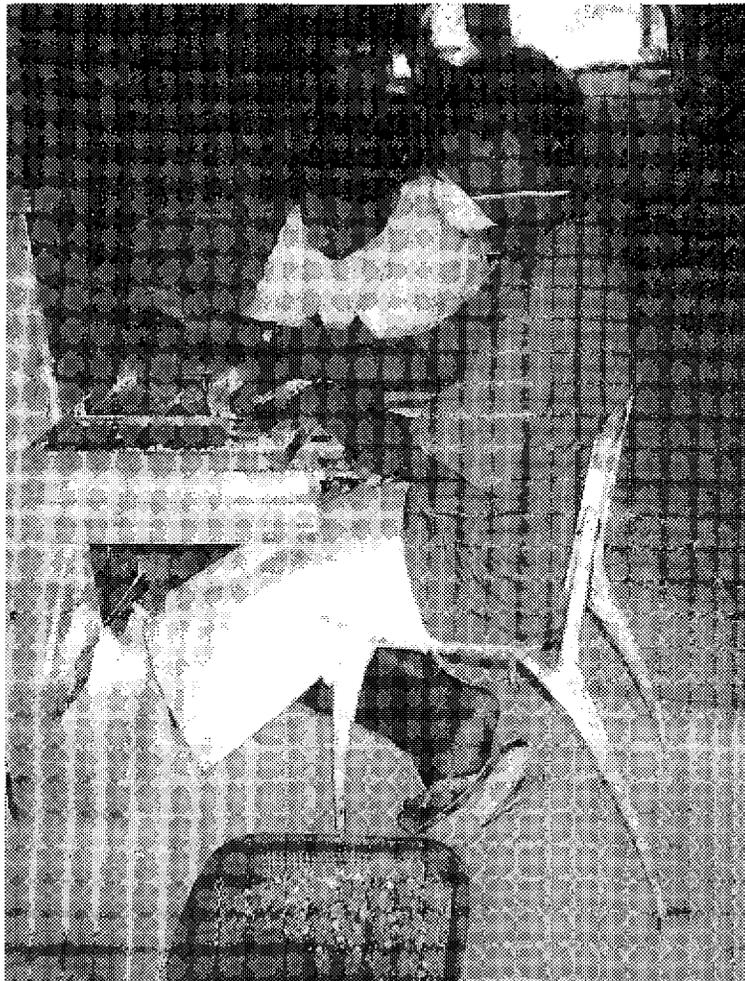
■ WOMEN'S FISHERIES DEVELOPMENT SECTION

In order to promote the services of the Project and ascertain the role of women in fisheries in the region, the Women's Fisheries Development Officer (WFDO) has made contact with island countries through correspondence and country visits.

In April, she visited Vanuatu, the Solomon Islands and Fiji, collected information on the level and areas of participation, constraints to development, and areas of assistance required, and compiled it in reports submitted to the countries.

In June, the Officer visited Papua New Guinea to view the activities of the Women in Fisheries Project, including training, credit support, and the role of organisations (in particular technical resource personnel), with the objective of developing activities in other countries in the region.

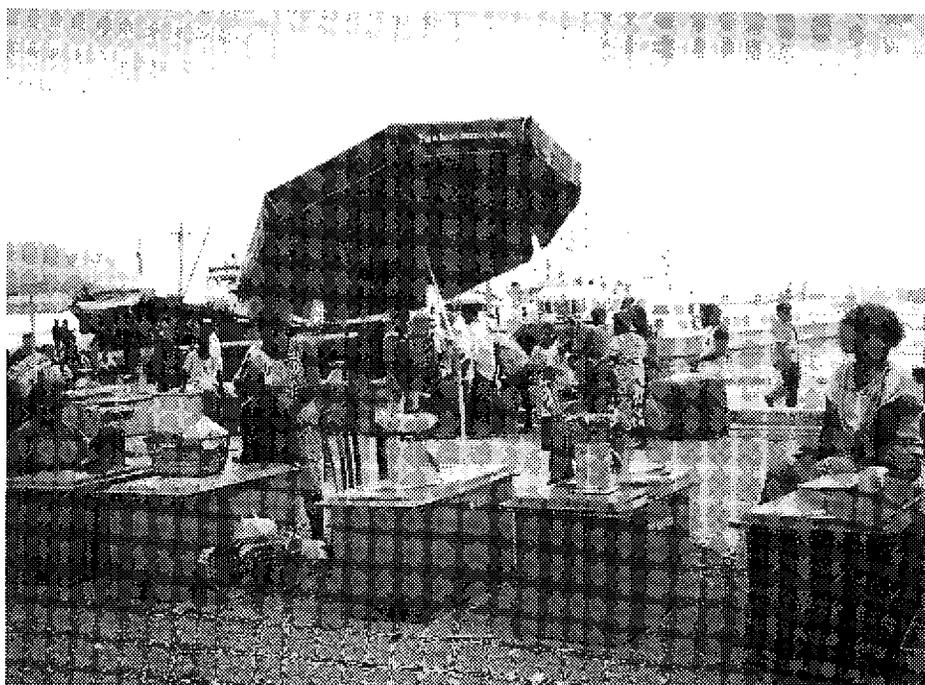
The WFDO took part in two workshops. From 26 June to 7 July, she attended the FFA/SPC Workshop on the Management of South Pacific Inshore Fisher-



Fijian women employed in the processing of trochus button blanks in Suva



Wewak graduates of the PNG Women-in-Fisheries Project training selling processed fish burgers, fingers and patties



Solomon Islands women selling frozen tuna at the Honiara market

ies, at which she presented a paper on *The role of women in the management of Pacific Island in-shore fisheries*. Country representatives expressed support for assistance to women involved in fisheries.

In addition to the donor support to the Project from the Canadian Ocean Resources Associates, the United Kingdom expressed support at the workshop, and is providing financial assistance through the SPC/UK Inte-

grated Coastal Fisheries Management Project.

The second workshop was the Asia/Pacific Regional Workshop on the Role of Women in Fisheries Development held in

Iloilo City, Philippines from 17 to 21 July. The Officer presented a paper on *The Participation of women in fisheries in the South Pacific*.

The South Pacific was well represented by eight participants from Fiji, Kiribati, Papua New Guinea, Solomon Islands and Tonga, who shared the experiences of women involved in

fisheries with representatives from the Asian countries of Bangladesh, Cambodia, India, Indonesia, Lao PDR, Malaysia, Maldives, Myanmar, Nepal, Philippines, Sri Lanka and Thailand. A resolution on regional concerns, which included recommendations for action, was compiled by the workshop for submission to the Fourth World Conference on Women to be

held in Beijing in September 1995. Areas for co-operation and collaboration were identified and included information exchange, personnel and training attachments.

Donor agencies represented at the workshop included the United Nations Development Programme and the Food and Agriculture Organization. 

■ TRAINING SECTION

Staffing update

It has been a time of change for the Commission's Fisheries Training Section since our last newsletter. Michel Blanc, Fisheries Training Officer since 1990, has been appointed Fisheries Education and Training Adviser to replace Hugh Walton.

Michel brings plenty of experience in the work programme and is now in the process of recruiting a new Training Officer to fill his vacated post. With the Section operating minus the services of one officer, things have been more than

busy for Michel. Fortunately, he has been assisted by the very able Henry Yule, seconded from PNG for 12 months as Fisheries Information and Training Associate, who works half his time for the Training Section.

Changes have also been afoot for the programme's Project Assistant position, which was filled by Carina Barnett when H el ene Lecomte moved to work for SPC's Director of Services. Carina has since departed to fill a position in the SPC's

Publications Section and has been replaced by Christine Briffa. Christine was thrown in at the deep end—her arrival coincided with the commencement of the SPC/Nelson course practical module in Touho, New Caledonia and the moving of the entire Commission to its new premises.

The new Fisheries Training Officer will be in office within the next few weeks and staffing levels in the Section will then be back to normal. 

Safety-at-sea public awareness project

The Training Section's safety-at-sea public awareness project is now well advanced in the regional distribution of the range of promotional materials developed during the past 10 months.

The logo stickers, checklist cards and stickers, T-shirts, posters and workshop resource manuals have been well received by fisheries organisations and training institutions, schools, NGOs and private fishers. An additional poster and two videos are almost ready for distribution.

The success of the project will depend on the in-country marketing and distribution of materials. The combined materials provide a package for extension officers and teachers to put

across the safety message to fishers and small-boat operators and the Commission will encourage and support national initiatives to expose small boat users to the project's messages on small-boat safety.

The real success of the project will be difficult to gauge, as the overall aim is to see a reduction in incidence of small-boat accidents at sea through seafarers being better equipped to handle unforeseen or emergency situations. When it comes down to it, many potential emergencies or life-threatening situations which might be averted through



being well prepared (i.e. being safety-conscious) will never be officially reported. However, if the project message does get through to boat operators, it may be possible to document financial savings in national

search-and-rescue budgets, but this will certainly require a sustained effort in reinforcing the message.

From the Training Section's perspective, the project has gen-

erated great interest from fisheries administrators and trainers and there is a strong demand for materials. Feedback on the materials and their application is encouraged and much appreciated. 

Video update

The Coastal Fisheries Programme team has been making a concerted effort to complete a number of scheduled (but delayed) video productions, all soon to grace your screens and classrooms.

There are six titles in the final production or distribution stage: 'A visit to the fish market', 'Once upon a fish stall', 'Air-freighting of chilled fish', 'On-board handling of sashimi grade tuna', 'Better safe than sorry', and 'Survival at sea - A Kiribati tale'.

The team which produced the well-received 'An icy tale' and 'A chilling story' has got together again to produce two light-hearted but strong-selling tales about fish quality and

marketing skills ('A visit to the fish market' and 'Once upon a fish stall') as well as a training programme for fish exporters ('Air-freighting of chilled fish'). The latest video will certainly be of interest to all the companies exporting sashimi-grade tuna overseas, as will 'On board handling of sashimi-grade tuna', which was filmed in Noumea during a visit by consultant Steve Beverly, working in association with the local Fisheries Department and their catamaran *Dar Mad*.

On a more tragic note is a lost-at-sea scenario, ('Better safe than sorry') based on the story of two friendly but rival fishermen and put together by the Training Section team and script-writer, Alastair Robertson.

Still on the safety-at-sea side, the Training Section has reached agreement with Juniper Films, an Australia-based company, to purchase the distribution rights for their production titled 'Survival at sea - A Kiribati tale' which tells the story of lost fishermen from Kiribati who drifted at sea for seven months. This video, as well as 'Better safe than sorry', will be circulated in association with materials produced by the Section's safety-at-sea public awareness project.

The videos have been produced or procured with financial assistance from the Governments of France and Canada and technical assistance from the commercial production companies Pacifica (Fiji), and Imag'in (Noumea). 



■ OCEANIC FISHERIES PROGRAMME

OFF activities during the last quarter

The European Union (EU)-funded South Pacific Regional Tuna Resource Assessment and Monitoring Project (SPRTRAMP) has now become fully operational, with two Senior Scientists (Biologist and Modeller), a Port Sampling and Observer Supervisor, three Scientific Observers and a Research Officer (Data) recruited. A fourth Scientific Observer and a Biological Technician are to be recruited during 1995.

Statistics and monitoring

The OFF's Statistics and Monitoring Section continued its principal function of logbook data processing and evaluation during the quarter. Estimates of 1994 logbook coverage rates for the major purse-seine fleets operating in the western tropical Pacific are now available.

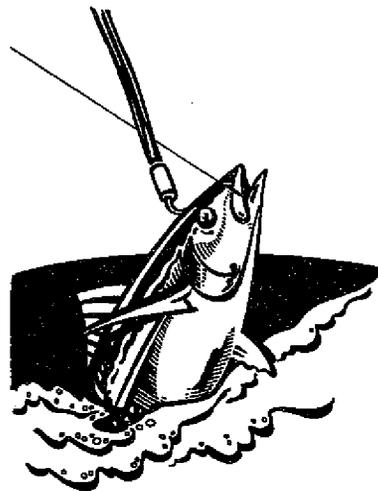
Large improvements in coverage rates for Taiwanese (96%) and Korean (86%) purse-seiners occurred in 1994. The much improved performance of these fleets in 1994 (coverage rates prior to 1993 were typically <50%) is thought to be due largely to the ban on high-seas transshipment introduced by Forum Fisheries Agency (FFA) member countries in mid-1993.

Of the other major purse-seine fleets, the US fleet provides complete logbook data under the terms of the South Pacific Tuna Treaty, while the coverage rate for Japanese purse seiners was 53 per cent. The relatively poor coverage of Japanese purse seiners is due mainly to the policy of the Government of Japan not to provide logbook data for fishing in high-seas areas.

Observer and port sampling activities associated with SPRTRAMP began in earnest during the quarter (see next article for more details on SPRTRAMP activities).

Biological research

The OFF's biological research capability was recently enhanced with the recruitment of Dr Patrick Lehodey to the SPRTRAMP Senior Fisheries Scientist (Biologist) position in January 1995. Dr Lehodey is currently working in two areas: tuna age and growth studies, and environmental determinants of tuna fisheries in the western and central Pacific. Significant progress has been achieved in both areas.



Western Pacific yellowfin have been confirmed to deposit daily increments on their otoliths, and some initial attempts to read a sample of otoliths proved successful. Further otolith sampling will now take place and the material will be analysed to provide estimates of growth.

Lehodey is also examining the relationships between tuna fisheries and various environmental parameters in the western Pacific. Using a model of Pacific-wide primary production and currents, he has demonstrated strong spatial correlation between primary productivity redistributed by currents for four months (by which time the productivity would have been converted to tuna forage) and tuna catches. The analysis will be developed further for possible inclusion in models of tuna movement and distribution.

Routine data processing and follow-up of tag returns from the Regional Tuna Tagging Project (RTTP) (and associated in-country projects) and Albacore Tagging Project continued, although at a much reduced level now that these experiments are approaching completion. Several interesting tag returns were received during the quarter, including an albacore at liberty more than seven years and a yellowfin that moved from the Coral Sea off North Queensland to the coastal waters of Japan, a distance of over 3,000 nautical miles, in two and a half years.

Significant progress has been made with error checking and editing of the tagging databases with the recruitment of Mr Babera Kaltongga to the SPRTRAMP-funded Research Officer (Data) position in January 1995. During the last quarter, Kaltongga has been attempting to validate tag-return data, such as recapture locations, with logbook data.

A new project aimed at determining the genetic structure of bigeye tuna population(s) in the tropical Pacific began recently, in collaboration with CSIRO (Hobart), and with funding support from FFA and the University of Hawaii.

Samples are being collected from seven locations across the tropical Pacific (Philippines, FSM, Coral Sea, Marshall Islands, Hawaii, Tahiti and the eastern tropical Pacific). The study will indicate whether bigeye constitute a single genetic stock in the Pacific, or if a more complex stock structure (such as separate eastern and western stocks) exists.

Assessment and modelling

The assessment and modelling activities of the OFP continued to focus on the detailed analysis of RTTP results. Analyses of these and other data are proceeding on several fronts, some of which are collaborative efforts with scientists from the University of Hawaii, Otter Research Ltd, the National Research Institute of Far Seas Fisheries (NRIFSF, Japan), the University of Queensland and the Forum Fisheries Agency.

The tagging-based assessment work has been further refined in the case of yellowfin to include estimates of natural and fishing mortality rates by size.

The analysis indicates that natural mortality is much higher for small yellowfin <40 cm fork length. This finding will have a significant impact on yellowfin assessment and interaction studies.

Collaborative work with the University of Hawaii on the development of a spatial model of tagged tuna dynamics and the application of such a model to tagging data sets has been completed (although further work is planned).

The model has been used to estimate the impact of the purse-seine fishery on Kiribati and other pole-and-line fisheries, as part of the FAO-funded Expert Consultation on Interactions of Pacific Tuna Fisheries.

Assessment of South Pacific albacore using a length-based model is close to completion, but an update of the analysis to include recent fishery data is urgently required. Funding has recently been approved from

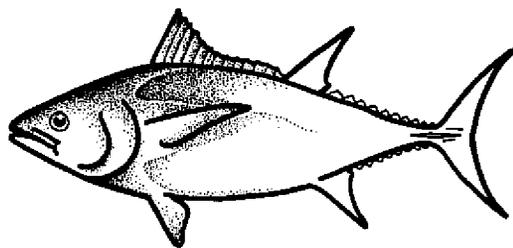
the University of Hawaii to apply a similar length-based model (but with spatial structure) to western Pacific yellowfin.

Many of the results of these population dynamics modelling efforts are now being used in bioeconomic analyses of western Pacific tuna fisheries, funded by the Australian Centre for International Agricultural Research (ACIAR) and being carried out in collaboration with the University of Queensland and FFA.

This project is attempting to integrate a variety of information on the fisheries, tuna biology and population dynamics in a form that will be useful for Pacific Island governments in determining tuna fisheries management policy.

One of the major objectives is to estimate levels of effort by the different industrial gear types operating in the western Pacific fishery that would maximise the economic benefits to Pacific Island countries.

Dr Michel Bertignac, who has recently been recruited to the SPRTRAMP Senior Fisheries Scientist (Modeller) position, is working on the development of a three-species (skipjack, yellowfin, bigeye), three-gear (pole-and-line, purse seine, long-line) simulation model, which will be the centrepiece of the bioeconomic analysis. 



SPRTRAMP observers are afloat

February 1995 was launching date for the South Pacific Regional Tuna Resource Assessment and Monitoring Programme Observers. Their first voyage, a shore-bound one, saw them attend the FFA- and SPC-sponsored Regional Observer

Workshop hosted in Brisbane. Three newly recruited observers and a concurrently recruited Port Sampler/Observer Supervisor are currently on deck, with a fourth observer about to join the team. The crew are from a variety of fisheries back-

grounds in Fiji (Filipe Viala), Tonga/Cook Islands (Sifa Fukofuka), Eire (Deidre Brogan), and the United Kingdom (Peter Sharples). The latest conscript, a Spaniard, brings his creel of experience from Atlantic tropical tuna fisheries.

The Regional Observer Workshop was implemented to provide a forum for exchange of ideas amongst observer managers and co-ordinators from throughout the SPC region.

It focused on setting a framework for regionally co-ordinated observer effort and development of national observer programmes.

Following the workshop, Filipe Viala and Sifa Fukofuka immediately cruised into the waters of the Federated States of Micronesia aboard Taiwanese longliners.

They used the well-established Micronesian Maritime Authority observer programme for safe passage into their new roles.

Shortly after, Deidre Brogan set some regional records by being the first female fisheries observer outside New Zealand and Australia to undertake an assignment in tropical tuna fisheries in the region (that we know of—we welcome correction on this point if erroneous).

After a little initial resistance from fishing companies and fishing-boat masters for different perceived problems, not least of all the archaic fisherman's superstition of ill-fortune that accompanies women on fishing-boats, the National Fisheries Development Company of the Solomon Islands was rewarded for its modern thinking and co-operative attitudes towards science in fisheries management with a big chunk of Irish fortune.

Its first fishing with Deidre on board brought a bumper set yielding approximately 250 metric tonnes, which more than filled the vacant holds.

Vessel and observer proceeded to an unloading port, then continued on another successful trip.

Most recently Deidre has been part of a team that has helped to kick-start the Marshall Islands Marine Resource Authority (MIMRA) observer programme aboard vessels fishing out of Majuro.

Together with Peter Williams, the SPC Fisheries Database Supervisor acting as an observer, she accompanied two Marshallese observers and Glen Joseph, the MIMRA observer co-ordinator, on a series of trips that focused on investigating pre and after-full-moon fishing behaviour of mainland Chinese longliners.

This programme was operated in such a way that briefing and debriefing of Marshall Island observers was able to benefit from the presence and experience of the SPC observers. This is a pattern that we anticipate will be repeated as other national observer programmes start up in the region.

As this newsletter goes to press, SPC observers will have been active on Japanese, Taiwanese and Solomon Island purse-seiners and Taiwanese, Mainland Chinese, Fijian, Vietnamese, New Zealand and Tongan longliners.

They will have been involved in fishing activities in the waters of Yap, Chuuk, Pohnpei, Marshall Islands, Cook Islands, Fiji, Papua New Guinea and Tonga and on the high seas between these areas. Their observer trips will have varied in length from but a few days (although usually at least seven) to over nine weeks.

Meanwhile, the Oceanic Fisheries Programme at SPC continues to develop procedures for on-board sampling and to cultivate regional congruity in sampling protocols and data handling.

Gear-specific scientific observer manuals will be written for use by SPRTRAMP observers and as templates for other observer programmes in the region.

SPRTRAMP will also be producing a Regional Port Sampling and Observer Newsletter, probably to be called 'Fork-Length'.

This will provide those working in the field with feedback on what their activities are achieving and be a medium for dispersing ideas and techniques to help improve sampling and reporting standards.

If readers of this article feel they have something to contribute to an inaugural (or later) edition of 'Fork-Length' please contact:

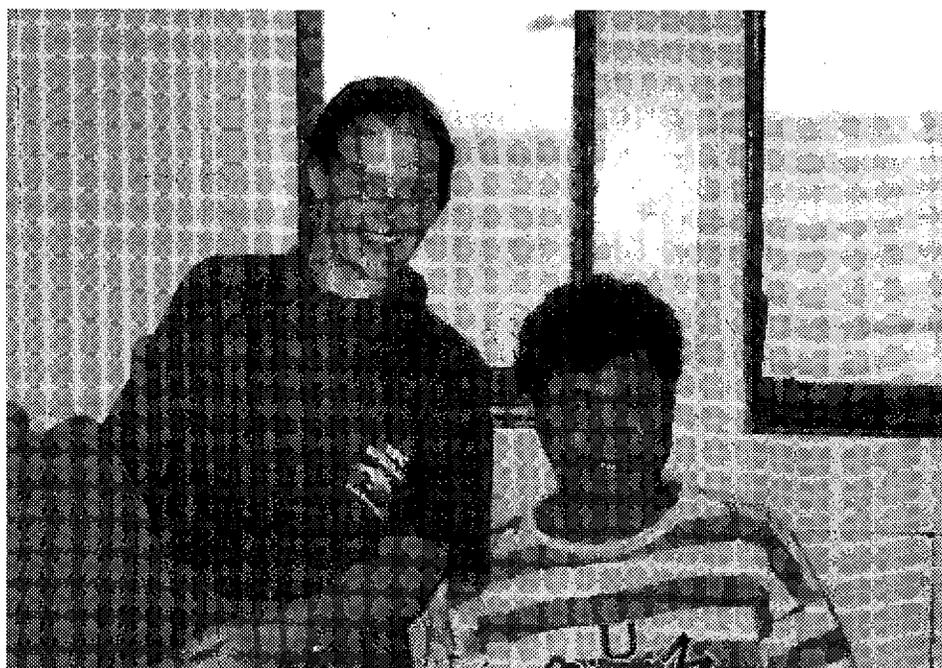
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So, who is driving this vessel? SPC Port Sampler/Observer Supervisor Peter Sharples samples hospitality and different cuisine with all nine of his mainland Chinese hosts.



After days of urging by the Chinese captain, the MIMRA observer coordinator Glen Joseph has finally shaved himself. The moment, caught on film, is shared here by Deidre Brogan, SPC observer, who refused the captain's insistence that she shave her . . . arms!!!

■ PALAUAN EARNS TOP AWARD FOR CONSERVATION

Reef and fisheries preservation efforts bring international recognition

Noah Idechong, former chief of Palau's Division of Marine Resources, was recently one of only six people world-wide to receive the Goldman Environmental Prize.

Noah, who was honoured for his work to protect Palau's coral reefs and fisheries, has received a US\$ 75,000 grant from the Goldman Environmental Foundation, billed by its promoters as the world's largest grassroots environmental award.

'We think it's a recognition of the kind of talent we have in Micronesia', said Dr Bob Richmond, Professor of Marine Biology at the University of Guam, who has worked on several environmental projects with Noah. 'It's a very prestigious award, and I think it's the first time anyone in this part of the world has been recognised in this way.'

'He really deserves it, added another colleague, Gerry Davis of Guam's Division of Aquatic and Wildlife Resources. 'He does something a lot of people have a hard time doing—he's

able to get the community to back up what he's doing. He educates them and they support his programmes."



Noah Idechong, who resigned from his former position last year to head the Palau Conservation Society, has fought to protect his country's endangered coral reefs and over-harvested fisheries in several ways. He enforced marine regulations and created a number of marine conservation initiatives.

Idechong convinced the chiefs of Palau, a nation of 15,000 people, to reinstate the age-old conservation tradition known as *bul*, which declared that from April to July there would be no

fishing in the spawning channels within the villages' reefs. This was considered to be one of the most important conservation measures in the Pacific in recent history, according to a news release announcing the award.

He also oversaw the installation of mooring buoys at Palau's most popular and fragile scuba-diving sites, helping save the coral from destruction caused by the repeated dropping of anchors by dive boats.

He played a key role in the passage of a nation-wide marine resources bill. The bill marked the first time in Palau's history that the Government had attempted to place restrictions on fishermen, and was met with considerable resistance.

'I've cheered and I've cried as I watched my beloved country during its long struggle to find its rightful place among the nations of the world', Idechong said in the release. 'Now that this is behind us, the greatest challenge we face is to safeguard our natural inheritance for ourselves and our children.'

(Source: *Pacific Daily News*)



■ CORNED BEEF STILL POPULAR DESPITE FISH PROGRAMME

Getting people to eat more fish and less imported foods like corned beef was a Marshall Islands idea behind the fisheries project, according to Marine Resources Authority (MIMRA) Director Danny Wase.

Unfortunately, canned food is still as popular as ever. The project is currently undergoing improvements, thanks to a

grant from the Japan International Cooperation Agency, to increase fish production in outer islands. The MIMRA fisheries project, funded by the Overseas Fisheries Cooperation Foundation (OFCF) was founded in 1989.

In its formative years it was operated by Japan, but MIMRA took over in 1993.

The project was intended to increase domestic production and develop the fisheries sector in the Marshall Islands. Two hundred and ten tons of fish have been brought in through MIMRA in the time that the project has been in operation.

Currently, there are four atolls with fish bases: Arno, Ailinglaplap, Kikiep and Namu.

MIMRA plans to expand to all twenty-four populated areas in the next three years.

A US\$ 3 million grant from Japan will make the expansion possible. Jaluit will be the next atoll to receive a fish base. All new bases will operate on solar energy. They will have solar-

powered ice-machines and electricity, according to Danny Wase.

An adviser from Japan, Hiroyuki Yoshida, has arrived on a two-year contract to help improve the fish marketing system in the outer islands.

The project is also looking into expanding to other markets, such as Kwajalein. The hope is that people on northern atolls will be able to sell their fish through the project to Kwajalein in the future.

(Source: *The Marshall Islands Journal*)



OVERFISHING THREATENS TONGA'S FISH STOCKS

Fish stocks close to Tongan shores are rapidly shrinking, and unless something is done about it, Tongans in the near future will find this traditional food harvest from the sea is insufficient for their needs.

The solution to the accelerating problem is management, and Patricia Kailola, a consultant fisheries biologist, was in Tonga for three months recently carrying out a study to see how Tonga could improve the management of its marine resources.

The Government is asking itself: Are we managing our marine resources properly? Will Tonga be able to maintain a supply of fish for its national consumption? Do we know the quantity of our marine resources? Will there still be enough fish in Tonga's 700,000 square kilometres of ocean to feed its future population?

Exploited

Tonga's inshore fisheries resources, during the past few years have been exploited at an

accelerating rate, due mainly to the availability of more sophisticated fishing technology such as spear guns and new deep-sea fishing methods, and the development of lucrative overseas markets for certain fish species such as red snapper.

It is recognised that a lack of proper fisheries management is leading to the non-sustainable use of resources and presents fundamental difficulties for the country in terms of food security.

Patricia said that her study is focusing on certain marine species such as lobster, clam, mullets, aquarium fish, octopus, shark and sea cucumber.

Giant clams

A number of projects have been launched in recent years to replenish depleting marine stock. Twenty giant clam circles have been established throughout Tongan waters, and trochus have been introduced.

Since 1991, the Japanese International Cooperation Agency has been operating an Aquaculture Research and Development Project.

Kazo Udagawa, the chief adviser, said their programme includes the nurturing of mullets and clams, and the introduction of green snails and trochus

shellfish. 'Under our clam programme we work closely with the people of Atata and the village of Kolonga. We gave them 2,000 baby clams which will take five years to grow to an edible size.' Kazo said that, at that stage, 500 of the 2,000 clams are reserved to become parent clams while the others may be eaten when ready.

New Act

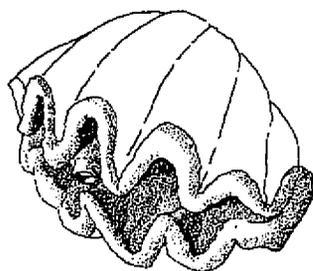
A new Fisheries Act came into force on 24 September 1994. The regulations cover conservation, local fishing policy, and foreign fishing policy. Patricia said that her findings will help to implement these regulations.

No records

Tonga's fisheries resources are difficult to assess because there is no record of the quantity of fish landed, and the Ministry of Fisheries has only recently begun issuing certificates to fish exporters. An accurate estimate of marine resources is still a long way off.

Even though there is a new Act, the difficulty remains with management.

Patricia said that Tonga differs from other Pacific Island countries, in that a particular community does not hold the exclusive right to its particular fishing ground, 'so that any Tongan



can go and fish anywhere in Tonga. A fisherman in Tonga-tapu may go and fish in Ha'apai'.

However, the most effective and the least expensive means of managing Tonga's marine resources is community management and Patricia hopes that

Town Officers could become involved in the policing of local fishing grounds.

(Source: *Matangi Tonga*) 

■ KONA LABORATORY GIVES HAWAIIAN FOOD PRODUCERS A BOOST

One of several food producers at the Natural Energy Laboratory at Keahold Point, Kona Cold Lobster, is in the business of keeping Maine lobster (a US speciality) alive and fresh. Lobsters are flown to Kona from Maine within a 24-hour period. Removed from their plastic foam shippers and chill packs, the lobsters are placed in holding tanks with fresh cold water circulating through them. They are fed a special diet until a restaurant needs them. Within hours, they can be in a restaurant kitchen as far away as Guam, with 3,000 to 4,500 kg of lobster shipped each week from the Kona facility.

Kona Cold Lobster is just one of several companies attempting to be commercially viable as food producers at the lab. At this ocean and solar technology centre, cold water from a depth of 600 metres is pumped to the surface and utilised in energy production as well as fish hatcheries, algae and seaweed production.

Experiments currently in progress involve running cold water through pipes to chill underground soil for strawberry, asparagus and tomato plants. Above ground, cold water can condense on pipes in the warm environment and irrigate crops.

Cold water is also used in Kona Cold Lobster's hatchery for lobster, where a Maine variety is cross-bred with a European one, resulting in a blue-shelled

lobster. The lobsters are constantly fed and kept from going into hibernation, cutting their growing time to about one half that in nature. It normally takes 2^{1/2}-3 years for a lobster to mature to a 700-900 g size that's ideal for restaurants.

Few of the blue lobster are allowed to grow to entrée size; rather, they are sold at 5-7.5 cm long and used as a garnish on plates in up-scale restaurants.

At Uwajima Fisheries, cold water helps in the production of hirame (flounder). A member of the Pacific halibut family, hirame is served up in Hawaiian sushi bars, where it commands top prices as sashimi and in sushi. Also under experimental production is mo'i, the Pacific threadfin, once the prized fish of Hawaii's ali'i (chiefs).

Ogo (crunchy seaweed) is a by-product at Uwajima. And awa (milkfish) is raised and sold on the Big Island.

At Royal Hawaiian Sea Farms, about 1,400 kg of ogo are sent out each week to local markets. Some ends up on the US West Coast, where restaurant chefs use it to garnish plates. Milkfish and tilapia are also being farmed at Royal Hawaiian's facility.

At Cyanotech, 27 green ponds are producing spirulina, micro-algae that are 60 per cent protein and high in beta-carotene, one of those antioxidants said to be good for the human body.

The algae's growth is spurred by the warm Kona sun, eliminating the cost of heating water, said Ron Scott, Cyanotech vice-president.

Paddles keep the algae moving in 180 m raceways. Every four days the spirulina is harvested and strained from the water, which is then recycled to begin the next batch. The algae are formed into tablets, capsules, flakes and other products that are marketed mainly through health food stores. 'This is the most productive agricultural land. It's 15 times more productive per acre than soybeans, using a tenth as much water', said Scott.

At Taylor United, a clam hatchery is in the research stage. Algae are being grown and fed to clam stock bred for spawning. Millions of clam seed are fed in tubs through which water flows constantly. Tanks are cleaned daily and the tiny specks are screened every week and separated by sizes, said manager Sue Cudd.

When the seeds reach 10 mm, about the size of a pencil eraser, they are shipped off to clam beds in the north-western USA, where they grow to adulthood. It takes three to four years for a clam to mature to a 5 to 7.5 cm size. Someday you might sit in the United States eating a clam that began life in Hawaii!

(Source: *The Honolulu Advertiser*) 

■ AQUACULTURE MAY NOT SOLVE FOOD CRISIS

Experts from across the Asia-Pacific region are sounding an alarm here about a widening gap between the world's food supply and population growth. With the population approaching six billion, they are looking at aquaculture as a future food producer.

But it must be 'sustainable' aquaculture—economically, socially and environmentally compatible—they stress. And there are multiple problems: diseases, available sites, environmental regulations, water quality, financing and technical difficulties.

Policy makers, scientists, technologists, economists and resource managers from more than 15 countries addressed those issues in June 1995 at the Pacific Congress on Marine Science and Technology in Honolulu.

Oceanographer Sylvia Earle stressed the adverse impacts on the Earth's support system when any part is displaced. 'There is an attitude that the only fish that have value are dead fish', she said.

'The bluefin tuna, a top-of-the-line predator, kg for kg is more valuable than a Ferrari', she said, adding she has seen a single bluefin tuna priced at US\$ 80,000 in the Tokyo market (see article in this newsletter).

Yet living tuna are teaching MIT researchers much about energy efficiency, because of their ability to move as fast as a nuclear submarine, Earle said.

The attitude that 'Natural resources are there for the taking' must be changed, she said, stressing an earlier warning

from aquaculturist John Bardach of the East-West Center that 'there is no free lunch'.

'We must find a balance between ourselves and life support systems', said Earle, adding that the trick is to do it while there are still options.

'If we don't solve that problem, nature will solve it for us', she said.

Much aquaculture development in the past decade was by commercial interests, which disregarded natural resources, said Imre Csavas, Regional Aquaculture Officer, Food and Agriculture Organization, regional office for Asia and the Pacific.

The developments surpassed sustainable levels and had to be scaled back after damaging the environment, he said.

John Jensen, extension fisheries specialist at Alabama's Auburn University, the nation's leading aquaculture university, said aquaculture has a farm value in the United States of US\$ 800 million to US\$ 1 billion and is mostly a feedlot industry, relying on grain shipped from the Midwest.

There is a lot of interest in different species, he said. But as far a cultivated white-meat fish 'catfish is the only game in town'.

John Corbin, manager of Hawaii's Aquaculture Development Program, said one of the big obstacles to aquaculture has been the environmentally wrong location of farms. But Hawaii is a model for sustainable aquaculture environmentally because farming locations are scrutinised through the environmental impact process, he said.

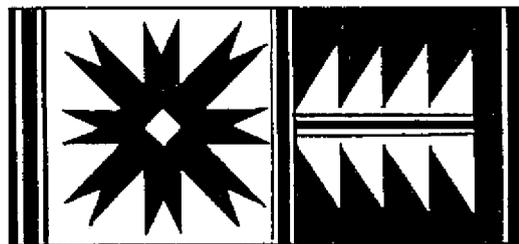
As far as economics of the industry are concerned, he said, 'We're still working on it'.

Many aquaculture businesses have failed in Hawaii and across the USA, possibly because of the need to expand and increase profit levels, Corbin said. 'Maybe it is not a corporate business', he added, noting that recent growth has been in small community and family operations.

They are in areas, such as Hamakua on the Big Island and Waianae, where they make a difference even though they're small, he said.

Bardach attributes the failure of many aquaculture ventures to 'lousy management', noting that some of those here were not Hawaii-based corporations. He hopes small fish farms grow and school kids get excited about aquaculture.

(Source: Honolulu Star Bulletin)



■ FIVE MARLIN WILL CARRY SATELLITE TAGS FOR SCIENCE

Five marlin are to go swimming for science soon, hauling satellite transmitters that will allow fisheries scientists to learn more about their behaviour.

The information will be used to help ensure that billfish stocks are not depleted by fishing pressure.

It's a programme of the Pacific Ocean Research Foundation (PORF), which was established and is partially funded through the Hawaiian International Billfish Tournament.

While some people may be surprised that a sport fishing organisation is supporting fisheries research, there's plenty of precedent. Government-collected hunting fees have supported conservation and scientific study in much of the United States.

The Pacific Ocean Research Foundation has been involved in a range of research programmes that provide important understanding of marlin behaviour, the animals' range, how they mix genetically with marlins in other areas, and how they handle fishing stress.

Electronic tagging in 1989 showed that blue marlin come to the surface regularly. That means they can be tracked. It also showed that marlins are especially susceptible to drift-netting, which is banned in most of the world's oceans.

The early tracking was done with electronic tags that required scientists to chase the fish in boats. The work was difficult, and the tags were only good for a few days.

The new satellite tracking packages are streamlined and should not interfere with the marlins' behaviour, scientists say. The transmitters, which will have a three-month battery, will emit a burst of information whenever their small antenna breaks the water's surface. The transmissions will be picked up by a satellite far overhead.

This allows scientists to track the animals from laboratories via computer, rather than chasing them around the ocean.

'The satellite tag, if successful, will provide much-needed information on the migratory movements of the blue marlin in the Pacific,' said Barbara Block, head of the PORF scientific advisory committee. 'The movements and migrations of the population of blue marlin that come to Kona have long been of interest to PORF scientists'.



Fish physiologist Richard Brill, the first director of PORF and a member of its scientific advisory committee, said the blue marlin is the primary subject of billfish researchers here because it's the most common billfish in Hawaii. They are caught most frequently in summer, when they appear to come to the Kona area for spawning.

'Kona is an active spawning area', he said.

Striped marlin are also found, but more often in the winter. Black marlin, sailfish and short-billed spearfish are seen less frequently, and swordfish are caught primarily around the north-western Hawaiian Islands, he said.

PORF also sponsors research on tuna. Brill said both tuna and billfish are very sensitive to water temperatures.

Block and Brill, in tracking tests of yellowfin tuna off San Diego, found that they prefer water temperatures of 68°F or warmer. They seldom dive into cooler waters below.

'Marlin, too, are temperature-sensitive. Research on striped marlin shows they seldom enter water more than 8°F colder than the warmest water available.

'They'll occupy the warmest water they can find', Brill said.

Anglers in Hawaii frequently discuss the seasonal times when tuna return to various areas. Brill said the fish, which travel the wide ocean, have little interest in geography, and aren't returning to specific places.

'They live in water masses. They are interested in water temperature, oxygen content and prey availability. Geography is meaningless to them', he said.

A number of fisheries scientists will be on hand later this month in Kona for the billfish competitions, where they'll perform investigations as anglers emphasise catching fish.

The tournament's pro-am qualifying event was scheduled for 22 to 28 July, and the Hawaii International Billfish Tournament was from 29 July to 5 August.

Tournament rules, partly in recognition of the increased understanding of the fishes, emphasise catch-and-release fishing, granting extra points for

smaller marlin that are tagged and released.

Brill said tagging research shows marlin of all sizes survive well after being released. The animals normally will swim down to the thermocline, that area where the warm water rapidly gets cooler.

'They seem to have about a two- to three-hour recovery. They drop to the top of the thermocline, and then they seem to resume what we believe is normal behaviour—going up and down between the surface and the top of the thermocline,' he said.

(Source: *The Honolulu Advertiser*)



■ NZ TUNA EARNS US\$ 80,000

A 327 kg southern bluefin tuna has earned US\$ 80,000 after being caught by the 53 m long Sanford-owned longliner *Santemaru 18* based at Auckland, New Zealand.

She made an unscheduled visit to Gisborne to have the bluefin carefully craned off in a sling to avoid bruising which could have cut the selling price.

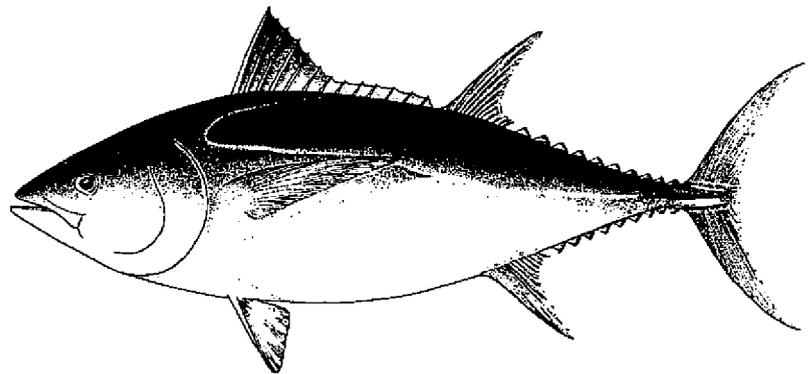
Ten crewmen worked in rotation with three men on the line for four and half hours to get the 2.4 m long tuna aboard while fishing east of Mahia and south of Gisborne.

Then its tail had to be cut off to fit it in an ice-slurry bin for cool-

ing. The catch was packed into an ice-filled and plastic-lined crate to be driven 300 km to Auckland for despatch to Tokyo, where it earned US\$ 260 a kg. It had been rated number one of 100 tuna on offer.

A tuna of 100 kg is a big fish, but to get one 250 kg plus is extraordinary. 'She's real rare', said Ian Vander Nagel, Tauranga branch manager for Sanford.

(Source: *Fishing News International*)



■ NEW WORLD RECORD: HARVEST TOPS 100 MILLION TONNES

The world harvest of fish and shellfish is now running at over 100 million tonnes a year and in 1993 rose to a new record of 101,417,500 tonnes.

Figures compiled by the Food and Agriculture Organization (FAO) for its *Yearbook of Fishery Statistics*, due to be published later this year, show that capture fisheries remain on a plateau.

FAO points out the good news that catches are not declining, except in some areas where this

may be welcomed as an indication that some stock rebuilding of the world's fisheries may have started as a result of reductions in the total fishing effort.

'This rehabilitation will help ensure future long-term sustainability', FAO comments.

China continues well in the lead among the top countries, with a rise in production from 15 million to 17.57 million tonnes.

Peru, in second place, rose from 6.87 million to 8.45 million

tonnes—and this performance is put in the shade by the Latin American country's catch leaping to 11 million tonnes last year. Japan with 8.13 million tonnes follows Peru in the world league, but catches by the Russian Federation fell again, to 4.46 million tonnes, as fleets were laid up after pulling back from uneconomic operations in distant-water fisheries.

Top species in 1993 was again the South American anchoveta, with catches of 8.3 million tonnes reported.

In a report on the state of world fisheries, FAO notes that the increase in total production between 1992 and 1993 came almost entirely from aquaculture, which now accounts for 16 million tonnes of the harvest.

It points, however, to its projections towards 2010 which indicate that, even at the present level of fish consumption, world population growth will boost demand by 19 million tonnes.



FAO says that such an increase in the production of food fish (to 91 million tonnes a year) is feasible if aquaculture production can be doubled in the next 15 years, and if significant improvements can be achieved in the conservation and management of capture fisheries.

FAO warns countries with capture industries: 'In the short to medium term, nations will need to constrain production in order to facilitate stock rehabilitation. In the case of some longer-lived demersal species and some tunas, the time required for stock

building may take up, or even exceed ten years'.

Technology to improve utilisation of by-catches and the use of more small pelagic fish for direct human consumption will help achieve food-fish goals.

World fish and shellfish production has now moved ahead of the previous 100.3 million tonne record set in 1989.

(Source: *Fishing News International*)



SCIENTISTS WILL SEED CORAL IN GUAM

The Guam Environmental Protection Agency, the Division of Aquatic and Wildlife Resources (DAWR), and the University of Guam Marine Laboratory are cooperating in a project to introduce coral larvae to Tumon Bay.

The attempt to seed coral in Tumon Bay represents a new approach to the island's reef problems, said Jerry Davis of DAWR, because prior projects focused on what caused the problems rather than on potential solutions.

'Why work on the problem when you can work on a cure?' he added. The cooperation of the three groups is an important

first step in working on a 'cure', or at least the beginning of one.

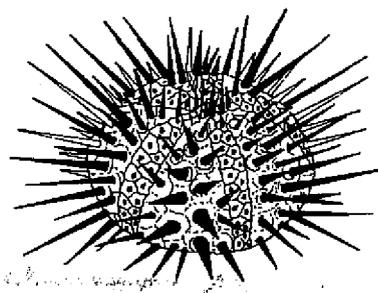
However, the problems of working with coral go far beyond bureaucracy and red tape. 'Coral larvae are not like plant seeds', said Dr Robert Richmond of the marine lab. 'You can't just dig a hole in the sand, put the larva in, and pat it down.' The larvae, which are at the mercy of ocean currents, can be picky about where they settle down. And until recently, just getting the larvae could be difficult.

'Even in the last three years, we've made big strides', Richmond said. He and his students can now raise hundreds of thousands of larvae from just two coral colonies.

The 'homegrown' larvae may eventually be used to grow coral for aquariums, which currently use large, live corals collected from reefs, and in projects like the seeding of Tumon Bay.

Unlike previous attempts to introduce coral to an area by using fragments from existing coral structures, Richmond

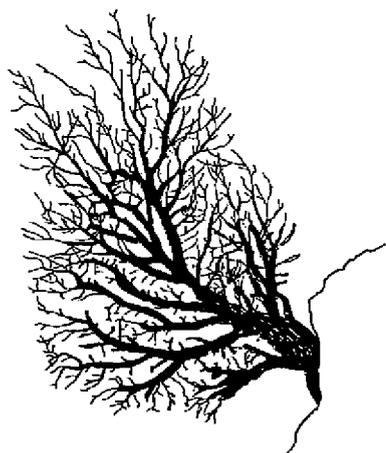
said, seeding uses cultivated coral larvae rather than coral taken from another area.



While established corals are attached to surfaces like old reefs or rocks, larvae are free-floating. Richmond and his team are trying a new technique to enhance the larvae's chance of finding a good place to settle.

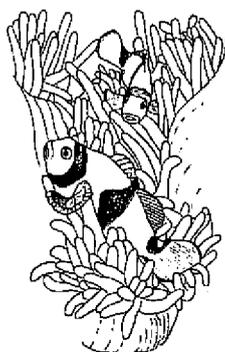
Using a device made of inexpensive hardware items, the larvae are confined to a small area in the hope that some of them will attach themselves to a site.

The Tumon project is serving as both a test of the new technique and an attempt to re-establish coral in the bay. Additionally, the project will provide new information about other aspects of coral larvae.



If the seeding is successful, much will be learned about the kinds of areas larvae like, and about what kinds of conditions are necessary for the larvae to attach, Richmond said.

Further, the technique could be used in other areas around Guam and the Pacific.



Despite the potential benefits of this project, both Richmond and Davis agree that it is not an easy answer to the problems affecting the island's reefs.

'You can't replace a 100-year old coral in less than 100 years', Richmond said.

(Source: *Pacific Daily News*) 

■ ABALONE SEEDING IS A SUCCESS

Soaring demand for abalone as natural stocks decline has escalated transplantation experiments and the stocking of open waters with hatchery-reared seed.

Significant success in stocking abalone beds with hatchery-produced seed has been achieved in Japan and Korea. Recently countries such as New Zealand and the US have also taken up the challenge.

Enhancement of this most valuable marine gastropod in the US is a two-pronged affair involving both commercial and sport divers. H. Roy Gordon of abalone seed- and juvenile-producer Bodega Farms of Bodega Bay, California, told *Fishing News International*.

Commercial divers operating along the California coast in the 1960s harvested about five million lb of abalone a year, he says. Commercial diving for abalone is carried out south of San Francisco only, as scuba gear cannot be used further north.

This year's commercial harvest of abalone in California will probably only reach 227 tonnes, as stocks have been severely depleted by heavy harvests, increased pollution and predation by an expanding sea otter population. In turn, this has driven the wholesale price up to about US\$ 48/kg.

'The commercial abalone dive fishery realised that it had got to do something, so they purchased an initial 40,000 seed for out-planting to suitable habitat', says Roy Gordon.

Finance came from an abalone fishery levy of 41 cents/kg – this was earmarked solely for stock enhancement.

'They've looked to New Zealand, where there has been considerable success with out-planting of abalone seed', says Roy Gordon.

A re-established breeding population will be the true success behind the enhancement programme. Gordon acknowledges that Japan has been very successful in enhancing its stocks of abalone, but he does not regard it as a model for the US because the Japanese eat many of the predators.

'We have lots of predators here and so does New Zealand which is, therefore, much more similar to the situation we have in California', he says.

Habitat

'In New Zealand commercial study they found that, if you use the proper habitat, i.e. put the abalone seed on the proper scarred rocks (formerly occupied by wild populations of aba-

lone) and get them acclimatised, they get significant results.

'That result may be only two to five per cent survival, but an abalone will reach three inches within two years of being planted out, and a single animal of that size is capable of spawning up to 300,000 eggs.

'With the seeding project, it's like it was back in the 1950s; the animals are closer to each other and the chance of fertilisation is good.'

Spawning of gravid abalones is triggered by sudden changes in water temperature, exposure to air or release of gametes by other spawning abalones. A sudden contraction of the foot muscle caused by such factors forces out the eggs and milt.

The other side of California's abalone enhancement story concerns the State's tens of thousands of sport divers, who carry out their free-diving activities north of San Francisco.

'The Northern California Abalone Group started having their guys donate money for stock enhancement out of their own pockets', he says.

'They went out on their own and took some large broodstock from Mendocino Country. That's where the record red aba-

lone—it was 30 cm—was taken last year.

'They brought the brood down here and we spawned them. The seeds will go back in the sea, where the sport divers will carefully put the animals on scarred rocks and stay with them until they crawl into crevices where they will be better protected from predators.

'Divers are confident that they are going to get a five to twenty per cent return, which will be

tremendous. Even one per cent would be wonderful because they would be spawning.'

Mexico, Japan and Australia are the world's major abalone-producing countries. The USA, New Zealand, South Africa, North and South Korea and Canada also land significant quantities. It is marketed in fresh, frozen, canned and dried forms and eaten raw or cooked. The shells are also of economic importance.

In addition to natural stock enhancement, abalone is being grown to market size under controlled conditions in land-based farms and in enclosures in the sea.

Bodega Farms sells young stock of 10–50 mm and now supplies abalone farmers in a number of countries.

(Source: *Fishing News International*)



■ USE OF SATELLITE MONITORING IN FISHERIES: THE NEW CALEDONIAN EXAMPLE

Since October 1994, 15 Japanese fishing boats operating in New Caledonia's economic zone under the Franco-Japanese Fishery Access Agreement have been equipped with Argos beacons, making it possible to locate them by satellite.

Our purpose in this article is not to describe how satellite monitoring functions, but to show how this tool can assist in the management of fishing fleets and fishery resources.

Information transmission

At Noumea's latitude (about 22°S), a satellite passes within range of a beacon about nine times per day on average.

A boat can thus be sensed almost 10 times a day and 10 daily position signals can be registered by the Argos processing centre, which then makes them available to authorised users for a period of four days.

Data are supplied to users in 'real time', either at regular intervals as specified in a contract, or as required by requesting the Argos server.

In both cases, the user must have an information receiving and storage system (an IBM-compatible personal computer) equipped with a modem enabling round-the-clock connection to the Argos server.

The data can also be obtained retrospectively on a computer medium (diskettes) or on print-outs for a period of three months at the most.

Information management and use

Each beacon is identified by a number included in the programme assigned to the user.

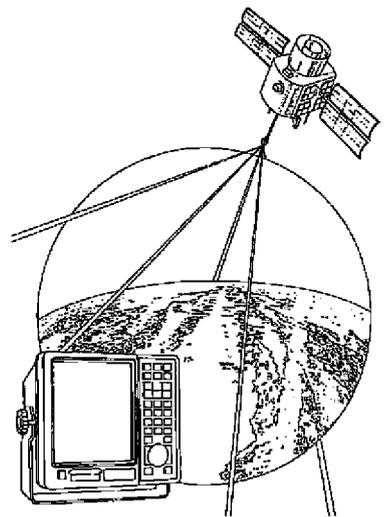
Using these numbers, the information is down-loaded from the corresponding beacons through the server on the ELSA programme which acts as an information collection and management software. This software can interface with many different spreadsheets and databases (Excel, Quattro, Lotus 123, DBase, etc.).

After selecting the times and beacons of interest, the user can see the trajectories and successive positions of the relevant

boats on the screen, plotted either on a world map or on a map of the Pacific on which it is possible to 'zoom in'.

Moreover, if the programme is supplied with the average speed of the boats when in transit and when fishing, times spent fishing can be distinguished from times spent in transit by analysing beacon trajectory and speed.

The terms of the current France-Japan Fishery Access Agreement do not provide for fishing results to be transmitted from the boats via the Argos system.



It should however be noted that this option is available in the ELSA software. The process would require the ship to use a mini-terminal connected to the beacon to record fishing data. The information would then be transmitted to the user using the same process as that for location data.

Succinct statistics on the results of the boat's activity (for example, changes in yield over time) can then be produced.

The advantages of fishing boat monitoring by the Argos system reside mainly in the very rapid receipt of position information (50% of the data are available in less than 2 hours) and in the ease of analysis provided by the data capture management software.

One option of the fisheries module allows 'real-time' transmission of fishing results, thereby facilitating quota management in addition to management of access to fishery areas.

All this is available for a software cost of FF 25,000 (US\$ 5,000) and the purchase of a modem to be connected to the mini-computer, which does not have to be restricted to this task (a basic office work station is sufficient).

Finally, it should be noted that each beacon monitored is charged for by Argos at a rate of FF 90 per day.

(Source: Régis Etaix-Bonnin)



■ INFOFISH-TUNA 1995 TO BE HELD IN PHILIPPINES

The Fourth INFOFISH World Tuna Trade Conference will be held at the prestigious Manila Hotel in the capital of the Philippines on 25-27 October this year.

TUNA 95 is organised in collaboration with the Philippines Department of Agriculture, FAO GLOBEFISH and Agra Europe (London).

The event, with its theme *Tuna in the 21st Century*, will be addressed by over twenty speakers, including industry representatives and international experts, in four sessions.

James Joseph, Director, IATTC, who will chair the conference, will also deliver the keynote address in the first session on 'Resource management and outlook'.

The issues of 'Conservation and embargoes' and 'Economics of production' will be examined by prospective speakers in this session, while Helga Josupeit, FAO GLOBEFISH, will present an overview of global tuna production and markets.

The industry situation and production prospects in major sup-

ply sources will be examined in Session II.

Arporna Sribhibhadh, former Director of Fishery Industries Division, FAO, Rome, will review the situation in Thailand. While the Philippines will be covered by Francisco T. Laurel, President, Federation of Fishing Associations of the Philippines, Ir. Soepanto, President Director, PT Usaha Mina, will present the Indonesian scene.

The Japanese tuna industry situation (with special emphasis on cultured tuna production) will be assessed by Tadashi Yamamoto, President, Japan International Fisheries Research Society. Peter Wilson, President, Global Ocean Consultants, will take a look at the situation in the South Pacific.

Andrew Wright, Deputy Director, Forum Fisheries Agency, is expected to cover the Western Pacific tuna industry. Paul Antonietti, General Manager, Saupiquet, and Joel Nageon de Lestang, Director Resource Management, Seychelles Fishing Authority, will speak on the West African and Western Indian Ocean tuna industries respectively.

The situation in Korea and Taiwan will be presented respectively by K. J. Choi, General Manager, Dongwon Industries, and Peter Ho, Vice-President, Overseas Fisheries Development Council of Taiwan, ROC.

The principal markets, including Europe, Japan, EC and beyond, are to be examined in Session III - Products, Markets and Consumption. Drawing on their long association with the industry, Jose M. Munoz, Jr, President, JEM Inc, and Walter J. Anzer, Secretary General, BACFID, will speak respectively on the US and European tuna markets.

Ryuichi Tanabe, Executive Managing Director, JMPIA, is expected to speak on the Japanese market and Steve Williams



from the University of Queensland is to cover the global sashimi market. Sjeff van Eys, Director, INFOPECA, will take a critical look at the emerging Latin American tuna markets. A presentation on Pet Food Products and Markets by L. Lawnin Crawford, Purina Japan, is of special interest in this session.

Various technological and quality control issues will be addressed in Session IV. Presentations on handling and quality standards, innovative and value-added products, and equipment will be included in this session.

Each session will be followed by a panel discussion. Day One

will have morning and afternoon sessions. On Days Two and Three, morning sessions only are scheduled, leaving the afternoons free. Post-conference optional tours to major tuna landing and processing centres in the Philippines will be arranged.

(Source: *Irfifish*) 



DID YOU KNOW?

Vampire fish show their teeth

A tinier and more voracious version of the candiru – the parasitic fish famous for finding its way into the orifices of unsuspecting bathers – has been discovered in Brazil. The fish, which does not yet have a name, seems to feed exclusively on the blood of its victims.

Wilson Costa, a biologist from the Federal University of Rio de Janeiro, discovered the transparent fish in the Araguaia river in the south-east Amazon basin. Costa says the fish is only a centimetre long, half the size of any of the three known species of candiru.

The fish has two hook-shaped teeth at the back of its mouth and an unusually flexible jawbone. At night, it lodges itself in the orifices of larger animals, usually the gills of other fish, buries its teeth in their flesh, and sucks out blood.

'We picked out one fish in the morning and it was full of them, so full of blood they were hardly able to move', says Costa. He says the candiru also slips inside human orifices, where it is impossible to shake it out because of the powerful grip of its teeth. 'Because most of the local people come from simple riverside communities, with few or no medical facilities, it can lead to serious infections', says Costa.

On one occasion, he says, one of the tiny candiru slipped into a cut on a researcher's hand and could be seen wriggling under the skin towards a vein.

(Source: *New Scientist*, December 1994)

■ BOOK REVIEW: FISHERIES BIOLOGY, ASSESSMENT AND MANAGEMENT

Fisheries biology, assessment and management, by Dr Michael King, is reviewed by Paul Dalzell, SPC Inshore Fisheries Scientist.

Fisheries science is a quantitative discipline and fisheries biologists need to be versed in how to estimate fisheries and biological parameters for management purposes.

Most of the maths involved is fairly simple algebra, but it can look fearsome to students of fisheries science.

Most of us in the 'trade' have had rely in the past on two standard references when determining the best approach to analysing fisheries data, namely W.E. Rickers' *Computation and interpretation of biological statistics of fish populations*, and R.J.H. Beverton and S.J. Holt's *On the dynamics of exploited fish populations*.

Comprehensive though these volumes are, neither could be described as 'user-friendly' and many of us have had to rely on more mathematically-oriented colleagues to explain formulae and equations.

Daniel Pauly of ICLARM was the first to address this problem, with the publication in the mid-1980s of *Fish population dynamics in tropical waters*, which was designed specifically to cut away the mysteries and arcana of stock assessment and present the methods and various techniques with simple clarity.

Following in this tradition comes *Fisheries biology, assessment and management* by Dr Michael King.

Dr King was until recently the Associate Director of the Faculty of Fisheries and the Marine Environment at the Australian Maritime College, where he taught fisheries biology.

Prior to this Dr King had worked extensively as a fisheries scientist in Australia, the Pacific and Asia. As a teacher, Dr King was able to appreciate the difficulties experienced by students in understanding the concepts of fisheries science and stock assessment. Out of these experiences has come this new book.

At 340 pages, the book is a comprehensive review of fisheries science methodology, and is divided into six lengthy chapters: Fisheries resources, Fishing gears and methods, Population dynamics, Yield, Fisheries assessment and monitoring, and Fisheries management.

There are also useful appendices in which most of the mathematical symbols and equations are summarised, and which contain advice on the collection and manipulation of length-frequency data, one of the most commonly collected forms of fisheries data.

Many of the examples in the book refer to tropical stocks, most of which will be familiar to Pacific Islands fisheries scientists, such as trochus, giant clams, deep-slope snappers and round scads.

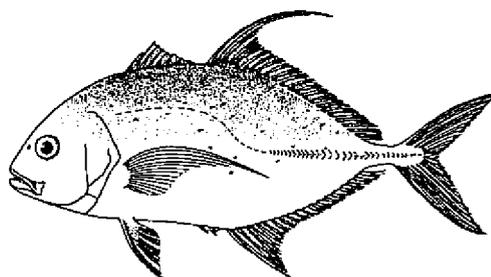
The methods used to estimate biological parameters such as mortality and fisheries parameters are clearly explained and illustrated, with easy-to-follow worked examples.

The publication of this book is very timely, given the importance of fisheries to the Pacific Islands region and to the increasing need to manage these fisheries resources.

A copy of this book should be on the shelves of every fisheries scientist in the Pacific Islands, or at least available in the fisheries division library.

The book is not cheap, costing £ 35 or about US\$ 55 excluding postage to this part of the world, but is a worthwhile investment for any fisheries scientist or fisheries division.

It can be obtained from Fishing News Books, Osney Mead, Oxford OX2 0EL, UK. 



THE APPLICATION OF HACCP IN A GOVERNMENT FOOD INSPECTION PROGRAMME

Introduction

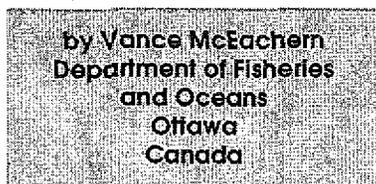
The acronym HACCP (Hazard Analysis and Critical Control Point) has come to mean food safety in the food industry throughout the world.

Although HACCP has been applied by the food canning industry for nearly 20 years, government food inspection agencies have just recently started to promote it as an effective tool in ensuring food safety.

Many countries have adopted HACCP principles as part of their food inspection programmes or are in the process of doing so. These new requirements will not only affect their domestic food processing industry, but also the food processors who export food products to these countries.

The Canadian Department of Fisheries and Oceans was one of the first government food inspection agencies to implement a mandatory HACCP programme. It is referred to as the **Quality Management Programme (QMP)**, and requires that all fish processing plants operate under HACCP-type controls.

This article will discuss the basic principles of HACCP and their importance in achieving safe food, the impacts that HACCP is having on international trade, government's and industry's role in implementing HACCP, and how the Canadian Department of Fisheries



and Oceans adopted these principles in the development and application of the Quality Management Program.

HACCP concepts and principles

HACCP was developed in the 1960s by the combined efforts of NASA (the US space agency), the US Army and the Pillsbury Company to ensure that the food provided to the astronauts during their missions was safe and did not pose a safety risk. The traditional inspection approach of 'snapshot' plant inspections and end-product testing did not provide the assurances required by the space programme. The assurances provided by the HACCP system did meet their requirements.

The power of HACCP is realised through the combination of analysis, control and prevention. Food-processing operations are analysed to identify where potential hazards exist and control measures are implemented at critical stages of the process to prevent the hazards from occurring. The HACCP system is versatile and can be adapted to all stages of production, processing, distribution and preparation of different food types to prevent problems.

Implementing HACCP involves applying seven basic principles:

1. Analysing the food production, processing, distribution and preparation to identify the potential hazards (biological, chemical, physical);
2. Determining the *Critical Control Points* in the process where those hazards can be controlled;
3. Determining the *Critical Limits* that must be met at each Critical Control Point;
4. Establishing the monitoring procedures at each Critical Control Point;
5. Establishing *Corrective Actions* to be taken when problems are identified through monitoring;
6. Establishing verification procedures to ensure the control measures are effective;
7. Establishing effective record-keeping systems.

The costs associated with implementing a HACCP system include: the costs of developing a HACCP programme unique to the product, the training costs for personnel, monitoring and record-keeping costs, and the costs of management overseeing HACCP implementation and operation.

However, it is important to point out that the lack of a HACCP system may also create costs for a processor through production inefficiencies, low-value product, recalls and the loss of market opportunities.

The potential benefits of a processor implementing a HACCP system include reductions of product risk, increased product quality, savings in production costs, reduction in product recalls and increased marketability of products.

Properly applied, there is no other system or method which can provide the same degree of safety and assurances of quality, and the daily operating cost of a HACCP-based system is small compared with a large sampling programme.¹

Under a HACCP system, industry can better ensure the food it sells is safe. Companies can more easily detect potential problems and quickly react to them early in the process before the product has reached the market.

Although HACCP was originally designed for application by a specific food-processing operation to control hazards inherent in the product and process, government food inspection agencies are beginning to apply the principles to enhance their food safety and inspection programmes. Countries such as Canada, Australia, Brazil, Uruguay, the European Community and Thailand have already integrated HACCP into the food inspection programmes and supported it through regulation.²

The scope of HACCP has also been expanded by some of these countries. A pure HACCP system focuses only on the

health and safety aspects of the product. Under Canada's Quality Management Program, HACCP-type controls have been expanded to control not only the hazards related to fish products, but also decomposition, economic fraud and misrepresentation factors.

HACCP effects on international trade

The international body, the Codex Alimentarius Commission, has advocated the use of a HACCP-based approach and is incorporating HACCP principles into the Codex Codes of Practice. These Codes of Practice will play an important role in international standard-setting under the World Trade Organization. Also, the European Union and the United States have commenced the process of implementing HACCP for their food industries and these new requirements will be extended to imported foods.

The US Food and Drug Administration's regulatory proposal requires that all sectors of the seafood processing industry, including processors, packers, warehouses and importers, implement HACCP principles. The HACCP system must entail a science-based analysis of potential hazards, determination of where the hazards can occur in processing, and the implementation of measures to prevent problems. Corrective action systems and record-keeping systems must also be developed and implemented.

The European Union has also implemented a number of measures in efforts to harmonise HACCP implementation in its member states. These measures are extended to recognising the equivalence of inspection systems in third countries and are based on HACCP principles.

The impact of mandatory HACCP on importers and exporting countries may be severe if they do not have a HACCP system in place. The failure to comply may result in products being denied access or subject to regulatory action.

Alternatives should be provided to allow the entry of products from developing countries that have not yet had the opportunities or mechanisms to develop and implement a national HACCP system.³

The Canadian Department of Fisheries and Oceans (DFO) is currently developing a new method of inspecting imported fish products, based on HACCP principles. The programme is referred to as the **Quality Management Program for Importers**.

The approach taken by the DFO is to use the information gained by HACCP systems to direct inspection resources. Fish products imported into Canada that have been processed under a HACCP regime will receive facilitated access to the Canadian market. Importers will be encouraged to require HACCP controls as part of their purchasing conditions.

¹ Huss, H.H. (1994). Assurances of seafood quality. FAO Fisheries Technical Paper No. 334:169 p.

² Lima dos Santos, C.A. (1995). Impact of HACCP on international seafood production and trade. 1995 International Boston Seafood Show Conference, Session 202.

³ Mills, R. (1994). The impact of HACCP-based requirements on international trade and the effect on developing countries. FAO Expert Technical Meeting - The Use of HACCP Principles In Food Control. Vancouver, Canada, 12-16 December 1994.

The lack of HACCP controls during production would not automatically restrict the product from entry, but those fish products that were not produced under HACCP controls would be subject to a higher level of inspection than those processed under HACCP controls.

The application of HACCP systems by exporters of food products will provide the importing countries with more knowledge and confidence that the food products were processed under safe controls. As a result, the products will enjoy a reduced inspection level and facilitated access to the marketplace.

In the final analysis, HACCP-type controls will be required by exporting food processors to maintain open and ready access to the large markets such as the US and the EU.

The role of government and industry in HACCP implementation

The role of government in the implementation of HACCP is to show leadership in the implementation and provide the infrastructure (which includes regulations, training, inspection/compliance and industry guidelines) that ensures its uniform application. Government must define and establish acceptable levels of food safety risk; establish HACCP implementation priorities relating to food types, facilities and processes; and integrate HACCP throughout the food chain.

Food safety policies and programmes should be developed, using risk analysis to focus in-

spection resources, and should be implemented and managed through national strategic plans.

The role of industry is to learn about and understand HACCP, implement its principles in cooperation with the food inspection agencies and ensure that its members are committed to its application at all levels of food production.⁴

DFO's Quality Management Program (QMP)

Although HACCP has been described as overly complicated and detailed for many of the fish industry sectors, the Canadian Department of Fisheries and Oceans has developed a practical and logical approach to implementing a HACCP-based system.

This system has been successfully adopted by the Canadian industry, which includes both large and technically sophisticated processing plants and small, family-run processing operations.

HACCP, like QMP, is a system designed to prevent instances of public health significance. However, QMP has been designed also to prevent instances of unacceptable quality and economic fraud from occurring. This is a fundamental difference between the QMP and a pure HACCP system.

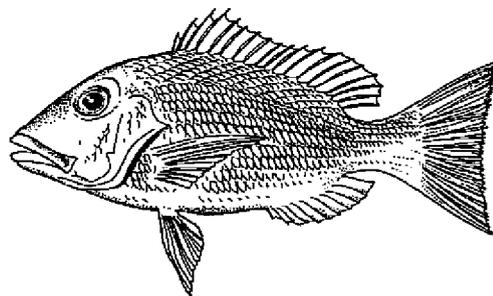
QMP is closely linked to the Canadian Fish Inspection Regulations, and the application of a QMP aids the processor in interpreting the regulations and operating within the regulatory requirements. The overall result is that the fish produced is safe, of acceptable quality and marketed fairly.

By implementing the Quality Management Program, the fish processing industry is able to demonstrate that this is operating on a day-to-day basis with controls that ensure compliance with the regulations.

The development of an individual Quality Management Program for a fish processing operation incorporates all of the basic steps involved in developing a HACCP system for a specific food product. A hazard assessment of the process operation is performed.

Critical control points are identified. Defect definitions and tolerances, monitoring procedures, record-keeping criteria, corrective action systems, and company verification measures are established for each critical control point.

As of 1 February 1992, each fish processing plant is required by regulation to have in place and be operating under a QMP specific to its fish processing operations. The Department developed the QMP Submission



⁴ Report of the Expert Technical Meeting – The Use of HACCP Principles in Food Control. Vancouver, Canada, 12-16 December 1994.

Guide to assist the industry in developing its programmes. The Guide helps the processor identify the Critical Control Points in the process and the associated hazards and sets out for the fish processing industry the minimum requirements for a plant's Quality Management Program.

Under QMP a fish processing plant is required to address 12 elements that are applicable to its operation. Potential hazards will be prevented through the application of controls at each of the elements in the process operation:

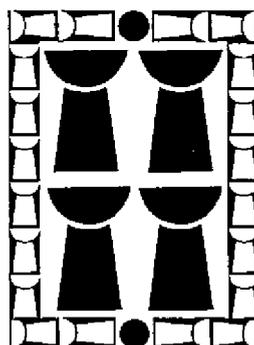
1. Incoming fish,
2. Other ingredients,
3. Packaging material,
4. Labelling,
5. Chemicals (cleaning agents, sanitizers, lubricants, and pesticides),
6. Construction and equipment,
7. Operation and sanitation,
8. Process control,
9. Storage,
10. Final product,
11. Recall procedures,
12. Employee qualifications.

A Critical Control Point is defined as a point in time or a physical location in the process at which failure of preventive measures will expose the customer to unacceptable risks related to tainted, decomposed, or unwholesome fish or to economic fraud.

At each Critical Control Point the fish plant must:

- ☞ Identify the standard that is applied to ensure compliance with regulatory requirements;
- ☞ Identify the monitoring procedures and inspection frequencies that will be followed to ensure that the standard is being met during production;
- ☞ Identify the reporting mechanism that will be used at each Critical Control Point to document the results of the inspections; and
- ☞ Develop contingency plans or corrective action plans that will be followed if and when the monitoring procedures identify an instance where the standard is not being met.

The fish processing plant must have available for inspection its documented QMP that provides a written description of the programme being implemented. The fish processing plant is also required to retain for three years records of all inspections performed as part of its QMP. These records must be made available to DFO Inspectors when requested.



In summary, a fish processing plant's responsibilities under QMP are:

- ☞ To develop its own in-plant QMP specific to its operation,
- ☞ To implement the in-plant QMP,
- ☞ To maintain the QMP records of the QMP inspections, and
- ☞ To correct all problems identified during the QMP inspections.

QMP inspection

The Department of Fisheries and Oceans inspects the fish processing plant against the Quality Management Program requirements. Individual inspectors perform QMP Inspections that entail:

- ☞ The verification of the written QMP to ensure that the documented standards, monitoring procedures, record-keeping systems and guidelines for corrective action meet the minimum requirements set by the Department of Fisheries and Oceans;
- ☞ The confirmation that the written QMP is being followed in the plant. This will require the inspector to observe the processor's QMP activities at each Critical Control point in the plant; and
- ☞ The verification that the processor's records are accurate. This will require the inspector to withdraw and inspect parallel samples of the processor's products and compare the results with those of the company's.

The completion of the QMP Inspection results in the process operation being rated as either Excellent, Good, Satisfactory, or Fail.

These QMP ratings represent the degree of confidence that DFO has in the company's ability to operate in compliance with the regulations and determines the inspection coverage to be directed at it in subsequent weeks.

Fail-rated plants will be asked to voluntarily correct the deficiencies and improve their rating to at least Satisfactory. Refusal to deal with the problems voluntarily will jeopardise the federal certificate of registration and therefore the ability of the processing plant to export its products.

Plants which receive a Satisfactory rating will be inspected on a frequent basis until they gain greater control over their process and obtain a higher rating.

Processing operations that are successful in meeting all but a few of the QMP requirements will receive an Excellent or Good rating. These plants will be qualified to apply for the use of the 'CANADA INSPECTED' logo on their product labels.

Also the product certification process will be streamlined and provided without delay, and the company will have more autonomy in its day-to-day processing operation.

The implementation of the Quality Management Program has provided added assurances that problems are identified early in process, prior to value being added to the product, and that process and product standards are being met.

The Quality Management Program has also allowed the Department to measure the level of compliance of the industry in a uniform manner and direct its resources to those areas where problems have been identified.

Since QMP is based on prevention and detection of problems, it provides for a better system for preventing crises.

The Quality Management Program – industry's role

The major change for industry under QMP is that it must accept more responsibility and accountability in monitoring its own performance.

The processing plants are required to perform inspections of the plant and products and initiate corrective actions when they identify a problem. And records of all these QMP activities must be maintained so that they are able to demonstrate that they consistently operating in compliance with the regulations.

The role of government in regulating under QMP

The implementation of the Quality Management Program meant a change in the relationship between the fish processing industry and the government.

Under QMP, the Department of Fisheries and Oceans' role shifted from solely an inspection function to include an auditing function. The inspector continues to perform random inspections of the process operation and products, but the focus is not on individual lots of product or on a day of plant operation, as previously, but rather on the overall QMP system.

The inspector's decisions are based upon a compilation of inter-related inspection results gathered over time by both the inspector and the processor.

Role of QMP in maintaining access to export markets

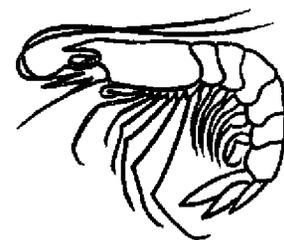
As previously stated, EU has implemented new import requirements as part of its common market initiative.

The Canadian QMP was determined by EU Inspectors to be equivalent to the EU requirements and Canadian fish products have received facilitated access to the EU market.

The Canadian Department of Fisheries and Oceans has also signed a Memorandum of Understanding with the Australian Quarantine and Inspection Service concerning the inspection and certification of fish products traded between the two countries.

Mutual goals of the two food inspection agencies are to:

- ☛ Provide reasonable assurance that fish products prepared under the supervision of each agency will not be tainted, decomposed or unwholesome and will otherwise meet the requirements of the importing country;
- ☛ To recognise export certificates issued by the participating agencies, thus minimising the re-



quirements for further inspections and analyses of certified shipments at the time of importation.

Under the MOU, Canada and Australia will recognise the principle of equivalency of their respective systems for controlling fish processing establishments and ensuring that imported and exported fish products are safe and of acceptable quality.

QMP played an important role in satisfying the Australians' new Imported Food Inspection Program implemented in February 1993.

Conclusion

In conclusion, HACCP-based systems are recognised internationally as a very effective ap-

proach to ensuring the production of safe fish products.

As more and more countries adopt HACCP principles as part of their national fish inspection programmes, fish production under HACCP systems will be imperative for processors wishing to maintain access to the major markets.

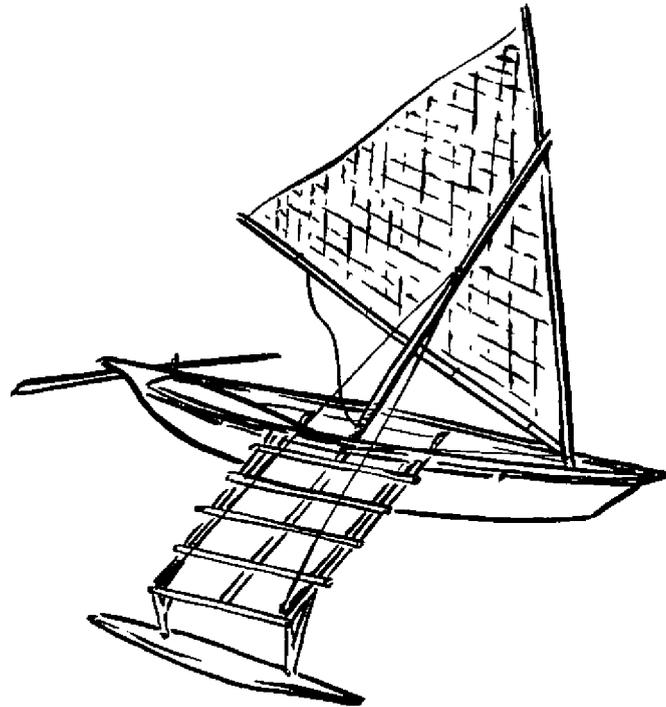
The development of a successful HACCP system will rely on the cooperation of industry and governments working together to design a system that meets their needs and satisfies international norms.

The Department of Fisheries and Oceans has been successful in implementing such a system, the Quality Management Program, and has demonstrated that HACCP principles can be

expanded to control other aspects of the product related to minimal acceptable quality (decomposition), economic fraud and product misrepresentation.

The Quality Management Program has provided the Canadian fish processing industry and the Department of Fisheries and Oceans with an effective mechanism to ensure the protection and assurance needed in today's demanding markets.

The price of this assurance was change. If HACCP-based systems, such as QMP, are to continue to meet the needs of industry and government, they must be adaptable and designed for improvement in response to future demands of the marketplace. 



NEW CALEDONIA HOSTS PRACTICAL MODULE OF NELSON COURSE AGAIN

For the second consecutive year, the practical fishing module of the SPC/Nelson Polytechnic training course for South Pacific Fishery Officers took place in Touho in the Northern Province of New Caledonia.

After five months of mainly theoretical instruction in New Zealand, the students arrived in New Caledonia keen to put their learning into practice; another motivating factor was the prospect of savouring some (!) raw fish marinated in lemon juice.

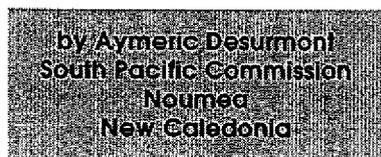
They found the New Caledonian winter more to their taste than the freezing temperatures that they had just left behind them in Nelson, New Zealand.

Material and human resources

Alistair Robertson had been seconded from Nelson Polytechnic to supervise the practical module, while Michel Blanc, the Fisheries Education and Training Adviser, and Satalaka Petaia, the Fisheries Development Specialist, took turns to represent SPC.

In addition, the five New Caledonian bodies listed below provided manpower and equipment:

☛ The Merchant Marine and Sea Fisheries Service: an 11 m catamaran, the *Dar Mad*, a pickup truck and 2 seamen to crew the *Dar Mad* for the duration of the module;



☛ The Marine Trades Training School: a 5.5 m, the *Pop*, a big pickup truck and a person for 2 of the 5 weeks the course lasted;

☛ The Northern Province Fisheries and Maritime Affairs Department: the *Tradwa*, a 7.5 m catamaran;

☛ Touho Municipal Council: a building 250 m² in area, containing 2 cold rooms (1 above and the other below zero) and a room fitted out for fish handling;

☛ The Touho vocational secondary school: a room to store fuel, a classroom and a mechanical workshop with some welding equipment.

The 10 students and their tutors were accommodated at the Touho Curriculum Development Centre, a former hotel converted into a training facility, located 2 km from the port.

This year, the students were fortunate to have bungalows facing the sea, a privilege that many tourists would no doubt have envied them.

At the end of each day's fishing, the fire which was quickly lit on the beach enabled the students

to improve on the Centre's regular canteen serve by grilling a few fish.

Work organisation and fishing methods

One objective of the practical module is to familiarise participants with the fishing techniques liable to be used in their country.

To avoid conflicts with local fishermen, it was decided in Touho to only fish outside the lagoon and to concentrate on deep-bottom species and on pelagics such as tuna and associated species.

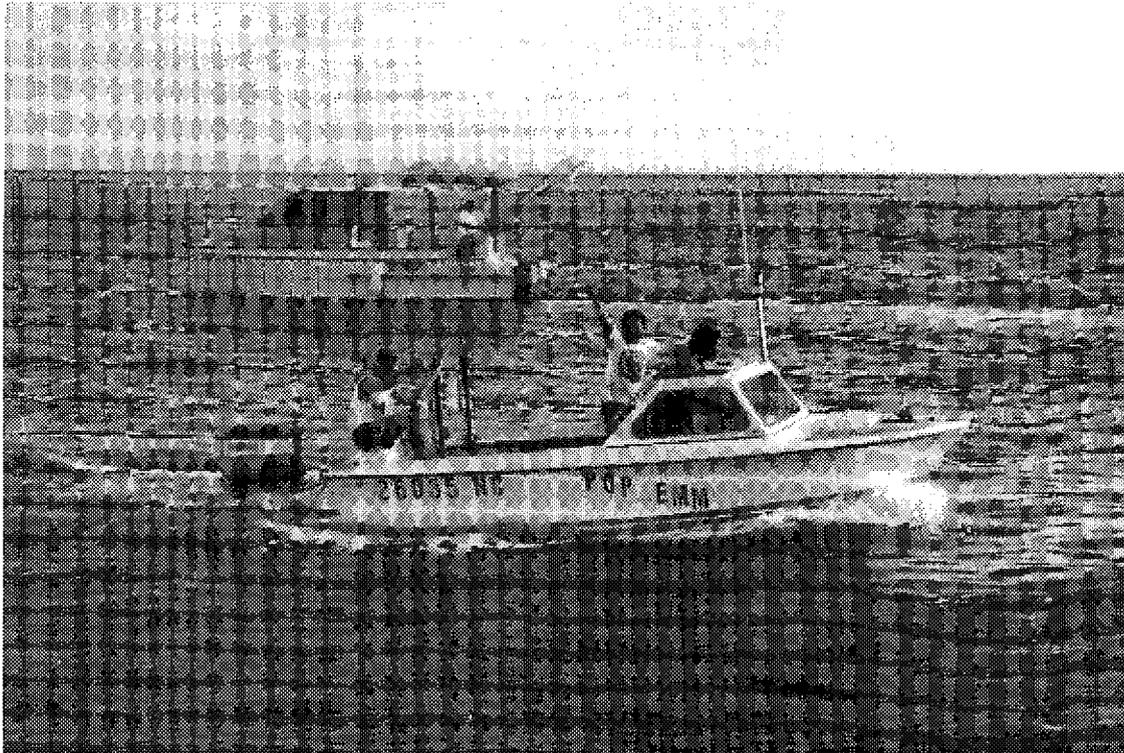
Each of the three boats was equipped with at least an echosounder, a GPS, a VHF radio and of course all the mandatory safety equipment. On the *Dar Mad*, a radar, a radio direction-finder, a thermometer to measure sea-surface temperature and a hydraulic line-hauler were also available.

In order to put into practice some of the lessons learnt in Nelson, three students from each crew were assigned the following duties on a daily basis:

☛ A skipper to direct manoeuvres and man the wheel while keeping an eye on the echo-sounder;

☛ A navigator to calculate the route, decide the bearing to follow and plot the boat's position on the chart;





Satalaka Petaia on *Pop* and Alastair Robertson on *Tradwa* seem to have opposite ideas on where to find the fish.

☛ A statistician to take notes on the day's significant events. The notes were used each evening to write up a fishing log which would be used to calculate each boat's profitability.

In addition to these specific jobs, everyone took part in the fishing exercise. Five different fishing techniques were used.

Deep sea handreeling

This technique, strongly promoted by SPC in the early days of deep-sea fishery development in the Pacific, has changed little in the past 15 years, which must be proof of its effectiveness.

An echo-sounder, a deep mooring and a handreel are the only equipment required. The students were able to realise the importance of wise selection of

the fishing spot and therefore the need for a good echo-sounder and an accurate positioning system.

Bottom longlining

On board the *Tradwa*, which was not fitted with hydraulics, Alastair Robertson assembled a number of 40-hook longlines, with the help of the students.

The longline was hauled with the help of a buoy in the same way as a deep mooring is brought up; fishing had to be restricted to zones without rugged bottom topography to avoid snagging the line.

On board the *Dar Mad*, which was fitted with hydraulics, the students used 100-hook longlines, applying a technique in common use in New Caledonia. Here again, the participants learnt how important accurate positioning and knowledge of

bottom topography are, because excellent catches were achieved with different longlines set at exactly the same spot.

Vertical tuna longlining

Two light FADs with a 3.5 mm monofilament mooring were deployed one month before the beginning of the Touho offshore practical fishing session.

Unfortunately, the only time they were seen again was when one was found lying on a reef several miles away from its original location. The failure was attributed to some nasty fish teeth.

The vertical longlining technique, normally used around FADs or in 'tuna holes', was therefore used in the open ocean, with a very limited chance of success. Despite this handicap, Satalaka Petaia and the *Pop*

crew managed to set two 15-hook longlines along the route taken by a school of tuna and hauled in 3 fine specimens each weighing about 20 kg.

Horizontal tuna longlining

A 40-hook horizontal longline was taken aboard the *Tradwa* in order to fish around FADs. Since no FADs could be located on station, this longline was set in the open sea without much success.

On the *Dar Mad*, which was fitted with a horizontal longline approximately 8 km in length, carrying 200 hooks, the students were able to realise how important work organisation is for this kind of technique.

They had a foretaste of the effort required of longline crews who have to set over 1,500 hooks daily. The same longline was used in the daytime for tuna and at night, after adding light sticks, for swordfish.

With yields of almost a kilo of fish per hook set, this method proved effective despite the relatively small size of the longline.

Trolling

The sport-fishing aspect of this technique makes it the favourite of the vast majority of fishermen, including the Nelson Course students. By using artificial lures, dead-bait lures, diving boards, various line lengths, boat-speed, etc., the students realised that a specific technique had to be used for each separate target species.

Julian Dashwood, Manager of SPC's Fisheries Programme, who came to Touho for a couple of days to meet the students, demonstrated his fishing skills by catching 14 Spanish mackerel in one day on the *Pop*.

Local malicious gossip suggests that he stole his technique (trolling slowly using a cannonball

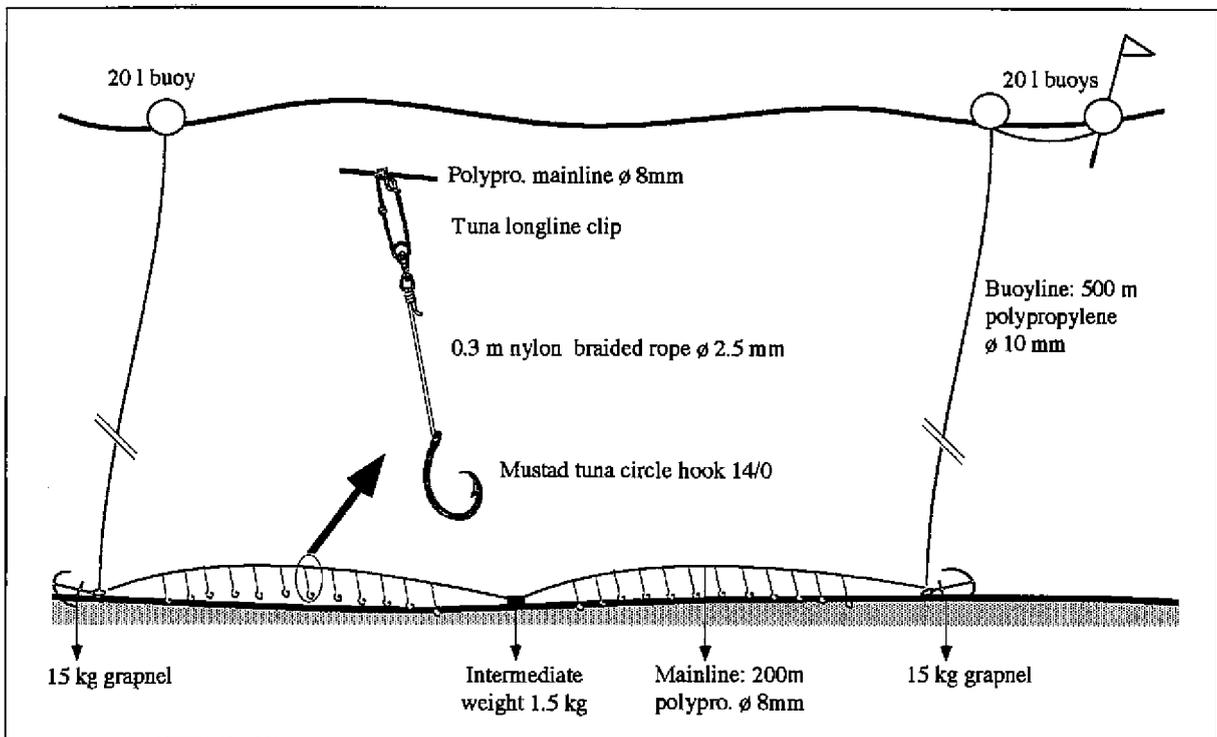
and a saury for lure) from his Oceanic Fisheries Coordinator, Antony Lewis ... but that is another story.

Fish handling on board and on shore

On each of the three boats, as soon as the fish were brought aboard, they were placed in a brine consisting of two-thirds ice and one-third sea-water.

They were kept in this mixture until the boat berthed. After being taken ashore, they were weighed and stored in ice in an above-zero cold room. Depending on buyers' requirements, the fish were then sold either whole, gutted or in fillets. The finest tuna specimens were prepared for the Japanese sashimi market.

The fish exporting experiment to the Sydney market in Australia, which was organised for the 1994 module, proved to be barely profitable.



Bottom longline used on *Dar Mad*



Jean-Marie Kayara (New Caledonia) with a 13 kg red snapper (*Etelis carbunculus*) caught on bottom longline

It was therefore not maintained for this year. In the end, the trainers were sorry that it had been dispensed with, not only because exporting had made it possible to avoid the complications of an almost saturated local market, but especially because it enabled the students to address a range of problems associated with exporting: catch selection, specific packaging, respect for minimum quantities and delivery deadlines, quarantine requirements, customs arrangements, etc.

Overall it is undeniable that the 1995 practical fishing module achieved most of the objectives set.

The students had an opportunity to familiarise themselves with each of the proposed techniques, to operate on-board electronics, handle catches, calculate the profitability of their fishing operations and all-in-all to get hands-on experience of some of the problems which fishermen encounter on a daily basis in their country.

What future for the SPC Nelson Polytechnic Course?

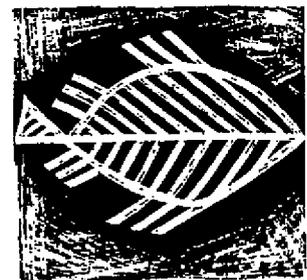
Since its inception in 1979, this course has undergone many changes in form and content, the most significant of which was the incorporation of a practical fishing module in 1983.

Although it is becoming increasingly difficult to secure funding for this course (there is indeed no guarantee that the 1996 course will actually go ahead), Michel Blanc of the SPC and Hugh Walton and Alastair Robertson of Nelson Polytechnic are nevertheless thinking about the possible improvements which could still be made.

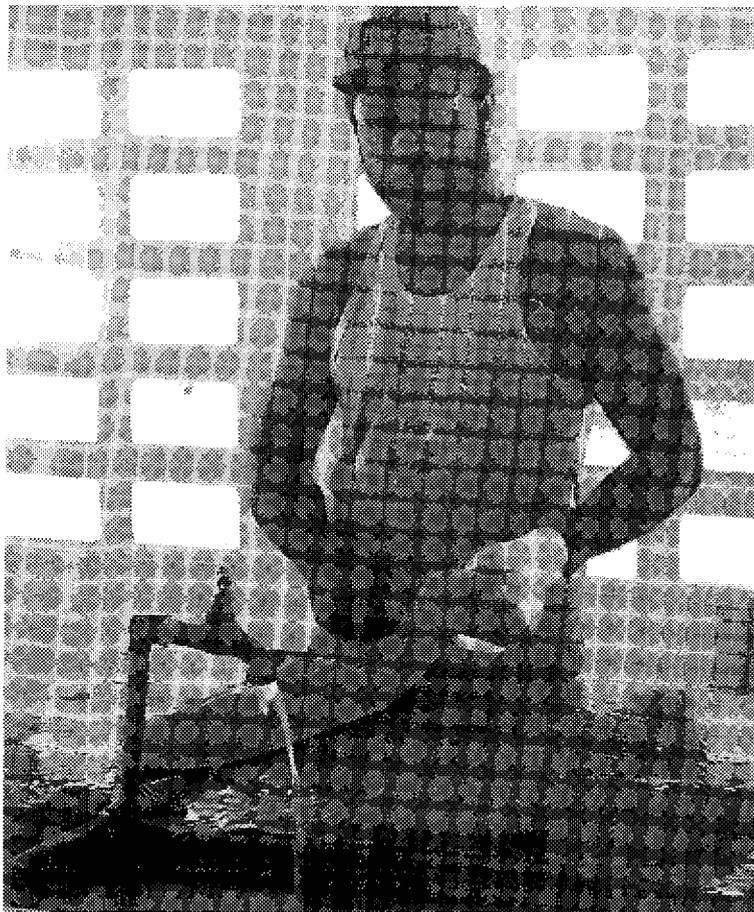
At the recent Inshore Fishery Workshop (see the article on page 2) it emerged that most Fishery Services were facing problems connected with stock management, statistical data collection, product processing and marketing, rather than any requirement to increase landings.

Could the course as it stands at present include training modules addressing these new needs or should a separate course be set up?

Could we propose that the students take part in modules already available within the school? Are fisheries officers



OK John, these are nice fish,
but did *you* catch them?



Alivereti Senikau (Fiji) skins
the filets of a good-size deep
snapper (*Aphareus rutilans*)

destined to become specialists or should they continue to receive a wide-ranging but general instruction?

These are the many questions your three colleagues will be endeavouring to answer to ensure that the Nelson Course,

which everybody agrees is an important one, continues to be tailored to the needs of regional fisheries officers. 



**The participants in the SPC Nelson fishing course
(with the famous 'hen' of Hienghene in the background)**

- First row:** Joel Poiou, Henry Yule (SPC staff) and Thomas Saun Kari (PNG)
Second row: Allan Shapley Mamu (Solomon Islands), Alastair Robertson (tutor, New Zealand), Mathew Kamupala (Niue), Patelesio Tualofa (Western Samoa) John Ngu (Cook Islands) Fioani Homasi (Tuvalu) and Alivereti Senikau (Fiji)
Top row: Damasus Mailing (Yap, FSM)

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