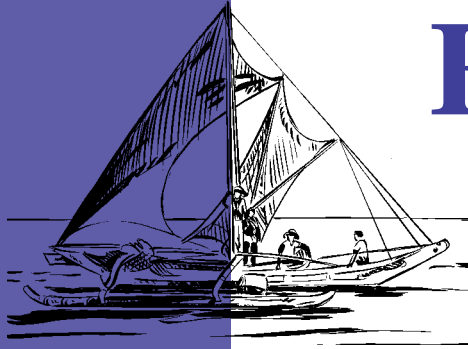


FISHERIES

Newsletter



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Julian Dashwood, Manager of the SPC Marine Resources Division, has left SPC after six years of service, to return home to the Cook Islands.



South Pacific Commission

Prepared by the Information Section of the Marine Resources Division

■ END OF AN ERA FOR SPC, START OF A NEW ERA FOR RAROTONGA

Julian Dashwood has decided to return home to the Cook Islands rather than take another contract as SPC Fisheries Programme Manager. He will be greatly missed by all of his staff.

Julian was born in 1946, and raised in Mauke, and traces his antecedents back on his father's side to the notable, or notorious, Sir Francis Dashwood, of 19th century 'Hellfire Club' fame. In the years since, he has strenuously tried either to live down, or to live up to, that name, depending on who he is entertaining at the time.

He is famous not only for his enormous hospitality, but for his down-to-earth wisdom garnered through years of service to the Cook Islands' government, latterly as Secretary to the Ministry of Marine Resources. Julian joined SPC towards the end of 1991, replacing Barney Smith as Fisheries Coordinator—a post later becoming the Fisheries Programme Manager—and immediately made his mark, not only on the staff but also on the teleost fauna of Noumea's prolific lagoon.

An ardent fisherman, he rapidly developed an enthusiasm for *Scomberomorus commerson* or Spanish mackerel (tazar, as it is known locally)—a species notably absent from the waters of the Cook Islands. Observers attributed much of the funding of the SPC Fisheries Programme to the fact that Julian and egregious offenders were often able to demonstrate, at first hand, the social role of artisanal fisheries to potential donors out on the lagoon, in dawn's early light, with a line in one hand and a stubby in the other.

In latter days he added significantly to our knowledge of appropriate techniques for value-added processing in small-scale

fisheries, using an old filing cabinet as a tazar smoke-curing column. The heady aroma of smouldering piles of old staff performance-appraisal forms, filtered through vintage filing cabinet drawers, regularly wafted across the SPC compound during the tazar spawning season.

During his time at the Commission, Julian guided the Fisheries Programme, particularly the Coastal Fisheries Programme, through a difficult period when several of SPC's 'traditional' donors were either losing confidence in the management of SPC, losing interest in marine resources as a critical economic sector, or simply losing interest in the Pacific Islands as a strategically important region.

He held the Programme together through this difficult period and supervised the consolidation of work to such an extent that the Programme could immediately take advantage of the opportunities offered by SPC's new direction.

The fact that he did this quietly and without fuss is not remarkable to those of us who remember his commanding presence as Cook Islands' representative in the Forum Fisheries Committee of the late 1980s, where he guided deliberations with an occasional cutting interjection and an entire lack of self-aggrandisement.

As Fisheries Programme Manager, Julian never had much time for micro-management, and was always willing to give initiative its head, but he did not suffer fools gladly.

Julian returns to the Cook Islands almost coincidentally with Philipp Muller stepping down from the Directorship of the South Pacific Applied Geoscience Commission

(SOPAC). Both men have been enormously influential in the development of regional aspirations in fisheries over the past 20 years—fisheries that cover a large part of the earth's surface—and both will continue to be enormously influential through their advice to the next generation of regional managers.

Without doubt, Dashwood will not find it easy to confine himself to the elder statesman role for long, and is expected to take advantage of his considerable technical experience, particularly with the black pearl industry, but covering just about every practical skill there is in fishing and fisheries management, to ram-page out from the Cook Islands.

He may need to do this simply in order to avoid being shanghaied into politics since, as will be clear to anyone who visits Julian at home, there are a lot of people who think very highly of him.

Julian's position at SPC has been taken up, after competition amongst a very strong field, by Dr Tim Adams, whilst the position itself has changed its designation to Director of Marine Resources in line with SPC's new corporate structure.

Although Tim and Julian are different in many ways, they share a similar management philosophy, in particular a lack of faith in micro-management and a propensity for cultivating the initiative of individuals. Tim came to SPC five years ago from the Fiji Fisheries Division and, whilst he is British by birth, he has spent all of his working life in the region promoting Pacific Island fisheries interests.



■ CAPTURE SECTION

Masterfisherman assistance to Tonga's longline fleet

Masterfisherman, Steve Beverly, recently spent four months in Nuku'alofa, Tonga, helping the Ministry of Fisheries on a variety of issues. The project came right on the heels of a Post-Harvest Section workshop on sashimi tuna handling and grading (May 1997) which Steve attended as a tutor.

Following the sashimi workshop, Steve intended to assist the domestic fleet in longline gear configuration, fishing techniques, fishing strategy, onboard handling of tuna, and vessel operations. However, vessel safety became the main focus of this assignment. The Ministry of Fisheries (MOF) and the Ministry of Marine and Ports were in the process of strengthening the safety regulations for fishing vessels in Tonga.

New regulations were to come into effect on 31 August 1997, and MOF had the authority to withhold fishing licences of any vessels that did not comply. The new regulations were to replace a loophole in the law that exempted fishing vessels from having to carry lifesaving appliances and devices.

Safety at sea has always been an issue in the South Pacific, but 1997 was an unusual year with the sinking of the F/V *Wasawasa* in Fiji during Cyclone Gavin, in which ten lives were lost, and the loss of twenty tuna fishermen from Alia catamarans in just two months in Samoa. The MOF in Tonga and SPC did not want Tonga to add to these grim statistics.

The new regulations were in two parts—one for vessels under 15 metres and the other for vessels over 15 metres. The requirements were for the usual array of equipment including:

For vessels under 15 metres:

- Life-raft;
- Life-jackets;
- Life-ring with lanyard;
- Distress signals (two parachute flares, two smoke signals, and six hand flares);
- EPIRB;
- Fire extinguishers;
- Pumps;
- Two fire buckets;
- Radar reflector;
- Two waterproof torches; and
- VHF radio, and SSB radio (if vessel goes beyond 12 miles.)

For vessels over 15 metres:

- Life-raft;
- Life-jackets;
- Life-ring with lanyard, lifering with light;
- Distress signals (two parachute flares, two smoke signals, and six hand flares);
- EPIRB;
- Fire extinguishers;
- Pumps;
- Fire hoses, nozzles, fire axe, three fire buckets;
- Medical kit;
- Hand leadline;
- Pilot ladder;
- Two waterproof re-chargeable signal lamps;
- Sextant;
- Binoculars with strap and case;
- Charts;
- Navigation tools (dividers, parallel rule, etc);
- Wheelhouse books (Light List; Pacific Sailing Directions; International Collision Regulations; IALA System of Buoyage; Chart Symbols and Abbreviations; Ships Medical Book);
- Set of signal flags;
- International Code of Signals;
- Anchor ball day shape;
- Diamond day shape; and
- VHF radio and SSB radio.

As it turned out, none of the vessels that Steve had intended to fish with, including the Ministry of Fisheries' vessels, had a full complement of in-date safety appliances and equipment.

Therefore, Steve spent most of his time, while in Tonga, upgrading the MOF's 19 m tuna longline vessel, F/V *Ekiaki* (Figure 1), so that it could pass a Ministry of Marine and Ports safety survey and be a good example to the private domestic fleet. The rest of MOF's fleet was also in need of upgrading, so preparations were made to renew all safety gear on F/V *Albacore* and F/V *Ngutulei* as well.

One of the problems encountered with renewing safety gear on a vessel in Tonga was the high cost, as everything, except for a few items, had to be imported directly. And, although lifesaving devices are duty-free in Tonga, there was still a goods and services tax of 20 per cent that was applicable to all imports.

Furthermore, many of the items, such as parachute flares and smoke signals, can not be air freighted as they are considered to be hazardous cargo. The process of upgrading just one vessel, therefore, became not only costly, but time-consuming as well. By the time Steve left Tonga, some of the equipment for F/V *Ekiaki* had not yet arrived from overseas—a good lesson in the need for advanced planning for all involved.

In addition to about T\$10,000 in safety gear, Steve ordered about T\$15,000 in new longline fishing gear for F/V *Ekiaki* using Tonga's project development funds from the US Multilateral Treaty. The order included ten miles of 3.5 mm monofilament mainline and enough 2.0 mm monofilament,



Figure 1: Ministry of Fisheries training vessel F/V *Ekiaki* at Faua wharf, Nuku'alofa

snaps, wire trace, sleeves, and hooks to make up 1,000 new branchlines, to replace the old branchlines (Figure 2). The hooks ordered for the project were the latest new item from Ocean Producers International in Hawaii, stainless steel 3.6 Japan tuna hooks. New floatlines were made from 6.4 mm tarred mainline, and a new radio buoy was purchased locally and rigged properly. One of F/V *Ekiaki's* crew, AB Fisherman, Hapakuki Talasinga, showed up every day for instruction in gear fabrication and became somewhat of an expert in making up longline gear. It will be up to Hapakuki to train the other members of F/V *Ekiaki's* crew.

Two longline trips were made on F/V *Ekiaki* to the area just to the northwest of Hunga Tonga and Hunga Ha'apai islands. This area proved to be a good spot for bigeye tuna but, as is usual for Tonga, albacore tuna dominated the catch. During the first trip Steve took in July on F/V *Ekiaki* (Figure 3), 67 albacore tuna, 18 bigeye tuna, and 6 yellowfin tuna were caught, along with the usual by-catch, on just four sets of about 700 hooks each. Another vessel, F/V *Capt Van*, fishing in this same area in September, landed 3.1 mt of fish, including 42 bigeye tuna, on just five sets of about 600 hooks each.



Figure 2: F/V *Ekiaki* with bins holding old branchlines

One fish weighed 69kg. F/V *Capt Van's* catch reportedly did very well in the Japanese market.

Unfortunately for the fishing effort, F/V *Ekiaki* was pressed into service during the 1997 Royal Agricultural and Industrial Shows held in Vava'u, Ha'apai, 'Eua, and Tongatapu during August.


Soon after the shows the vessel suffered a few breakdowns and was waiting for spare parts from Japan and New Zealand when Steve left Tonga in late September.



Figure 3: Hauling the gear on F/V *Ekiaki*

Steve was also assisting MOF's Principal Fisheries Officer, Taniela Koloa, with a draft management plan for MOF's new longline research and training vessel, F/V *Takuo* (Takuo means yellowfin tuna in Tongan).

The new vessel, which is expected to arrive in Tonga in February 1998, will be a 39.5 m steel longline freezer vessel equipped with both traditional and monofilament longline systems. F/V *Takuo* is being built by Niigata

Engineering of Japan and will be given to the government of Tonga by the government of Japan in a grant aid scheme. This vessel will be involved in longline fisheries research and training in Tongan and international waters. 

Judge at 1997 Royal Agricultural and Industrial Show in Tonga

Masterfisherman, Steve Beverly, while on assignment in Tonga, was asked by the Secretary for Fisheries, 'Akau'ola, to act as a judge at the Royal Agricultural and Industrial Show.

The show is usually an annual event, but from 1997 onwards, it will be held only every three years. The 1997 show was, therefore, the last Royal Agricultural and Industrial Show of the century. There were four shows in all, one in Vava'u on 16 August, one in Ha'apai on 19 August, one in 'Eua on 27 August, and the big one on Tongatapu on 29 and 30 of August. The Niua did not participate this year because of cyclone damage to crops (Cyclone Keli). The shows included displays of agricultural products, in-

cluding subsistence crops and export products such as vanilla, squash pumpkins, and coffee; handicrafts made from agricultural products such as pandanus mats and tapa cloth; small industry products including locally made timber furniture; and locally produced seafood including fresh, preserved, and cooked shellfish and finfish.

Steve acted as a judge, along with Ministry of Fisheries' staff, for the seafood events during all four shows. All shows were preceded by a special ceremony called the Presentation of the Ha'unga, in which the Ministry of Fisheries presented a gift of fish to His Majesty King Taufa'ahau Tupou IV. Steve was invited to attend this special ceremony at the Fan-

gatongo Palace in Vava'u. The fish presented to His Majesty were caught by the Ministry of Fisheries' longline vessel, F/V *Ekiaki*, and included twenty albacore tuna and a blue marlin (Figure 1).

The ceremony was conducted by the Honourable Prime Minister and Minister for Fisheries, Baron Vaea of Houma. HRH Princess Salote Pilolevu represented the King.

Ministry of Fisheries had displays at the Vava'u, Ha'apai, and Tongatapu shows. At the Vava'u show the MOF display included an artificial pond with aerated sea water. The pond contained living samples of all the molluscs being cultivated by JICA at the Aquacultural Research and De-



Figure 1: Ministry of Fisheries staff present fish to His Majesty, King Taufa'ahau Tupou at Fangatongo Palace, Vava'u.

velopment Project at Ministry of Fisheries' Headquarters in Sopo, Tongatapu, including: giant clams (*vasuva*), trochus (*takaniko*), and green snail (*'elili*). At the Ha'apai show the crew of F/V *Ekiaki* displayed fresh tuna (Figure 2), including a 50 kg bigeye tuna caught the previous week. Samples of sashimi were given out to visitors.

The Ministry of Fisheries' display at the Tongatapu show included aquarium tanks with live trochus, green snail, and mullet and milkfish. MOF also gave out samples of sashimi. The Limu Tanga'u Project (a joint venture between MOF and H&H Ltd of Japan) had a display of the many



Figure 2: F/V *Ekiaki* AB Fisherman, Taione, proudly displaying some of the catch at the Ha'apai show



products being made from *limu tangā'u* (seaweed), including Muzuku Soup and a soon-to-be-marketed skin lotion that is reported to be a good treatment for skin cancer.

The staff of a local bottom-fish-fishing and fish-exporting company, 'Alatini Fisheries Company, put on several demonstrations of fish filleting. After each demonstration they sold the finished products to the visitors.

Most of the other seafood displays at all four shows were competing for cash prizes totalling over T\$14,000. The prize money

was donated by private sector donors. First prize in most events was T\$500 and second prize was T\$200. There was competition between individual fishermen and fishing villages in a variety of categories, including fresh seafood; dried seafood; smoked seafood; iced fish; and cooked seafood in a balanced breakfast, lunch, and dinner. There was also competition in making traditional fishing gear. The criteria for the judges were variety, quality, display method, and appearance.

The best individual display on Vava'u was won by Sione V. Fifita, the best on Ha'apai was won

by Tu'ifua Vaikona, the best on 'Eua was won by Falakiko Fale-maka, and the best on Tongatapu was won by Paulo Laukai. 'Alatini Fisheries Company won three prizes in all including best exporter, best iced fish, and best fisheries development.

At each show, once the King and Princess had reviewed all of the displays, all of the seafood went on sale. At the Vava'u show, the entire display was sold in less than 30 minutes, attesting to the local demand for fresh fish and seafood.



Retired Masterfisherman revisited

What happens to SPC Masterfishermen after years of bottom fishing, FAD fishing, and FAD rigging and deployments? They retire quietly to the farm, right? No chance.

On a recent visit to Vava'u, Tonga, SPC Masterfisherman, Steve Beverly, ran into 'retired' SPC Mas-

terfisherman, Paul Mead (Paul was a Masterfisherman at SPC during the 1970s and 1980s). Paul was busy making up a FAD mooring for Ministry of Fisheries in Vava'u (see photo). The FAD that Paul was rigging was one of three deployed by MOF during the week of the Royal Agricultural and Industrial Show in 1997.

Aside from generously donating his time and talents to MOF, Paul is occupied with his charter fishing and fishing gear businesses in Vava'u. He takes anglers out on his fishing vessel, F/V *Dora Malia*, and, along with his wife, Alisi, runs a gear and bait shop, the Ikapuna Store.



Sioli Pasikala, F/V Ekiaki's chief engineer watches, as veteran SPC Masterfisherman Paul Mead splices a FAD mooring line for Vava'u MOF, August 1997.

Activities at headquarters

The Fisheries Development Adviser, Lindsay Chapman, travelled to Vanuatu, Solomon Islands, Papua New Guinea, and Fiji to meet with officers of each Fisheries Department and representatives from the private sector.

These meetings were to assess the needs of these countries in developing their offshore resources, mainly tuna, through development and expansion of their respective domestic fleets, and to assess where the Capture Section could assist.

These meetings proved very successful, with interest expressed from three countries for technical assistance from the section's Masterfishermen in the next 12–18 months.

Whilst in Fiji, Lindsay met with staff of the Regional Maritime Programme (RMP)—Angus Scotland, Regional Maritime Training Adviser and Peter Heathcote, Regional Maritime Legal Adviser, that has recently moved under SPC's umbrella, based in Suva.

Meetings focussed on where fishing vessels, manning levels and skipper and crew qualifications fitted into the overall framework of the RMP as they work to assist countries upgrade their Shipping Legislation and Regulations.

The completion of the two types of reports, published and unpublished, continued as a major activity in Noumea. The report 'Tuna longline fishing assistance to the National Fisheries Corporation (Pohnpei Division) FSM' was published, with two other reports in progress and expected to be published during the last quarter of 1997.

The finalisation of reports in the unpublished series has progressed well, with six reports finished and distributed to member countries and territories. It is ex-

pected that another four will be completed and distributed by the end of 1997.

Recruitment of a second Masterfisherman for the section is progressing, with the close of applications on 31 August 1997. It is anticipated that the recruitment process will be completed by mid-November and a three-year contract, under AusAID funding, offered to the successful applicant. It is expected that the new Masterfisherman will take up the post in January 1998.



REGIONAL COURSE ON VESSEL OPERATION MANAGEMENT AND ELECTRONIC AIDS FOR COMMERCIAL FISHING SKIPPERS

The United Nations Development Programme (UNDP) has funded the above two-week workshop to be held in February 1998, plus in-country follow-up assistance from a Masterfisherman. Closing date for nominations to attend this workshop is 30 November 1997. Nominations need to be on the appropriate SPC application form and have the endorsement of the official SPC contact in their country or territory.

As a follow-up to this workshop, the Section's Masterfishermen will spend 10–12 days working with each participant in their country on the vessel they are working on. This will allow each participant to gain on-the-job training specific to their needs and individual situation, which will reinforce what has been presented at the workshop. Interested Skippers and First Mates of fishing vessels are encouraged to contact their Fisheries Department to obtain a copy of Meeting Announcement No. 17, that explains the workshop component of this UNDP-funded project.

■ TRAINING SECTION

From 4 to 15 August 1997 the Fisheries Training Centre at Santo, Vanuatu ran an intensive two-week course to help first-time Ni-Vanuatu fishermen obtain work on Taiwanese longliners.

The South Pacific Commission (SPC) developed a teaching package and assisted the Santo Fisheries Training Centre through the provision of two resource per-

sons. An experienced tutor from the New Zealand School of Fisheries and Teriihauroa Luciani were in Santo for the duration of the course to co-ordinate inputs from local tutors and assist with the overall organisation of the course.

The package was also intended to have application to pre-sea safety courses in other Pacific Island

countries or for any such course that might be considered in the future. The immediate target group of this pilot project consisted of 22 young Ni-Vanuatu from various backgrounds. The initiative was funded by the government of the Republic of China/Taiwan.



Rationale and programme objectives

Over the last several years 100 Ni-Vanuatu crew have been seriously injured and 17 killed during employment on foreign fishing boats. One reason for this is that new crew members are being employed 'off the street'. There is no vetting of capability or aptitude and new recruits have no prior knowledge of life on board.

They have no safety skills or knowledge of dangerous circumstances which might protect them in the first few months of employment. In addition, many find life on board intolerable and break their contracts. This causes inconvenience for the employer and loss of income for the crew member as he must meet the considerable cost of an airfare home.

Based on the above rationale, the objectives of the course were:

1. To provide participants with basic safety skills and fishing knowledge to make them more capable of safely undertaking a career on board a foreign fishing vessel,
2. To create, during the operation of the programme, a working environment and ethic which will allow tutors to identify participants who do not have either the work ethic or aptitude for life on board.

Training methodologies

The course was live-in, with participants following a continuous, intensive work programme over 14 days. A set of training methodologies was applied as lectures, question-answer discussions and practical exercises. Little emphasis was given to written learning or exercises. Learning was accomplished through spoken explanations accompanied by drawings, diagrams and hands-on practice.

Videos were also used wherever possible. One of the keys for the success of this training was the inclusion of ex-fishermen from the Vanuatu Fishermen's Association and its president Mr Kalorano Kalo in the training teams.

They greatly assisted during practical sessions and greatly increased the participation of students during question-answer discussions.

Facilities at the Fisheries Training Centre (FTC)

The facilities at Santo are very impressive and are highly suited to an intensive live-in course such as this. However, the increase in the number of participants from the proposed 16 to the eventual 22 placed a strain on facilities.

A recommendation will be made on the number of future participants and will be included in the course assessment report. The Training Centre has only one vessel suited to the type of practical fishing time envisaged for this course.

In an ideal situation such a vessel would be able to do tuna longlining on some small scale, but Mr Simon Reid from the New Zealand School of Fisheries considers this unimportant to the outcome of the course, and the F/V *Etelis* was quite suitable for the bottom longlining that was done.

Suitability of course outline, materials and resources

The course assessment report contains a comparison of the actual timetable and subject areas covered vs. the proposed timetable and lessons, however, only two of the proposed lessons were dropped and replaced with other topics.

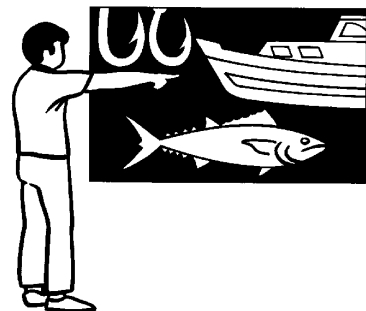
Overall, the course outline is almost entirely suitable for the Santo course, and recommendations made in the course assessment report are mostly a matter of emphasis and the level at which various topics should be covered. Of those lessons included in the course outline, the two that were omitted were:

1. Lesson 18 'anchoring and use of surge drum' (Item 10 PIQFD), and
2. Lesson 19 'practical steering exercises on board boats using Taiwanese commands'.

Mr Reid also reported that after talking to and learning from the Ni-Vanuatu ex-fishermen he now has a better appreciation of the duties that new arrivals are likely to be assigned.

They are first likely to be untying branch lines on the conveyor when shooting the gear. Similarly, they are likely to be coiling branch lines or acting as general dogsbody when hauling the gear. They would be expected to splice rope and make and repair new gear.

Mr Reid recommended practical sessions should focus on these areas a little more. In addition, the dangerous operations and positions on board should be explained and emphasised, but it is difficult to prepare people for these tasks in a pre-sea course.



Conclusion

After two weeks, the participants produced significant results considering the limited training they had received. More visible results were seen from practical sessions. Trainees were good at splicing, coiling and clipping branch lines, as well as at learning Taiwanese words and phrases.

As a result of the training efforts, two participants are expected to start working on Taiwanese fishing vessels overseas before the end of August 1997. There is a substantial potential for running future courses; only 22 Ni-Vanuatu were trained while many others, including Ni-Vanuatu ex-

fishermen, would have liked to have participated. The parties involved—the trainers and the Vanuatu Fishermen's Association in particular—all perceived the project as a success, and are highly motivated and committed to continue project activities.

Following this first course at Santo, the Fisheries Training Section chose two complementary avenues for follow-up activities:

1. To assist FTC in offering the course again in the future based on knowledge and experiences gained by the staff of the Centre, with the help of the teaching package already used and tested in the pilot project.

2. To circulate (to all interested countries and territories) a complete description of the teaching aids and course outline. The Training Section will then work with those who decide the course and materials are appropriate to their fishery.

Enquiries around the region indicated that several countries, especially Papua New Guinea and the Federated States of Micronesia (FSM), are interested in a similar course as a first step for youths taking on jobs at sea.



■ POST-HARVEST SECTION

HACCP regulation update

With the implementation of the USA Seafood HACCP Regulation imminent, the Post-harvest Section has given high priority in the last six months to assisting member states to meet the requirements of the new regulation. The new Seafood HACCP regulation, that comes into force on 18 December 1997, affects all processors exporting seafood products to the USA and any of its territories in the Pacific (i.e. Guam, Northern Mariana Islands and American Samoa).

The HACCP (Hazard Analysis and Critical Control Point) issue was highlighted during a technical session at the 26th South Pacific Commission Regional Technical Meeting on Fisheries held in Noumea in August 1996.

It was decided at the meeting to assist the process of implementing HACCP in the region through a FAO/SPC Technical Cooperation Project (TCP). The project, titled 'Assistance to the South Pacific to Meet New Fish Importing Regu-

lations' was approved by FAO in April 1997. The Project began later than originally scheduled in May 1997. In spite of a late start the project succeeded in completing the programme of activities three months ahead of schedule. It also brought to the fore the benefits to the Pacific region that ensue from cooperation between FAO and SPC.

The first phase of the project collected information in a one person-month consultancy from selected states and territories in the South Pacific, including current status and statistics of the seafood industry, quality assurance and export procedures, details of seafood exporters, and current legislation and regulations governing food control and fish exports.

Between 10 May and 13 June 1997, the consultant, Bob Gillett, visited Tonga, Samoa, Fiji, the Federated States of Micronesia, Hawaii, New Caledonia, and the Solomon Islands. A copy of the report 'Hazard Analysis and Crit-

ical Control Point (HACCP) for Seafood Exports: The Situation in Selected Pacific Island Countries' has been circulated to all fisheries contacts in the region.

The second phase of two person-months was comprised of two parts. Part 1 collected information on the legal requirements of HACCP and provided for the Pacific Island countries options for a legislative framework for food control and seafood exports. Part 2 drew up generic HACCP plans tailored to the requirements of Pacific Island seafood exporters.

The legal study, undertaken by Ted McDorman from Canada, examined the US Seafood HACCP Regulation and the EU Seafood Directive.

The goal of this examination was to outline for the seafood exporters (countries, companies and individuals) of the South Pacific region the 'legal' application of HACCP to seafood exports to the United States and European Union

(see article on page 33 of this issue of the *Newsletter* on the US legislation).

The report also reviewed the laws and regulations of the numerous regional states and territories that relate to food safety, fish marketing and seafood exports as a prelude to identifying strategic regulatory options that the countries and territories of the South Pacific have as a consequence of the global embracing of HACCP concepts and HACCP regulations in the seafood trade.

A draft copy of the report 'Seafood Safety Standards (With Special Reference to HACCP): Review of the Import Regulations of the US and EU and the Relevant Laws of the South Pacific Region' was again sent to all national fisheries contacts in the region in September.

The technical HACCP consultancy, undertaken by David Russell Graham from Australia, reviewed operations of specific plants, and offered advice and assistance on the implementation of HACCP to processors and government fisheries officers in Fiji, Tonga and Solomon Islands.

As an outcome of the review generic HACCP plans were drafted to assist processors in their own HACCP plan implementation. The report also detailed Sanitation Standard Operating Procedures (SSOPs) and reviewed constraints to implementation by the Pacific Islands region.

The third and final phase of the TCP involved a Regional Workshop on the 'Implementation of HACCP-based Quality Assurance for Seafood' held at Pacific Harbour, Fiji from 30 September to 3 October 1997.

The workshop provided a grounding in the legal and technical aspects of HACCP implementation by the USA and identi-

fied strategic options which governments could pursue in meeting the US requirements. In addition to representatives from Government Departments from 13 Pacific Island countries and territories who were sponsored by the project, self-financing representatives of several seafood exporting companies, HACCP consultants and participants from other regional organisations attended the workshop.

The most important recommendations that resulted from the workshop were:

- ⇒ Organisation of training activities and the provision of HACCP specialists to assist regulators and exporters (a number of these were either under way or planned) were considered an important and valuable area of support to exporters and regulators alike and should be continued.
- ⇒ An evaluation of the way the US FDA (Food and Drug Administration) HACCP Regulation is being applied should be made six months after the regulation has been implemented to assess whether new initiatives and activities need to be considered by regional organisations, exporters and regulators.
- ⇒ The South Pacific Commission should take the lead role in HACCP programming in the region and be responsible for keeping the countries and territories informed of changes and new developments in US FDA's position on HACCP. In addition, it was requested that HACCP assistance should become a priority area for the SPC Post-harvest Section's work programme.

The following reports are available from either the SPC Coastal Fisheries programme, Noumea or the Fishery Industries Division, FAO, Rome:

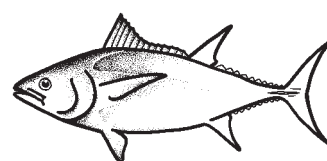
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Over the coming months, leading up to the implementation of the US HACCP Seafood Regulation on December 18, at least two HACCP workshops are planned—one each in Samoa and Fiji, and possibly a third one in Tonga.

These courses will be taught by FAO and SPC staff. A HACCP expert is also being hired by SPC with UNDP financial support to provide direct technical assistance to seafood exporters in Fiji, Samoa and Tonga in the first instance. The expert will help companies finalise and operate to developed HACCP plans.



Review of Outer Island Project Fish-Marketing Centres — Kiribati

In response to a request from the Government of Kiribati the SPC Post-harvest Fisheries Adviser visited Kiribati in July to help review the operation of Outer Island Project fish marketing centres. The review team, which included the Senior Economist and Senior Accountant from the Ministry of Natural Resources Development, visited three outer islands during the two-week assignment.

These were Nonouti, Maiana and Tabiteuea North. Fish-marketing centres (that include ice makers, ice stores, and sometimes chill stores and freezers) had been installed on the two former atolls while the Island Council on Tabiteuea North (and other similarly placed atolls in the Gilbert Group) had asked for similar facilities to be installed.

Once the review is completed it will help the government decide whether similar ice-making and fish-marketing facilities should be installed on other remote island sites, or whether they should focus on making the facilities that they have work more effectively in supplying fish to Tarawa.



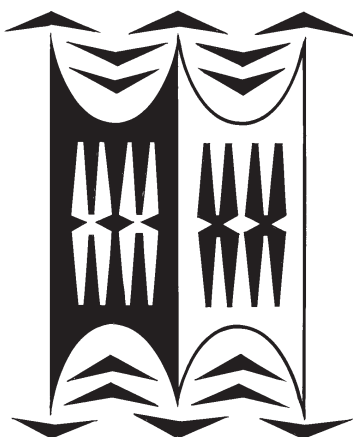
Video production on the Management of Coastal Marine Resources

Under a collaborative Project between the Fiji Government and SPC's Integrated Coastal Fisheries Management Programme (ICFMaP), a project was undertaken in Macuata and Bua Provinces in Vanua Levu, Fiji in February/March 1996 on the Management of Coastal Marine Resources.

At the completion of the study it was felt that a valuable, informative training video could be produced showing the steps in the development of this resource management plan and the resulting benefits to the local fishing communities in the two Provinces.

In August, the Fiji Fisheries Division and ICFMaP staff worked with a local video-production

company in Fiji to re-enact the process whereby local communities in Macuata decided to ban commercial-scale gill-netting in their coastal waters.



The re-enactment was centred on the village on Mali Island—and what the people experienced during the hard early days of the ban—the change to using hand-lines to catch fish, and slowly, as the fish resources recovered, how the situation changed so that the village prospered.

The role of the Fiji Government and SPC in helping to write up a management plan for the long-term sustainable utilisation of fish resources is demonstrated and improvements in the handling and marketing of fish to ensure higher returns. The video will be completed and distributed by the end of the year.



■ WOMEN'S FISHERIES DEVELOPMENT SECTION

Gender Analysis Workshop for SPC Fisheries Programme Staff

A workshop on gender analysis was held at SPC on the mornings of 9 and 10 October 1997. Organised by Patricia Tuara (Women's Fisheries Development Officer), the aim of the workshop was to introduce SPC Fisheries Programme staff to the concepts of gender and the practice of gender analysis.

Twenty participants attended the workshop. Two thirds of the par-

ticipants were from the Fisheries Programme, while the other one third was comprised of staff from the Pacific Women's Resource Bureau and the Community Health Programme. This mix of staff from different backgrounds promoted a healthy environment for the sharing of knowledge.

The list of topics covered during the two mornings included:

- Definition of terms. The gender analysis framework,
- Examination of background concepts,
- Ideologies, values and culture,
- Resource management and gender,
- Examining gender issues in fisheries management,

- Designing projects to include consultation and participation,
- Balancing natural and social resource management issues.

Ms Gayle Nelson (Gender Issues Adviser) from the Forum Secretariat provided a good coverage of the topic. She stressed the point that gender analysis when applied to resource use is linked to the sustainable management of resources.

Ms Yuki Yoshida (Programme Manager of the Environment and Natural Resources Unit) from UNDP shared her experiences using the application of gender

analysis to a UNDP-funded forestry project.

The workshop encouraged participation by all staff. Where applicable, group exercises were undertaken to discuss concepts, and put into practice, the tools of analysis. Two fisheries projects were assessed in terms of identifying:

- the activities of members in the community (men, women and children),
- who has access to, and who has control of, resources,
- factors which influence the success of a project.

Although the duration of the workshop was quite short, it was successful in introducing staff to gender concepts and tools. Participants expressed interest in learning more about gender and its application to resource use.

The Women's Fisheries Development Section would like to express its sincere appreciation to the United Nations Development Programme for meeting the costs of the two resource personnel, and to the governments of Australia and New Zealand for funding logistical costs.



■ OCEANIC FISHERIES PROGRAMME

Second Multilateral High-Level Conference

The Second Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific was held at Majuro, Republic of the Marshall Islands from 10 to 13 June 1997.

The Conference was attended by representatives from Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Japan, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, People's Republic of China, Philippines, Republic of Korea, Solomon Islands, Taiwan/ROC, Tonga, Tuvalu, United States of America, Vanuatu, Wallis and Futuna, and Western Samoa. Indonesia was unable to attend.

Observers from Canada, the Food and Agriculture Organization of the United Nations (FAO), the South Pacific Forum Secretariat, the South Pacific Forum Fisheries Agency (FFA), the Inter-

American Tropical Tuna Commission (IATTC), the South Pacific Commission (SPC), the South Pacific Applied Geoscience Commission (SOPAC) and the University of the South Pacific (USP) attended the Conference.

The Conference elected Ambassador Satya N. Nandan (Fiji) as its Chairman. Ambassador Nandan then presented a statement on the issues before the Conference. Statements were made by the representatives of Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Japan, Kiribati, Korea, Nauru, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, People's Republic of China, Taiwan/ROC, Tonga, Tuvalu, United States of America, Vanuatu, Wallis and Futuna, and Western Samoa. Statements were made by the observer delegations of Canada, FAO and IATTC.

The representative of Fiji presented a report to the Conference on matters arising from the Multilat-

eral High Level Conference held at Honiara, Solomon Islands from 5 to 9 December 1994. The Conference was informed that, following the Honiara Conference of 1994, three technical consultations had been convened.

A technical consultation on the collection and exchange of fisheries data, tuna research and stock assessment, was held at Noumea from 15 to 19 July 1996, and two technical consultations on fishing vessel monitoring systems were held at Honolulu in September 1995 and Nadi, Fiji from 13 to 15 November 1996 respectively. The Conference was informed of the outcomes of these technical consultations.

Dr John Hampton of the Oceanic Fisheries Programme of the SPC presented a report on the status of tuna stocks and the fisheries for key tuna species in the western and central Pacific, namely skipjack, yellowfin, bigeye and the South Pacific albacore stock. The report indicated that, of the

four tuna species, three are subject to low or moderate exploitation rates. Only the bigeye stock gives cause for some concern. The information upon which stock status has been determined is generally good, with the exception of bigeye, about which there is considerable uncertainty relating to stock structure.

The Conference discussed issues relating to the conservation and management of highly migratory fish stocks, and options for the development and operation of a regional fisheries management arrangement. Following the discussion, the Chairman presented a report on the outcomes of the Conference. The following are excerpts from the Chairman's report:

Species to be covered

Participants considered that the regional mechanism for conservation and management should cover all the highly migratory species listed in Annex 1 of the 1982 United Nations Convention on the Law of the Sea.

However, they also agreed that the focus of the work of the regional mechanism in the first instance would be on the four main tuna species of commercial interest; bigeye, skipjack, yellowfin and the South Pacific albacore stock.

Other species which might be considered at a later date included marlins, swordfish and oceanic sharks. The mechanism should, however, provide for collection of data on all non-target species and should provide a means for taking timely action in respect of such species if that becomes necessary.

Geographical area to be covered

In considering the geographic area to be covered by the region-

al mechanism, the Conference identified a number of issues which needed to be taken into account. These included the range of the stocks, their degree of mixing, the existence of other management regimes for the same stocks, and whether to use a common geographic area or separate areas for each stock.

The Conference considered that insufficient information was available to enable it to draw latitudinal and longitudinal boundaries at this stage. Uncertainty relating to the bigeye stock structure further complicates determination of the area to be covered.

Some participants considered that for the purpose of enforcement, it was important that the boundaries of the area covered by the regional mechanism were clearly defined. It was agreed that the area to be covered should be examined in detail by experts and fisheries managers before the Conference reached any firm conclusions on the issue.

The basic principles of conservation and management to be applied in areas under national jurisdiction and on the high seas

It was recognised that Article 5 of the Implementing Agreement (*Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, A/CONF. 164/37, 8 September 1995*) contains the basic principles for conservation and management of highly migratory fish stocks and that these basic principles would apply throughout the range of the stocks without prejudice to the sovereign rights of the coastal States to conserve and manage the resources of their exclusive economic zone.

A number of these principles however will need to be elaborated upon and translated into practical measures. It was suggested that these matters might be considered by a technical consultation to be convened during the intersessional period.

The application of the precautionary approach to conservation and management of highly migratory fish stocks in the region

It was generally agreed that the precautionary approach must be applied to highly migratory fish stocks of interest in their entirety, although it was acknowledged that the meaning of the concept is not clear in its application to highly migratory fish stocks. It was explained that the precautionary approach should not be used in a manner which inappropriately restricts a fishery. On the other hand the absence of scientific data should not be used as a reason for not taking action.

The methods by which the participants will obtain and evaluate scientific advice, review the status of the stocks and assess the impact of fishing on non-target and associated or dependent species.

The Conference agreed that the Implementing Agreement identifies the type of data and information to be collected. The question is how to obtain and evaluate these data. Two options were identified: to establish a new scientific advisory body or to utilise existing regional scientific structures.

It was generally agreed that, to the extent possible, existing structures should be utilised, although the Conference acknowledged that it would be necessary to more clearly define the role of the existing bodies and their rela-

tionship to the new regional mechanism. Participants acknowledged the expertise of SPC and the valuable service it provides for the region.

It was felt that the services of SPC should continue to be utilised and that appropriate arrangements might be concluded with SPC, including the possibility of contracting out. One of the difficulties identified was that a number of Conference participants are not members of SPC and therefore would not be able to participate within the SPC structure in any policy decisions regarding data collection.

The nature of the measures for ensuring sustainable use of the resources, for example, allocations of allowable catch or levels of fishing effort

The Conference considered that this issue was inextricably linked to the basic principles of conservation and management. It was agreed that the nature of the measures for ensuring sustainable use of the resources should be considered by the technical consultation to be convened for the purpose of considering fisheries management methods.

The allowable catch

The Conference noted that all participants were committed to establishing levels of catch which ensure sustainable utilisation of the stocks in their entirety.

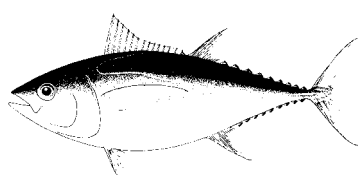
A number of factors were identified which might be considered in determining the allowable catch and allocations of allowable catch. These included catch history, size of exclusive economic zone, the geographical particularities of the region, socio-economic factors, the ability to monitor catch, and developmental aspirations of small island developing states.

The relationship between the regional mechanism and the role, objectives and operations of any relevant existing bodies

The Conference agreed that, in establishing a new regional mechanism, existing bodies such as the Standing Committee on Tuna and Billfish (SCTB), the South Pacific Albacore Research Group (SPAR) and the Western Pacific Yellowfin Research Group (WPYRG), should be used as much as possible, as well as global bodies such as FAO.



There was strong endorsement for minimising duplication and taking advantage of existing expertise in order to make future mechanisms for conservation and management efficient and cost-effective. It was agreed that where existing bodies can provide services in a cost-effective manner the regional arrangement should use them. Where other bodies may be of assistance in fulfilling the objectives of the regional arrangement, the participants should enter into relationship agreements for that purpose.



The means by which participants ensure the full cooperation of their relevant national agencies and industries in implementing recommendations and decisions arrived at through the regional mechanism

It was generally accepted that cooperation of national agencies and industries would be secured through a range of consultative mechanisms, legislative and regulatory processes. It was noted that legally binding measures are necessary to secure cooperation.

Dealing with the issue of over-capacity

A range of views were expressed regarding the current potential for over-capacity in the central and western Pacific tuna fishery. The Conference considered that while over-capacity was not yet a problem, the regional mechanism should provide a means for dealing with the potential for over-capacity before it becomes a problem.

The mechanisms to be established for effective monitoring, control, surveillance and enforcement – the role of the flag State, the role of the coastal State and the role of participants in the regional mechanism

The Conference agreed that the regional mechanism will need to develop specific procedures for monitoring, control, surveillance and enforcement. Such procedures should include observer schemes and in-port monitoring.

Given the geographical nature of the region there was a need to go beyond flag State and coastal State responsibilities and develop an international mechanism for enforcement. However, any such procedures should be based on

the provisions of the Implementing Agreement. It was noted, however, that there was a need to establish conservation and management measures before they could be enforced.

While the Conference considered enforcement to be a controversial issue, its importance in the context of regional arrangements was recognised.

Resolving the problem of participation by new entrants

A number of points were raised for consideration under this heading. It was noted that the Implementing Agreement made reference to the question of new entrants and this should form the basis for consideration of the issue.

It was also noted that the question of non-participants should also be considered. The Conference suggested that there was a need to agree on the 'real interest' of new entrants and that in the case of fully exploited fisheries the mechanism should provide a means to bar new entrants from the fishery.

The type of decision-making procedures which will best facilitate the adoption of conservation and management measures in a timely and effective manner

The Conference identified a number of possible methods for decision making. These included decision making by consensus, majority voting and a chambered voting system. The Conference expressed a general feeling that

consensus decision making was the most satisfactory method, although several delegations spoke in favour of an objection procedure or opting-out procedure.

Several delegations favoured a system whereby decisions were legally binding. The suggestion was made that different procedures might be applied to different issues. The Conference noted that the issue of decision-making procedures was closely linked to the issue of dispute settlement.

The nature of the institutional arrangements required to give effect to the range of cooperative activities

The Conference expressed a preference for the establishment of cost-effective institutional arrangements which utilised the services of existing bodies to the fullest extent possible. It was considered that the regional mechanism should be legally binding and should provide a means for establishing legally binding measures on the high seas.

The Conference considered that the issue of establishing an independent core secretariat would need to be considered in due course. Participants expressed flexibility with regard to the future institutional arrangements.

Mechanisms for the peaceful settlement of disputes

There was general agreement on the need to establish an effective dispute-settlement mechanism which would have the ability to make legally binding decisions.

The Conference agreed that the dispute settlement provisions contained in the Implementing Agreement provided a sound basis for this.

Nevertheless, there was general preference for resolving disputes bilaterally and in a peaceful manner.

Future programme of work

The Conference agreed that it would reconvene in June or July 1998. In addition, it agreed that two technical consultations should be convened during the inter-sessional period.

The first of these, to be held in December 1997 in Honiara, Solomon Islands, will have as its objective to evaluate and compare the effectiveness and practicalities of different options for the management of highly migratory fish stocks in the region, make recommendations and identify issues which require further consideration by the Conference.

The second technical consultation, to be held in Nadi, Fiji in April 1998, will have as its objective to consider and develop options for monitoring, control and surveillance, make recommendations and identify issues for further consideration by the Conference. The Conference adopted the terms of reference for the technical consultations.

It was agreed that the Forum Fisheries Agency Secretariat would provide Secretariat services for the technical consultations and the Conference.



Consultant works on bigeye stock assessment

The Oceanic Fisheries Programme (OFP) of the South Pacific Commission (SPC) is responsible for conducting stock-assessment studies on bigeye tuna (*Thunnus obe-*

sus) from the western and central Pacific. In September 1997, the OFP Coordinator issued a three-month EU consultancy contract to provide scientific support for

this assessment. The contract was given to Dr Marc Labelle, formerly head of an applied mathematics laboratory at IFREMER in Nantes, France.

The contract objectives are:

- to assemble bigeye tuna catch and length frequencies from a variety of sources and consolidate these data into an appropriately stratified database;
- to estimate bigeye growth rates from available tagging and length-frequency data;
- to make a preliminary evaluation of the suitability of exist-

ing data for generating abundance indices and conducting assessments by means of dynamic production, delay-difference and age-structured models; and

- to provide a comprehensive report on the above.

The work conducted under this contract is not expected to provide an in-depth assessment of bigeye stock status, since this re-

quires considerable knowledge on the limitations of each model and on crucial deficiencies of the data sets.

The overall objective of this study is mainly to identify important data gaps, assess the merits of potential approaches, and recommend interim measures for assessments and monitoring activities while the available knowledge base expands.



Tuna follow El Niño

Over 70 per cent of world tuna landings, amounting to over three million metric tons annually, are taken from the Pacific Ocean. The skipjack (*Katsuwonus pelamis*), a surface tuna, is the most widely fished species in the Pacific and forms more than two-thirds of all catches in that ocean.

The huge warm pool (29°C average temperature over a surface area larger than Europe), situated in the western ocean, accounts for most skipjack catches in this ocean. Do skipjack follow the interannual movements of this warm-water pool over several thousand kilometres, which movements cause the well known climate event El Niño?

If so, how can this event be explained, since warm water is relatively poor in nutrients? Such are the questions which the South Pacific Commission and ORSTOM (French Scientific Research Insti-

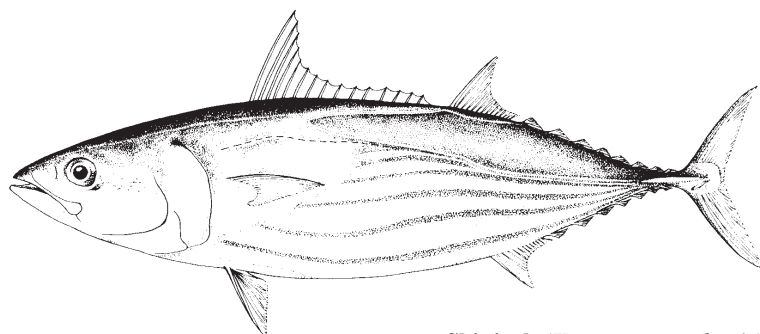
tute for Development through Cooperation) are trying to answer in a study the results of which have just been published in the journal *Nature*. The study's findings should make it possible to achieve better fishery management in an area extending over 6,000 km along the equator.

Every three to four years, under the effect of a simultaneous change in the wind and current systems induced by a change in atmospheric pressure between French Polynesia and northern Australia, the eastern edge of the warm-water pool, located close to the equator at 180° longitude on average, moves 3000 km eastwards. Well known as El Niño, this warming event of the central Pacific surface waters, which also affects the eastern part of the basin, is the warm phase in a global climate fluctuation system called ENSO (El Niño - Southern Oscillation).

El Niño is followed by a cool phase, referred to as La Niña, during which the warm-water pool is pushed beyond its average position towards the western coast of the equatorial Pacific, causing the temperatures of the central Pacific to fall below normal.

In order to determine whether tunas follow these west-to-east and east-to-west shifts of the warm-water mass, scientists have endeavoured to correlate environmental data signalling these movements with the fishery statistics gathered from this same oceanic area. Fisheries statistics are used to estimate variations in fish abundance in a given location.

The results obtained show that the largest tuna catches occur during La Niña episodes (1988-1989 and 1995) in the western Pacific basin (between 140° and 160° east). On the other hand, during El Niño years (1992-1994), maximum catches moved 2500 km further east and as far as 170° west in the Pacific. These data, which reflect skipjack movements over several thousand kilometres, westward during La Niña and eastward during El Niño, have been confirmed by the results of a study carried out by the South Pacific Commission on the movements of tagged tunas.



Skipjack (*Katsuwonus pelamis*)

Why do tunas follow the movements of the warm-water pool, although this water is relatively poor in nutrients? One of the theories considered by the scientists is that the organisms (zooplankton and micronekton) on which surface tuna feed, arrive in the warm-water body.

An indirect product of upwellings (deep, cold water rich in minerals rising to the surface) in the eastern Pacific, this zooplankton and micronekton is thought to be pushed westward by an equatorial current and to accumulate in the warm-water mass at the convergence zone between the flows going in opposite directions.

Because of the movement of the warm-water mass and that of the planktonic organisms, this nutrient-rich zone (secondary production) which is very attractive for

surface tuna, is thought to form a strip several hundred kilometres wide along the eastern edge of the warm-water pool. It would therefore be in search of food that skipjacks would follow the back-and-forth movement of the warm-water pool through various warm phases (El Niño) and cool phases (La Niña) of ENSO.

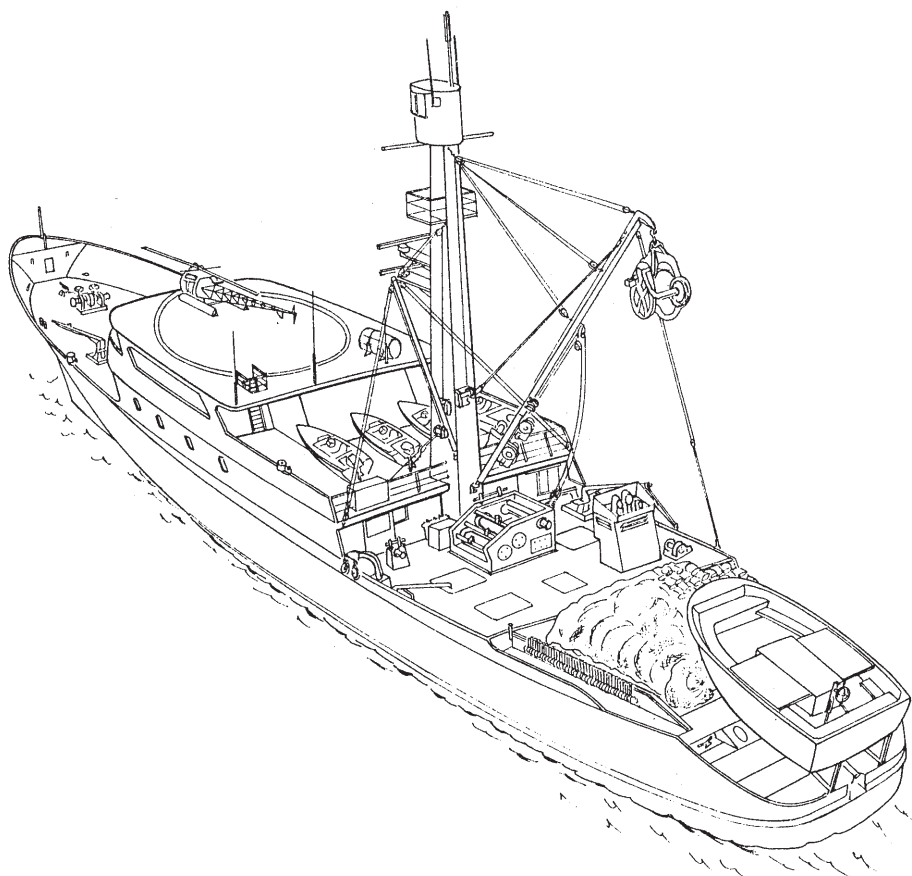
The demonstration of this correlation between tuna movements in the equatorial Pacific and the El Niño climate event offers rewarding prospects for better management of tuna fishing in this oceanic region.

It is possible to forecast the appearance of an El Niño event and the movement of the warm-water pool, and therefore tuna migrations, at least two months in advance using the basic index formed by the change in atmos-

pheric pressure between French Polynesia and northern Australia. In addition, simulation models today make it possible to forecast an El Niño event up to one year in advance. This index, in the same way as these models, could be used to define the zones most favourable for fishing in advance and establish whether fish abundance variations are due to their migration towards other areas or results from fishing.

Overall, this would make it possible to gain a better understanding of tuna abundance variations in the equatorial Pacific and prepare fishing strategies compatible with the requirements of sustainable exploitation of oceanic resources.

(Source: ORSTOM) 



■ NEW THEORY CLARIFIES THE COMPLEX MECHANISMS OF EL NIÑO

Every three to four years a climatic anomaly well known as El Niño occurs in the equatorial waters of the Pacific Ocean and is accompanied for several months by severe meteorological disturbances with sometimes dramatic consequences: e.g. torrential rains on the normally arid coasts of Peru of Ecuador, melting of tropical Andean glaciers, droughts in South Africa and Australia, storms and storm surges along the west coast of the United States, cyclones in Hawaii and French Polynesia etc.

El Niño is in fact just one phase of a system of global climate fluctuations called ENSO (El Niño – Southern Oscillation), which occurs in the equatorial Pacific but which affects the whole planet.

What are the oceanic and atmospheric mechanisms which characterise this climatic event? After conducting research on this subject for over 10 years as part of the international TOGA (Tropical Ocean and Global Atmosphere) Programme, the physical oceanographers at the ORSTOM (French Scientific Research Institute for Development through Cooperation) Centre in Noumea, New Caledonia, can now offer some new information on ENSO's dynamics, highlighting certain mechanisms which had previously either been ignored or underestimated in existing theories.

Using in-situ current measurements carried out over a period of several years (from moored current-meters and drifting buoys) transmitted by US Navy (GEOSAT) and French-American (TOPEX-Poseidon) satellites, these researchers have shown how, in the central equatorial Pacific, surface currents associated with equatorial waves, themselves a result of wind variations, play a fundamental role in the development

process of the various phases of ENSO and in their inter-annual sequence.

ENSO manifests itself in variations of surface-water temperatures in the eastern and central Pacific: i.e. increases in temperature during the warm phase (El Niño) and decreases during the cool phase (La Niña). These temperature variations are coupled with variations in atmospheric pressure between French Polynesia and northern Australia. This change in atmospheric pressure causes a simultaneous change in wind and current patterns along the Equator as well as the movement of an immense warm-water pool situated in the western equatorial Pacific.

As a source of intense interaction between the ocean and the atmosphere, this warm pool, which covers a surface area larger than Europe, has a direct effect on the climate of the Pacific and the whole planet.

The upward movement of heat through the atmosphere created by this water mass, whose temperature is always above 28°C, causes a very heavy concentration of clouds at higher altitudes (atmospheric convection) leading to rain and a significant release of heat in the higher latitudes of the Southern and Northern Hemispheres.

Genesis and development of an El Niño episode

During El Niño, the western edge of the warm-water pool, located on average at 180° at the Equator, moves some 3,000 km eastwards. This pool moves quite easily under the effect of wind and current variations, as its water, which is warm and of low salinity and therefore low density, literally

floats above the underlying water, which is cold and salty and thus denser.

As integrated in the model devised by ORSTOM oceanographers, this west-to-east movement of the warm-water pool starts after westerly winds begin blowing in the western Pacific and the tradewinds weaken.

These westerly winds cause the formation of surface currents which shift the western edge of the pool to the east. While moving in an easterly direction, the warm-water pool expands in size both on the surface and in depth. The phenomenon of atmospheric convection also gathers strength; consequently the westerly winds become stronger. Surface currents then grow stronger and the warm-water pool moves even further eastwards.

At the same time, at the point where warm surface water meets cold, deep water (depth of 50 to 150 metres), the westerly winds generate a series of equatorial waves moving eastwards at a speed of 250 km/day. As it arrives at the edge of the upwelling along the deep western coast, which normally cools this coastal region, El Niño contributes to the warming of the eastern part of the Pacific basin; at this stage it is considered to be fully developed.

La Niña follows El Niño, which follows La Niña, and so on

The arrival of the equatorial waves along the South America coasts halts the eastward movement of the eastern edge of the warm-water pool. In fact, after 'rebounding' off the coasts, which form an effective barrier, these waves, along with the currents associated with them, pulse back

at a speed of 100 km/day towards the centre of the Pacific Basin, halt after about a year, gradually pushing the eastern edge of the pool back to its starting point (180°), and, finally, even further west. The suction caused by the westward return of this warm-water mass sets off an upwelling of deep cold water along the western coast of South America.

The temperatures in the eastern part of the Pacific basin then once again become cold. One or two years after its 'departure', El Niño gives way to La Niña, the cool phase of ENSO. During this phase, the wind/current/equatorial wave system and their reflexion continue, but with varia-

tions in wind speeds (strong trade winds, weak or non-existent westerly winds) and currents which flow in the opposite direction from those observed during El Niño.

Then, still under the effect of the successive 'rebounding' of equatorial waves off the coast of South America and the associated currents and new westerly winds, La Niña is followed by another warm episode of ENSO. Thus the cool and warm phases of ENSO alternate at intervals of about 40 months.

This conceptual model revises those previous theories about ENSO which had not taken into

account the major effects of surface currents, equatorial waves and their 'rebounding' off the South American coasts on the movement of the warm-water pool.

By explaining the process of succession of the warm and cool phases of ENSO on an inter-annual scale as well as their principal development mechanisms, this new concept devised by researchers at ORSTOM should contribute to refining numerical simulation models used to predict global climatic phenomena whose consequences can be particularly dramatic in the inter-tropical zone.

(Source: ORSTOM)



■ ASSESSMENT OF COMMERCIAL FISHERY RESOURCES IN THE NORTHERN PROVINCE LAGOON

In response to a request from the Northern Province, ORSTOM has just completed an assessment of the commercially exploitable fishery resources (approximately 300 species) of the lagoon areas of the Northern Province of New Caledonia. This project was carried out under a 'Development Contract' between the French Government and the Province.

The extensive sampling work needed was carried out by ORSTOM's team of scientists assisted by Provincial technical staff. The work concerned all the biotopes (reefs, lagoon bottom, mangroves) found in the Northern Province's 100,000 km² of lagoon.

In 270 days of field work, over 1,800 survey dives, 400 experimental handline fishing trips, 210 bottom longline sets and 100 net sets were carried out.

Over the same period, more than 80,000 km were covered by car and approximately 18,000 nautical miles (33,000 km) by boat.

Such a programme is unprecedented anywhere in the world. No sampling project had ever been carried out on such a vast geographical scale in the tropical environment. It yielded a great deal of very important information on the structure of fish populations (diversity, abundance, biomass), and on the preferred locations of species and individual specimens as determined by their size and their biology (breeding seasons, nutrition, habitat, etc.).

The total stock of demersal fish was estimated at 138,000 mt. Approximately a quarter of this is formed of currently almost unexploited species (herbivorous fish). Also, half of the total stock is located in the Belep Islands area, with the rest being divided over the east and west coasts.

Generally speaking, over half of the total stock is located on the reefs (mainly on the barrier reefs), and the other half on the lagoon bottom. The latter part is difficult to exploit, thus forming a 'reserve stock' for the resource.

In the Belep Islands, because of the populations' characteristics (especially the biomasses, yields and sizes observed), and negligible fishing pressure, the fish stocks of the Cook and Français barrier reefs can be considered untouched. Conversely, the east and west coast populations display the characteristics of exploited stocks.

On the basis of information provided by professional fishermen on the one hand, and of the quantities consumed for subsistence purposes (28.6 kg/inhabitant in the Northern Province), on the other, it was possible to assess fishing pressure in the various geographical areas and locations studied.

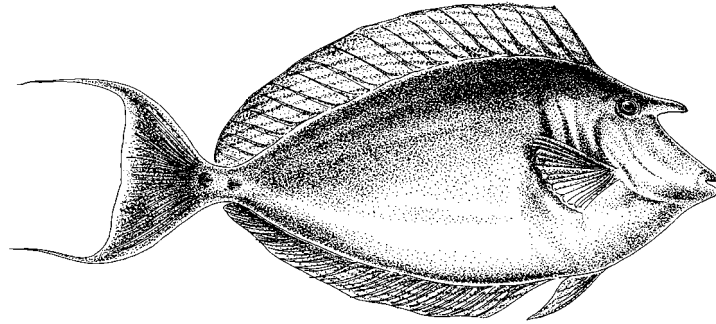
Subsistence catches accounted for 90 per cent of total catches in the Northern Province, estimated at 1,330 mt in total in 1996. This means that the increase in fishing pressure is mainly influenced by the quantity consumed for subsistence purposes and therefore by population growth trends. In

1996, it was estimated that fishing pressure in the Belep area represented 0.003 per cent of the total stock in that area. The same calculation for the west and east coasts gives values of 0.3 and 0.1 per cent.

Also, there is a relation between total stocks and fishing pressure in the various localities of the Northern Province. This shows that catches come particularly from certain environments and certain species. On the west and east coasts, line fishing would appear to exercise higher fishing pressure, mainly on the reefs and surrounding areas. These data confirm that fishing activity has an impact on settlement on the west and east coasts.

All this information made it possible to estimate how much can be landed at present without dangerously depleting the resource. Over the whole of the Northern Province lagoon area, approximately 10 per cent of the total stock is exploitable (13,000 mt). This consists mainly of emperors (Lethrinidae), snappers (Lutjanidae), groupers (Serranidae), rabbit fish (Siganidae) and parrot fish (Scaridae). Compared to total fishing pressure, the stock would appear to be far from being threatened in its entirety and it would be possible to considerably increase fishing effort.

However, it must be considered that, at a more specific geographical scale, some reef environments and geographical areas are already sustaining quite a high



level of fishing activity. In some cases, the exploitation limit has already apparently been reached and indeed exceeded for some categories of fish, as, for example, at Kone, with fish caught by handlining.

Some recommendations can be made on the basis of this survey and also on the basis of the forecast doubling of lagoon fishing effort in the Northern Province within 10 years. The purpose of this recommendation is to make possible the sustainable management of this resource, which is of vital importance for the Northern Province's coastal communities.

Firstly, the system used to appraise fishing activity in the Northern Province needs to be adapted. At present, it is based on the results of professional artisanal fishing, which is a fringe activity. It is essential to take into account subsistence fishing through household surveys carried out at regular intervals.

Secondly, the study which has just been carried out is to some extent a 'snapshot' of fish popu-

lations at a particular moment. It is essential to consider monitoring stocks, particularly in the most vulnerable areas. This would yield information about trends.

Joint analysis of fishing pressure and current stocks would make it possible to monitor the rate of exploitation of fish populations and its probable consequences for the resource.

This prior information is required for the possible implementation of a management regime designed to conserve stocks, particularly if it is intended to create new fisheries. What can, however, already be said is that it would apparently be desirable to redirect some of the fishing effort currently affecting fish stocks which are close to the maximum exploitation level towards other groups of species such as breams or parrot fish etc., but also towards less exploited biotopes, such as the lagoon floor in particular.

A diversification of fishing techniques would make it possible to achieve this goal (fish corrals, traps etc.). In addition, it would have the advantage of opening up lagoon fishing activity to potential new markets (such as live fish or species of interest to collectors).

(Source: ORSTOM)



■ PALUAN CONSERVATIONIST RECEIVES FELLOWSHIP

Noah T. Idechong, Executive Director of the Palau Conservation Society, has been awarded US\$150,000 by the US-based Pew Fellows Program in Conservation and the Environment.

He will use the grant to assess Palau's evolving resource management methods and develop effective marine management programmes and conservation projects that mesh Palau's unique cultural and political values and systems with Western management strategies.

The Pew Fellows Program is a partnership of The Pew Charitable Trusts—USA's largest foundation supporter of efforts to protect the environment—and Boston's New England Aquarium. The program provides annual awards of US\$150,000 each to ten of the world's most talented marine scientists, advocates and policy makers from across the globe.

The awards, which are widely viewed as the pre-eminent marine fellowships in the world, support innovative work in four areas: fisheries conservation and management, coastal management, marine pollution, and marine-ecosystem conservation.

'It was a real surprise to receive the Pew Fellowship. I did not anticipate it because I know many scientists had been nominated and I felt I could not compete with them,' says Idechong, whose background is in business and resource management.

'Getting the fellowship reinforces my belief that marine conservation work has a lot to do with people, their resources and their needs, not just scientific information.'

Idechong plans to study and document Palau's current marine management systems and shape new

programmes and strategies based on his findings. 'Like most of the tropical Pacific, Palau's inshore marine resources are increasingly subject to overharvest and environmental degradation,' he says.

'Palau's conservation management methods are neither traditional nor purely Western, so management issues are complex and are further complicated by changing values and political systems. We need to examine these changes to determine legal avenues and cost-effective ways to manage our marine resources.'

Idechong's ultimate goal is to preserve the island's resources 'for the economic and social benefits of all Palauans.' He says he hopes the project will also serve as a model for similar initiatives in other coastal communities.

Idechong, who has a B.Sc. in Business Administration from

The Pew Fellows Program in Conservation and the Environment is a grant-making programme awarding ten annual fellowships of US\$150,000 each to outstanding marine scientists, environmental advocates, and policy makers from across the globe. The Program is a partnership of The Pew Charitable Trusts—the largest US-based Foundation supporter of efforts to protect the environment—and the New England Aquarium in Boston, Massachusetts.

Selected Fellows are exemplary visionaries and problem-solvers for healthy ocean ecosystems whose work has important ramifications for creative marine conservation strategies, deployment of new technologies, and the establishment of policy at the regional, national, and international levels. Widely viewed as the pre-eminent marine fellowships in the world, the awards support innovative work in four areas: fisheries conservation and management, marine pollution, coastal management, and marine ecosystem conservation.

The Pew Fellowships, targetted primarily to early and mid-career professionals, are competitive awards based on the applied conservation merit of the proposal, the individual's professional achievement, and the potential impact of the project. Since the inception of the programme in 1990, Fellows have been selected from throughout the United States and countries around the world including Argentina, Australia, Brazil, Canada, Chile, India, Jamaica, Kenya, Mexico, Palau, Poland, Russia, South Africa, Sweden, Tanzania, Turkey, the UK, and Vietnam.

The Pew Charitable Trusts, among the largest philanthropies in the United States, support non-profit activities in the environment, culture, education, health and human services, public policy, and religion. The New England Aquarium (NEAQ) opened in 1969 as the USA's first modern aquarium and currently attracts more than 1.2 million visitors each year. NEAQ is known for its role in regional, national, and international marine conservation efforts and for its innovative educational programmes.

Hawaii Pacific College, has held a variety of resource management positions, including being Palau's Chief of the Division of Marine Resources. In addition, he helped found the Palau Conservation Society, Palau's only environmental NGO, with assistance from The Nature Conservancy



and the McArthur Foundation. He is considered by many experts to be one of Palau's most effective resource managers.

(Source: Pew Fellows Program)



■ NEW FISH-POISONING TEST KIT

Recently at the Pacific Science Inter-Congress meeting in Fiji, it was announced that a commercially available ciguatera test kit, referred to as 'Cigua-Check', has been developed and will soon be on the market.

A new Hawaii-based company, Oceanit Test Systems Inc., is manufacturing the test kit referred to as Cigua-Check. Cigua-Check is the first of its kind on the market and is available to the public starting since October this year.

The test kit was developed in cooperation with Dr Yoshitsugi Hokama of the University of Hawaii, School of Tropical Medicine, who has an international reputation for his work on ciguatera. Many of Hawaii's fishermen will remember the Stick Test developed by Dr Hokama and distributed through a grant from the Hawaii State Department of Health.

With every test kit distributed, there was a post card, ... 'the fisherman was supposed to tell us the results of the test,' said Hokama. He added that they found out that the test was very sensitive and they didn't have a single 'false negative' case where anyone got sick after finding a fish to be free of ciguatoxin using the kit.

'However, some people complained that the test found too many fish to be poisonous. Actually, I believe that many reef fish have low levels of poison that

may not be enough to make people sick but are high enough to trigger the tool kit.'

Almost a decade ago, an arrangement was made between the University of Hawaii and a mainland firm to develop the Stick Test into a commercial product. However, after several years (and several lawsuits), the mainland firm lost the right to market the kit.

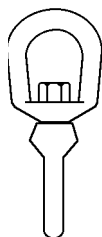
In the meantime, Dr Hokama was working on a new method that would overcome some of the difficulties experienced by fishermen with the first kit. The new test kit is based on an antibody technique, similar to the old Stick Test, but has been changed to make it both more effective and easier to use at home.

To produce and market the new kit, Dr Hohama assisted in forming a new company, Oceanit Test

Systems Inc., in partnership with an established local research firm. Oceanit Laboratories Inc. has developed the immunobead assay test kit to provide quick, simple and reliable detection of ciguatera poison in fish. The test takes about 40 minutes, mostly waiting time, to complete. A tiny piece of fish meat is placed into a small bottle along with a test stick.

After a few minutes, the stick is removed, dried and placed into a second bottle containing a purple liquid. If the test stick absorbs the purple colour, than you know that the fish has ciguatoxin and should not be eaten. The amount of purple colour on the stick is directly related to the amount of poison in the fish.

Ciguatera poisoning is a serious threat to public health and fisheries development along tropical and subtropical shorelines.



Sometimes associated with coastal construction projects, and almost always in areas without a lot of freshwater inflow, the toxin is produced by dinoflagellate algae and is passed up the food chain. The dinoflagellate itself is too small to be seen with the naked eye.

However, under conditions of a bloom, hundreds or thousands of the dinoflagellate cells coat the surface of limu in shallow waters. When the fish eat the limu, they also eat the dinoflagellate and take the poison into their own bodies.

Because the dinoflagellate only grows in certain places, only the

fish in those areas become ciguatera toxic. If the population of dinoflagellate blooms due to the aftermath of a big storm, or a large in-water coastal construction project, then fish in that area can become ciguatera toxic. Partly because the poison is fat-soluble, it tends to accumulate at its highest levels in the liver, roe (eggs and sperm) and head of the fish. These parts of reef fish should never be eaten.

Oceanit Test Systems Inc. is a subsidiary of Oceanit Laboratories Inc. Oceanit Test Systems Inc. specialises in developing detection methods for fish poisoning and marine toxicology. Oceanit, founded in 1985 by Patrick K.

Sullivan, is a Hawaii-based company specialising in environmental coastal civil engineering, marine biology, planning and research and development in related technologies.

For the past 10 years, Oceanit has been involved with ciguatera-poisoning monitoring for various resort and coastal developments. For more information, visit the Cigua-Check home page at <<<http://www.cigua.com>>>

(Source: Hawaii Fishing News)



■ AUSTRALIA TIGHTENS FISH STANDARDS

To raise the quality of both domestic and imported fish, the Australian government plans to upgrade its procedures for inspecting fish imports and fish products by accepting the recommendations of the Report of the National Task Force on Imported Fish and Fish Products.

The Minister for Primary Industries and Energy, John Anderson said the Government would provide A\$7 million (US\$5 million) to implement the report's recommendations on quarantine, and the risks associated with fish imports, and fish health.

In addition to this funding, the government will spend about A\$38.7 million (US\$25 million) over the next four years to upgrade fish health inspection at airports, mail centres and shipping terminals.

In Victoria, the issue of poor-quality fish being sold to the public as a superior product is a major worry. Some Melbourne fish shops are being compelled to sell inferior or imported flake because of the decline in the catch of the better-quality local school (*Galeorhinus galeus*) and gummy shark (*Mustelus antarcticus*).

Local fish authorities say some consumers think they are buying these fish when they ask for flake. Instead, they may be purchasing the bronze whaler, elephant, pearl, hammerhead or sword shark species.

Stocks of top-quality school shark are so low compared with past years that catch limits are likely to be introduced next year, according to the Australian Fisheries Management Authority.

(Source: *Seafood International*)



■ FSM FISHERIES GRANT APPROVED

The Asian Development Bank has approved a fisheries' modernisation grant for the Federated States of Micronesia. The Manila-based bank approved a US\$934,000 technical assistance grant to the FSM which will allow the country to benefit more from its important tuna harvest.

The grant will be used to streamline the Micronesian Maritime

Authority and will also help in the development of a plan to coordinate government, private and foreign fishing operations, according to the bank.



The US\$934,000 will be used to implement policy recommendations agreed upon during the ADB-funded Fisheries Policy Summit, held in the FSM in December 1996.

Summit recommendations included focussing on fisheries and marine education and training, coordinating the roles of the government and the private sector,

encouraging investment and consolidating commercial fisheries under one authority.

The development of a fisheries policy is considered as a cornerstone of the FSM economic re-

structuring programme, which is being overseen by the Asian Development Bank in preparation for declining Compact of Free Association money from the United States. The overall restructuring programme involves streamlin-

ing the governments, increasing private sector participation in government agencies and instituting a privatisation programme.

(Source: *Pacific Daily News*)



■ NORTH QUEENSLAND COUNT METHODS WIDELY USED IN THE PACIFIC

Techniques devised by Department of Primary Industries Fisheries Biologist Melita Samoilyls are being used by fisheries officers from Papua New Guinea, Fiji and Solomon Islands—a group of whom have been in Townsville recently honing their skills in analysing data sets gathered over recent years using her census system.

This data analysis and interpretation workshop marked the end of a half-million dollar Australian Centre for International Agricultural Research project in

which Ms Samoilyls drew on earlier collaborative research to produce an underwater visual census manual for use by other South Pacific nations.

Dubbed the 'UVC Person of Fisheries', Melita prefers the look-don't-touch method of assessing fish numbers because it is fairly quick and simple to use, without being destructive.

'Instead of catching fish, we scuba dive defined areas of reef and record how many fish we see.

From that count we can determine, say, the average density of coral trout on the leeward side of a reef,' she explained.

'The conventional ways of managing fish stocks were all developed in the 50s in North America and Europe where many of their fisheries are single species. A coral reef is a very complex entity with lots of species which also interact with each other.'

Ms Samoilyls said this complexity of many species, together



National Fisheries Authority Fisheries Officer John Aini (left) and Fisheries Scientist Augustine Mobiha of Kavieng, New Ireland Province in Townsville for a data analysis workshop on underwater visual census methods of assessing coral reef fish stocks.

with many landing sites and various types of fishing gear in South Pacific reef fisheries, made assessment of fish populations difficult and invariably there is little information on the state of these stocks. These fisheries, at both a subsistence and community level, are an integral part of life for many Pacific Island people, and provide a primary source of protein.

'Underwater visual census data, when compared with catch and effort estimates, provide a useful way of assessing fish stocks. UVC also has the advantage of getting people into the water to have a look at the environment they are working in rather than looking at dead fish from a boat—so we are getting an ecological perspective as well,' she said.

'If you can independently monitor fish stocks, together with knowing how much you are catching, when and where, then you are in a very strong position to assess how the stocks are going and how they need to be managed.'

She observes that having the opportunity to study reef fisheries in Pacific Island countries where fishing pressure is invariably greater than it is here, gives us an insight into understanding the impacts of fishing on the Great Barrier Reef.

Melita Samoily's reef fish stock-assessment manual details how to conduct LTVC and fishery surveys, how to set up a data base and how to analyse, present and report the findings.

During the recent data analysis workshop, visiting fisheries officers Iliavi Tuwai (Fiji), Jon Leqata and Eddie Oriehaka (Solomon Islands), Augustine Mobiha and John Aini (Papua New Guinea) reviewed the manual for user friendliness as well as working on interpreting data sets. The group said the Townsville workshop had been valuable both as a training exercise and as a rare opportunity to network with other Pacific Island scientists.

They all agreed that the techniques learned would enhance their work and lead to publication of reports which would in turn guide the management of their reef fisheries resources.

(Source: Department of Primary Industries News Release)



AMERICAN FISHERMEN ASKED TO INCREASE LOCAL CREWING PROPORTION

American tuna fishing boats in the Western Pacific are being asked to increase the number of Pacific Island seamen they employ from 15 per cent to 50 per cent of the crew over the next five years, according to a joint statement from the Forum Fisheries Agency and the US Tuna Foundation (USTF).

Pacific Island states have a strong desire for more involvement in tuna fishing, which for some is the only hope of a sustainable economic future, the statement said. Crew-

ing was a 'significant' part of that involvement. At talks between the FFA and the USTF, future cooperation, including the use of local shore facilities by the US fleet and investment in processing tuna in the islands, also had been discussed, the statement said.

Under a 10-year agreement programme between the US and the 16 countries which form the FFA, the US Government and fishing companies pay a total of US\$18 million a year so that up to about

50 US purse seiners can fish in the 30 million square kilometres of exclusive economic zones claimed by FFA members. The area yielded about one million tonnes of tuna worth US\$1.7 billion in 1996 and is the origin of half the world's canned tuna supply. The statement said that relations between FFA and US fishermen were a model of cooperation that should secure the future of the world's greatest tuna fishery.

(Source: *Pacific Report*)



FISHING TOP THREE

American Samoa, Guam, and Hawaii are among the top ten US ports in terms of commercial fishing value. Pago Pago, American Samoa, according to the Honolulu-based Western Pacific Fishery Council, is the top US port by far. Fish landed in Pago Pago last year had a value of US\$212.5 million. It also ranked number one in 1995.

Other statistics for 1996, released by the US National Oceanic and Atmospheric Administration, placed Guam fourth, with fish valued at US\$94.6 million, and Hawaii sixth, with a US\$64.3 million catch. The Western Pacific region's other major port, the Northern Marianas Islands, had a 1996 value of US\$18.6 million,

placing it 48th among US ports. The primary species targeted by US commercial fishing vessels in the Pacific include tuna, swordfish, marlin, mahimahi, various bottomfish, and lobster.

(Source: *Pacific News Bulletin*)



FISHING AROUND FISH AGGREGATING DEVICES (FADS) IN VANUATU

Background

Fish aggregating devices (FADs) have been used in the waters around Vanuatu for over 15 years, to attract and hold schools of tuna for domestic fishermen to exploit. In the early years, it was the Fisheries Department that utilised the FADs as they conducted experimental fishing trials using different fishing techniques, and encouraged local fishermen offshore to fish for tunas around the FADs.

The Commission was involved in some of the experimental fishing around FADs in Vanuatu, with a Masterfisherman assigned to assist the Fisheries Department for six months in 1983. Fishing trials were conducted using one of the Fisheries Department's plywood Alia catamarans fitted with outriggers for trolling (Figure 1).



Figure 1: Plywood Alia catamaran with outriggers and four handreels used for trolling (1983)

*by Lindsay Chapman,
South Pacific Commission,
Noumea, New Caledonia*

Other experimental fishing methods were used around FADs during this visit, including vertical longlines, single-hook shark lines, palu-ahi handlines and gillnets (Chapman & Cusack, 1997).

Good catches of saleable surface species, mainly tunas, wahoo and mahi mahi (Figure 2), were recorded from trolling. Encouraging results were recorded from the mid-water fishing methods, with mainly undesirable species like sharks being taken with the gillnets (Figure 3).

As local commercial, recreational and charter fishermen started to utilise the FADs, the Fisheries Department reduced its fishing activity. This led to the Fisheries

Department concentrating more on research activities on the in-shore species, whilst continuing to construct and deploy the actual FADs as needed, when materials were available. The Vanuatu Fisheries Department has endeavoured to maintain a FAD programme over the years, however lack of funding and resources has limited their success at times.

As part of the FAD programme in Vanuatu, different construction materials and buoy designs were trialled. In some cases, these design changes were dictated by the availability of different materials, or the preference of the person in charge of FAD construction and deployment at the time.

The experiences gained from these changes have been passed on to the Commission for consideration in developing standard and proven FAD designs for the region. Two designs have been recommended by the Commission, with two manuals produced covering different aspects of programme planning (Anderson & Gates, 1996) and rigging deep-water FAD moorings (Gates, Cusack & Watt, 1996).

FADs in recent years

Funding of FADs in Vanuatu has become more difficult in recent years, as the availability of donor funding has declined and Government budgets have been tightened. With reduced funding, the number of FADs in Vanuatu decreased in the 1990s to the point where for more than seven months in 1996–97, there were no FADs at all.

In May 1997, one FAD was deployed using available materials held by the Fisheries Department, supplemented by materials purchased by local operators reliant on FADs for their fishing operations.



Figure 2: The catch from trolling trials around FADs off Port Vila in 1983



The main person behind the industry support is Mr René Laurant. He has not only assisted in the purchase of necessary materials for FADs, but also assisted the Fisheries Department in constructing and deploying the FADs. More recently, René was able to get some charter and commercial fishermen together to purchase enough materials for two FAD buoy systems for future deployments.

The FAD deployed in May 1997 was of the Indian-Ocean design (Gates, Cusack & Watt, 1996), using pressure floats as the buoy system (Figure 4) instead of the normal purse-seine floats used in the SPC-recommended design.

As there was no polypropylene rope available to complement the nylon rope on hand, a 16 mm

Figure 3: Gillnetting trials around FADs off Port Vila in 1983 produce large catches of sharks, but very few saleable fish.

combination rope (polypropylene rope around a wire rope core) was used. The combination rope had several pressure floats attached (Figure 5) to lift the bottom hardware free from the seabed. The anchor used was comprised of several old steel tracks.

Data on the use of FADs in Vanuatu is scarce, even though the Fisheries Department runs a data collection system for commercial fishermen wishing to obtain duty-free fuel. Most fishermen declare their bottom-fishing catch, but not their trolling catch as this in many cases is used as bait for their bottom-fishing operations, or as food for the crew and their families. Table 1 shows the catch data held by the Fisheries Department for FAD fishing in 1996, and highlights the catches taken by René's operation.

The table on page 30 shows that René's fishing operation caught over 10 t of saleable fish from the FADs off Port Vila in 8 months fishing in 1996, compared to the remaining catch of just over 3 t in 12-months fishing. René's operation ceased fishing in September when the last FAD off Port Vila was lost. The other catches recorded were probably from fishermen incorrectly completing their catch returns, or putting the incorrect month down on their return.

As already stated, the table shows the recorded commercial catch data for catches around FADs, as held by the Fisheries Department. However, it does not include the catch or benefits received from the recreational and charter fishing operations, especially out of Port Vila.

René Laurant's fishing operation

René owns a large property at Elaboe Point, a 30 minute drive on a rough road from Port Vila. At his property, René has two 4.2 m aluminium dinghies with 25-



Figure 4: Pressure floats strung together to form the buoy of a FAD



Figure 5: Combination rope used for mooring line with streamers on the top section and pressure floats attached to the middle section

horsepower outboard engines stationed in the calm waters of a small bay (Figure 6).

The dinghies are operated by Ni-Vanuatu crew (two per dinghy) who travel to the FAD(s) off Port

Table 1: Commercial catch records for 1996 by species for fish taken around FADs in Vanuatu showing the catch (in kg) of René Laurant's fishing operation compared to all other recorded data.

Month	Yellowfin tuna		Skipjack tuna		Other species		Total	
	René	Other	René	Other	René	Other	René	Other
January	92	102	548	127	60	48	700	277
February	1,764	363	313	94	34	82	2,111	539
March	280	151	200	28	20	0	500	179
April	345	51	415	10	110	22	870	83
May	625	73	160	119	380	71	1,165	263
June	730	22	390	83	645	257	1,765	362
July	570	128	270	200	265	276	1,105	604
August	0	36	0	41	0	160	0	237
September	1,231	36	569	10	336	49	2,136	95
October	0	46	0	27	0	185	0	258
November	0	36	0	0	0	60	0	96
December	0	35	0	91	0	27	0	153
Total	5,637	1,079	2,865	830	1,850	1,237	10,352	3,146



Figure 6: One of the dinghies being loaded in the sheltered anchorage facility ready for fishing

Vila twice per day (early morning and late evening) to troll when weather permits. The whole fishing operation relies on there being FADs to troll around—no FADs, no fishing.

The fishing gear used is very basic. Two rigidly mounted trolling lines with a shock absorber rubber are used, one attached to either side of the dinghy, plus a gamefishing rod-and-reel mount-

ed forward (see Figure 6). The hand-hauled troll lines are made from a 40–50 m length of 150–200 kg test monofilament nylon, terminating in a swivel. Attached to the swivel is a lighter monofila-

ment trace of 80 kg test, and a synthetic lure with double hook. The gamefishing rod and reel is fitted with 80 kg test monofilament with a variety of commercially made lures used.

A morning trip will commence at least one hour before sunrise; in June this equated to a 4.30 am departure from the anchorage. The vessel travels at full speed to the vicinity of the FAD, slows and starts to troll using the three lines whilst looking for the FAD. The FAD is very difficult to locate visually in the pre-dawn and dawn light, so time is lost searching. To overcome the problem of locating the FAD in low light, René has recently purchased a hand-held GPS (global positioning system) unit for use in locating the FADs. He first has to get the location of the FAD, then train the crew how to use the GPS.

Once the FAD is located, trolling effort is concentrated in the vicinity of the buoy, mainly on the up-current side where the tunas tend to concentrate. The skipper of the dinghy, (on this trip Albert Joseph [Figure 7]), drives the dinghy whilst keeping his hand on one of the ridged-mounted trolling lines to feel a strike.

The crew (on this trip Eric Mahit), holds the rod and reel (Figure 8) whilst watching the other ridged-mounted trolling line. When a fish is hooked, the dinghy is slowed, allowing the fish to be hauled in quickly to avoid shark damage.

Most of the catch of tuna was taken in the first hour of daylight. As this FAD off Port Vila had only been in the water for 3–4 weeks, there appeared to be only a small school of tunas aggregated around it, with some mahi mahi.

Figure 8: Crewman Eric Mahit working the rod and reel hoping for a strike



Figure 7: Dinghy skipper Albert Joseph working one trolling line while steering the dinghy



When the tuna stopped striking, the skipper changed his rig and replaced the lure with a single hook baited with a tapered strip of fresh skipjack from the morning's catch. This was trolled at a slow speed and before long the first mahi mahi was caught. Two lines were then baited and trolled.

Over the next 1.5 hours many strikes occurred from small mahi mahi, however no more were landed. By 9.00 am fishing had finished for the day and we headed for the anchorage at Elaboe Point. The catch was unloaded (Figure 9) and cleaned on the beach before being transported to Port Vila for sale at 350 Vatu/kg.

René has a simple method of paying the crew. The catch is weighed in and sold, direct running expenses deducted (mainly fuel used) and the balance is split equally three ways—one-third to René, one-third to the crew and one-third to the vessel to cover maintenance. Everyone is happy with this arrangement. Unfortunately, without a continuing FAD programme in Vanuatu, fishing operations like this will disappear.

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Figure 9: Unloading the catch of skipjack tuna, small mahi mahi and yellowfin tuna at the end of a morning's fishing

ASSISTANCE TO THE SOUTH PACIFIC TO MEET NES FISH-IMPORT REGULATIONS

The following is taken from: *Seafood Safety Standards (With Special Reference to HACCP): Review of the Import Regulations of the US and EU and the Relevant Laws of the South Pacific Region* by Ted L. McDorman, Associate Professor, Faculty of Law, University of Victoria, Victoria, B.C., Canada. FAO/SPC Project No: TCP/RAS/6713(A).

by Ted L. McDorman,
University of Victoria,
British Columbia, Canada

UNITED STATES

Background

Approximately 55 per cent of the seafood consumed in the United States is imported. These seafood imports come from 135 countries (FDA Statement, 60 F.R. No. 242, p. 65097).

Not surprisingly therefore, the US seafood safety standards apply both to imported and domestically-sourced seafood. The federal agency with the primary responsibility for assuring seafood safety is the Food and Drug Administration (FDA) which is an institutional component of the US Department of Health and Human Services.

FDA's legislative responsibility as regards seafood is to ensure that seafood either imported into the United States or crossing internal state lines (collectively referred to in the United States as interstate commerce) is safe and wholesome. This responsibility derives from the Federal Food, Drug and Cosmetic Act (21 U.S.C. 301 et seq.).

Section 402(a) (#21 U.S.C. 342(a)) provides that the FDA can control the production and trade of

any 'adulterated' seafood. In the import context this means that the FDA can prohibit from entry into the United States any seafood determined to be 'adulterated'.

To determine whether a seafood product (or other food product) is adulterated, the FDA has employed three regulatory strategies.

First, through formal regulation, the FDA can establish a 'tolerance' that identifies a limit above which a seafood is deemed injurious. As of the early 1990s, only one formal tolerance existed that specifically dealt with seafood and that involved polychlorinated biphenyls (*Seafood Safety*, 1993, p. 288).

Second, the FDA can establish 'action levels' which, although not legally binding and not in the form of a formal regulation, have the effect of establishing limits which seafood must meet. Failure to meet these action levels will result in imported seafood being refused entry into the United States.

Finally, the FDA can control any food where it can provide sufficient evidence that the food constitutes a problem for public health. This authority can be used irrespective of the non-existence of tolerance or action level standards. Microbiological pathogens in seafood are controlled using this third strategy (*Seafood Safety*, 1993, p. 292). Seafood imported into the United States must comply with the same criteria for

wholesomeness and safety as imposed on like US products. The FDA has the direct responsibility for inspection (and approval) of imported seafood.

The FDA has developed a strategy of automatic detention for certain fish species (e.g. swordfish, mahi mahi) until the importer can provide assurances that the product is safe. This automatic detention can be extended to products and suppliers that the FDA finds to be inconsistent with US seafood safety standards.

The power to extend automatic detention in this manner derives from the authority of the FDA to refuse admission to any seafood product that 'appears' from examination or otherwise not to be safe and wholesome (i.e. is 'adulterated').

The approaches of the FDA to seafood import monitoring are: reliance on past experience with specific fish species and suppliers; and sampling and testing. The first approach has led to the automatic detention programme for high-risk species and suppliers.

The reliance on sampling and testing to identify the high-risk species and suppliers and to assure safety for non-identified high-risk seafood has been criticised as being ineffectual. To improve the monitoring of seafood safety, make sampling and testing more efficient, and to shift the burden of seafood safety onto the processors and suppliers, the United States developed the Seafood HACCP Regulation. The Seafood HACCP Regulation will come into force in December 1997.

The Seafood HACCP Regulation

There are three mandatory aspects of the US Seafood HACCP Regulation that are of critical importance to exporters of seafood to the United States.

- Every processor (American and non-American) **must**, where an identifiable food-safety hazard is reasonably likely to exist, put in place a HACCP plan consistent with the details of the US regulation. Failure of a processor to have and implement a HACCP plan, where one is necessary, means that the imported seafood is 'adulterated' and the FDA will deny entry of the product into the United States.
- The HACCP plan adopted by a processor (American or non-American) **must** have been developed by an individual who has received training in the application of HACCP principles deemed adequate by the FDA. A HACCP-trained individual must also regularly reassess, modify and review both the HACCP plan and its implementation.
- The US importer **must** be able to verify to the FDA that the seafood seeking entry into the United States has been processed or produced in accordance with an effective HACCP plan. If an importer is unable to show that the seafood product in question has been processed or produced under a HACCP plan, the seafood 'will appear to be adulterated and will be denied entry' (Sec. 123.12(d)).

From these three mandatory aspects of the US Seafood HACCP Regulation come a large number of questions.

Who is a processor that is required to have a HACCP Plan?

A processor is defined as any person engaged, either in the United States or in a foreign country, in processing (Sec. 123.3(l)). The addition of the phrase 'in a foreign country' ensures that the HACCP requirements for seafood production apply outside the United

States. Processing is broadly defined as including: handling, preparing, freezing, preserving, packing, dockside unloading or holding (Sec. 123.3(k)(1)).

Harvesting and transporting are not considered processing and the mandatory HACCP requirements do not apply to fishers (except where vessels engage in processing) or the act of transporting processed fish (Sec. 123.3(k)(2)). In the Pacific Island context, canning of tuna is clearly processing, as are the onshore handling and packing of fresh-chilled tuna and other fishery species.

The HACCP plan requirement attaches to acts of processing and the processor rather than the owner of the fish or fish product. If the fish owner is not the processor, the owner, seeking to export to the United States, must utilise a processor that conducts its activities consistent with a HACCP plan.

While it is only a processor that is required by the US regulation to have and operate its activities under a HACCP plan, where hazards to food safety may arise in harvesting or transporting, these activities may benefit from operating pursuant to a HACCP plan.

When is a HACCP plan necessary?

Despite what is stated above, not every processor must have a HACCP plan. More accurately, everyone engaged in processing must conduct a hazard analysis. If such an analysis reveals that food-safety hazards are 'reasonably likely' to occur, then the processor is required to develop and implement a written HACCP plan.

A food-safety hazard is defined as 'any biological, chemical or physical property that may cause food to be unsafe for human consumption' (Sec. 123.3(f)). In analysing the possible existence of food-safety hazards, a proces-

sor is to consider that such hazards can be introduced both within and outside the processing facilities and can arise before, during and after harvest. However, it is only food-safety hazards that are 'reasonably likely' to occur that must be identified. The regulation states:

A food-safety hazard that is reasonably likely to occur is one for which a prudent processor would establish controls because experience, illness data, scientific reports or other information provide a basis to conclude that there is a reasonable possibility that it [the hazard] will occur in the particular type of fish or fishery product being processed in the absence of these controls. (Sec. 123.6(a))

The US HACCP Regulation and the supplementary guide, *Fish & Fisheries Products Hazards & Controls Guide*, give direction as to the types of hazards that may occur for particular fish and processes. The potential food-safety hazard of histamines associated with tuna and mahi mahi is specifically noted in the regulation (Sec. 123.6(c)(1)(vi) and 123.3(m)) and in the *Guide*.

Because food-safety hazards will differ from species to species and depend on the processing activity, a HACCP plan will be unique to each location where fish are processed and to each fish and fishery product being processed. A processor that creates a generic HACCP plan for all facilities, activities and fish is **not** complying with the HACCP plan requirement.

What must be contained in a HACCP Plan?

Consistent with the previously noted seven principles of HACCP, Section 123.6(c) sets out what each HACCP plan, at a minimum, is to contain:

- a list of food-safety hazards reasonably likely to occur;
- a list of the critical control points for each of the identified hazards;
- a list of the critical limits that must be met at each critical control point;
- a list of monitoring procedures to be used at each critical control point to ensure compliance with the critical limits;
- corrective action plans to be used where a deviation from the critical limits at the critical control point occurs (there is a detailed provision that deals with corrective actions, Sec. 123.7);
- a list of the procedures to be employed to verify that the HACCP plan is adequate and effective; and
- provision for a record-keeping system that documents actual values and observations obtained during monitoring of critical control points.

When completed, a HACCP plan is to be dated and signed by the most responsible individual on site at the processing facility or a higher level official. 'This signature shall signify that the HACCP plan has been accepted for implementation by the firm' (Sec. 123.6(d)(1)).

Does having a HACCP Plan fulfill the processor's regulatory obligation?

Just having a HACCP plan does **not** meet the requirements of the US HACCP regulation. There are two parts to implementing the HACCP regulation: establishment of a plan and monitoring how the plan works. The last two of the seven HACCP principles are relevant: verifying the adequacy and effectiveness of the HACCP plan and

documenting (record keeping) the key variables at the critical control points. The US regulation is clear, a processor must have and 'implement' a HACCP plan (Sec. 123.6(g)).

Moreover, every processor is to 'verify that the HACCP plan is adequate to control food-safety hazards ... and that the plan is being effectively implemented' (Sec. 123.8(a)). The key to effective implementation is a regular review of the HACCP plan itself where there has been a change in the source of fish product. At a minimum a HACCP plan and its operation is to be re-assessed on a yearly basis. Also, there is a necessity for ongoing assessment of the appropriateness and adequacy of critical control points, critical limits, the procedures used for monitoring and the corrective action plans.

What are the HACCP documentation obligations on a processor?

Given that one of the desired effects of HACCP is to reduce sampling and testing in favour of reviewing and inspecting HACCP plans and their implementation, the documentation of the HACCP plan and its operational effectiveness is critical.

First is the written HACCP plan itself. Second are the records of the monitoring of the critical limits at the critical control points. Third are the corrective-action records that arise where critical limits are not met (the detail of the corrective action plans is in Sec. 123.7). Fourth are the records of the verification procedures.

Together, these four sets of documents constitute the processor's HACCP record. A reviewer or inspector of the documents should be able to determine if a processor has appropriately identified seafood safety hazards, established critical control points and

limits and whether these HACCP components are being effectively implemented in such a way that a reviewer or inspector can be assured that particular fish and fish products have been produced or processed in a manner that minimises seafood health risks to the consumer.

It is an important part of the US HACCP Regulation that monitoring records be **reviewed** and that the reviewer sign and date that the review took place. As stated in the regulation:

The purpose of this review shall be, at a minimum, to ensure that the records are complete and to verify that they document values that are within critical limits. This review shall occur within 1 week of the day the records were made (Sec. 123.8(a)(3)(i)).

The reviewer's assurance that the critical limits have not been exceeded is an important component of the record of the implementation of a HACCP plan. The need for a weekly review of how a HACCP plan is operating is indicative of the emphasis in the HACCP regulation of effective implementation of a paper plan.

Records are to be made of all corrective actions taken where critical limits have been exceeded and where any product testing takes place. As above, these records are to be reviewed either within a week or within a reasonable time. The reviewer is to provide assurances, amongst other things, that corrective action procedures were followed.

The paper record of the HACCP plan and its effective operation is critical if HACCP is to successfully minimise seafood health risks for consumers. Inadequate or incomplete documentation **could** lead the FDA to determine that a HACCP plan is **not** being implemented

and, therefore, that the seafood in question is adulterated.

Who can carry out the numerous HACCP responsibilities?

The Seafood HACCP Regulation specifically directs that certain key HACCP responsibilities must be undertaken by an individual who has appropriate HACCP training. While the wording of the regulation is imprecise, the intent is that key HACCP activities must be carried out by individuals having received training through courses that the FDA recognise as adequate (for the exact wording, see Sec. 123.10). The regulation also provides that 'job experience' can qualify an individual to undertake the HACCP responsibilities.

Having a HACCP-trained individual undertake many of the key HACCP responsibilities provides the FDA with increased assurance that the HACCP plan and its implementation are accomplishing the goal of minimising food-safety hazards. It is also part of the overall HACCP strategy of placing the burden of compliance and enforcement of seafood safety on to the processor.

The key tasks that **must** be done by the HACCP-trained individual are:

- developing the HACCP plan;
- reassessing and modifying the HACCP plan as part of the verification process, at a minimum once a year (and when corrective action plans are employed); and
- performing and documenting the record reviews.

Given that the last responsibility regarding monitoring records must be done weekly, the HACCP-trained individual is a critical part of a processing team that is

effectively implementing a HACCP plan.

An appropriately HACCP-trained employee can fulfill the above task or the HACCP-trained individual can be a third party. The tasks assigned a HACCP-trained individual can be done by different individuals, provided each is appropriately HACCP-trained.

Will the FDA pre-approve or certify a processor's HACCP Plan?

There is no provision in the regulations for the FDA to provide a certification or approval of HACCP plans. The FDA policy is not to pre-approve HACCP plans. It is not even clear whether the FDA will indicate whether an individual meets the regulatory requirement of being HACCP-trained. The FDA's concern is one of cost (reviewing and approving HACCP plans) and efficiency (the plans and their operation are best reviewed through onsite inspections where possible) (*HACCP Training Curriculum*, 2nd ed., 1997, p. 131).

Who is an importer and what is the importer's role in the US HACCP regime?

Simply stated, the US Seafood HACCP Regulation places on the importer the responsibility for providing adequate evidence to the FDA that the seafood in question has been processed or produced pursuant to an appropriate and effective HACCP plan.

It is the responsibility of the importer to ensure that the HACCP requirements for a foreign processor are met. It is the importers who bear the direct burden of dealing with the FDA, since the importer is in the United States while the foreign processor, by definition, is outside the United States.

An importer is defined as a US owner or consignee of the seafood seeking entry or the US agent or representative of the foreign owner who is responsible for offering the goods for entry into the United States (Sec. 123.3(g)). It has always been the responsibility of the importer to offer for entry into the United States only seafood that is unadulterated.

However small a seafood importer's current business, the responsibility on the individual offering the goods for US entry is, in some situations, about to increase since they now must verify that the foreign suppliers meet the requirements of the Seafood HACCP Regulation. An importer is going to have to become proactive in its approach to seafood imports.

The FDA has explained the above in the following terms:

Currently, ... the importer is not required to operate in a proactive manner to ensure that it is meeting ... [its responsibility that seafood not be adulterated]. Rather the importer need only offer products for entry ... and thereby place the burden on government to find a problem.

[It] is feasible for importers to take steps to ensure that they are not offering adulterated products for entry Requiring such measures will not be a significant added burden for many importers, particularly as HACCP principles become more widely used ... (FDA Statement, 60 F.R. No. 242, p. 65154).

Section 123.12(d) is clear: if an importer cannot provide sufficient evidence to assure the FDA that seafood seeking entry into the United States has been processed under conditions

equivalent to those set out in the Seafood HACCP Regulation, then 'the product will appear to be adulterated and will be denied entry.'

How can an importer verify that seafood has been processed under an appropriate HACCP Plan?

There are two avenues. The first effectively removes most of the responsibility for HACCP verification from the importer. This can occur where there exists a memorandum of understanding (MOU) between the United States and the country where the seafood was processed which results in the FDA recognising that the country of origin has equivalent food safety laws, standards and inspection practices. This MOU option is discussed more fully below (see 'The Government-to-Government (MOU) Equivalency Option', pp. 17-20).

Where seafood comes from a country not having a MOU with the United States, then the US importer has the responsibility to satisfy the FDA that the seafood was processed under an effective HACCP plan. The importer is to have and implement written verification procedures to accomplish this goal.

The written verification procedures **must** include 'product specifications that are designed to ensure that the product is not adulterated' (Sec. 123.12(a)(2)(i)). The written verification procedures must also include affirmative steps sufficient to provide evidence that the seafood was processed under an effective HACCP plan. The following is suggestive of what would be appropriate affirmative steps for an importer to take:

- maintain a copy of the foreign processor's HACCP plan and 'a written guarantee' from the

processor that the seafood was processed in a manner consistent with the HACCP plan;

- periodically test the imported seafood;
- regularly inspect the foreign processor's facilities to ensure that seafood is being processed pursuant to a HACCP plan;
- obtain from the foreign processor the HACCP monitoring records that relate to the specific seafood sought to be imported;
- obtain a certificate from the foreign country's inspection authority or a competent third party that the seafood was processed under a HACCP plan; or
- other verification measures as appropriate (see Sec. 123.12(a)(2)(ii)).

Given that the goal of the written verification procedures is to satisfy the FDA that the seafood has been processed under a HACCP plan as outlined in the Regulation, the importer will of necessity need to collect and verify the accuracy and sufficiency of **most** of the above noted suggested information.

The precise mechanics and the paperwork for the importer to satisfy the FDA of the HACCP requirement are not yet certain. (FDA Statement, 60 F.R. No. 242, p. 65160) At an absolute minimum, however, the importer, if requested by the FDA, must be able to produce the written verification procedures it has established for all imported seafood.

How will the FDA enforce the new regulation?

The ultimate penalty under the Seafood HACCP Regulation is that the seafood will be deemed to be

adulterated and thus will be denied entry to the United States. It is irrelevant that an importer, a foreign processor or owner of the seafood seeking entry can demonstrate that the seafood is safe for human consumption. The regulation deems seafood not processed pursuant to an appropriate HACCP plan as adulterated irrespective of the actual safety of the seafood.

The FDA has stated:

The purpose of these regulations is to cause processors ... to develop and implement HACCP systems The importer requirements are designed to impose an obligation on importers to ensure that, like domestic products, the products that they are importing are not adulterated ... This requirement means that importers must be able to satisfy themselves, and ultimately FDA, that the fish ... that they are offering for import were produced subject to a HACCP system If an importer does not have evidence that shows that the products were produced subject to such controls, it should not offer the product for import... . The lack of such evidence creates the appearance of adulteration that cannot be overcome by the collection and analysis of a finished product sample by an importer (FDA Statement, 60 F.R. No. 242, p. 65159).

Although the Seafood HACCP Regulation contains mandatory language (e.g. importers **must** provide evidence of proper HACCP plan processing) and stiff penalties (denial of entry), the legislation is goal-oriented (HACCP plans and safe seafood) rather than rule-oriented. Goal-oriented legislation inevitably involves administrative discretion whether (and how) the legislation shall be enforced. The penalty, denial of entry, is necessary as a deterrent and the ultimate

consequence but can be anticipated to be used sparingly provided importers (and foreign processors) are in substantial compliance and the goal (HACCP plans and safe seafood) is not being compromised. The FDA has commented:

FDA expects to exercise broad regulatory discretion in deciding when violations of these regulations warrant regulatory action, just as it does now for other situations. The agency will analyse each case on its merits, based at least in part on the potential for harm that exists (FDA Statement, 60 F.R. No. 242, at p. 65126).

One of the key aspects of HACCP is the shifting of responsibility for seafood safety from the random testing and sampling by governments to the seafood processors themselves. In the case of imports, it is the importers that have the task of enforcing HACCP requirements on foreign seafood processors. The FDA will become more involved in inspecting processes (HACCP plans, monitoring records, reviews, etc.) than in the actual seafood itself.

Of course, random testing, sampling and inspection by the FDA will continue to occur. As has been noted, this shifting of government inspection 'from lot and border checks to the more comprehensive view of HACCP ... constitutes a major change' (Evans, 'Seafood safety—what exporters must know about HACCP', 1995, p. 51). This will be the challenge for the FDA.

Sanitation-control procedures

Good sanitation practices are already mandatory for all foods. A food is adulterated if it is processed under unsanitary conditions (Section 402(a)(4) of the FFDC Act, 21 U.S.C., 342(a)(4)). The Current Good Manufactur-

ing Practice (CGMP) (*see*: 21 F.R. Part 110) provides direction regarding sanitation conditions and practices.

However, after a review, the FDA concluded 'that a significant portion of seafood processors operate under poor sanitation conditions' (FDA Statement, 60 F.R. No. 242, at p. 65146) and that the FDA had 'not succeeded in developing a culture throughout the seafood industry in which processors assume an operative role in controlling sanitation in their plants' (FDA Statement, 60 F.R. No. 242, p. 65147). Therefore, the FDA decided to include in the Seafood HACCP Regulation specific provisions regarding sanitation control by seafood processors (Sec. 123.11).

The sanitation-control provisions in the Seafood HACCP Regulation are to operate simultaneously with the conditions and practices that exist in CGMP regulation and the HACCP requirements. The essence of the new provisions is monitoring. Processors are to monitor, and document the monitoring, of key sanitation conditions and practices that take place in the processing facility.

There are eight key sanitation conditions and practices that are to be monitored and the monitoring documented:

- safety of water (including ice) that comes into contact with food;
- condition and cleanliness of food-contact surfaces, including clothes;
- prevention of cross-contamination;
- maintenance of hand-washing, hand-sanitising and toilet facilities;
- protection of food, food packaging and food contact services from contaminants;

- storage and use of toxic compounds;
- employee health conditions; and
- exclusion of pests from the facilities (for the details *see* Sec. 123.11(b)).

The regulation recommends that each processor have and implement a sanitation standard operating procedure (SSOP) which covers the above-noted sanitation conditions and practices. While an SSOP is not required, it is mandatory that sanitation control records related to the above eight conditions and practices be maintained, as well as the monitoring records (Sec. 123.11(c)).

Sanitation controls and monitoring can be incorporated into the HACCP plan and implementation. Sanitation controls and monitoring may be dealt with separate from the HACCP system. It is important to note that even where a HACCP system is not required (no reasonable likelihood of a food hazard), sanitation controls and monitoring **are required**.

The importer must be able to assure the FDA that seafood seeking entry into the United States has not been processed under insanitary conditions (Sec. 123.12 (2)(i)). Part of the importer's affirmative steps that can (or must) be taken to provide that assurance may include: obtaining from the foreign processor the relevant sanitation monitoring records; obtaining appropriate foreign government or third-party inspection certificates that the sanitation requirements of this regulation were followed; inspection of the foreign processor's facilities; other verification measures appropriate to show foreign processor compliance.

Failure of the importer to provide evidence of a foreign processor's

compliance with the sanitation requirements of the Seafood HACCP Regulation will result in denial of entry of the relevant seafood.

Government-to-Government (MOU) equivalency option

Why MOUs?

The Uruguay Round Agreements on Sanitary and Phytosanitary Measures (SPS) and the Technical Barriers to Trade (TBT) obligate their adherents to remove barriers to food trade created by standards, by creating common standards and requiring states to seek bilateral agreements recognising equivalency of food-safety standards.

Moreover, it has already been noted that under the Seafood HACCP Regulation the importer need not be put to the test of assuring that the foreign processor has adopted and implemented sanitation controls and a HACCP plan where the seafood is processed in a country with which the United States has a government-to-government agreement (MOU) through which the United States accepts that the seafood from that country has been processed in a manner equivalent to, and thus in compliance with, the sanitation and HACCP requirements (Sec. 123.12(a)(1)) and 'How can an importer verify that seafood has been processed under an appropriate HACCP regime?').

From the importing state's (United States) perspective, a MOU is desirable since it shifts the principal burden of seafood-safety enforcement and inspection on to the exporting state. The FDA benefits since it will utilise its scarce resources targetting seafood from states which do not have an MOU with the United States since food-safety hazards are more likely to exist with those products. The importer benefits since it need not be concerned

with verifying the safety of the seafood seeking entry. The exporting seafood processor benefits since it should find it easier to deal with its local government rather than either the US importer or the FDA.

The only possible loser in the MOU arrangement is the government of the exporter which has to negotiate with the FDA to reach an equivalence (MOU) arrangement and must have in place laws, controls, inspectors, etc. sufficient to assure the FDA that equivalent seafood-safety protection exists.

The FDA approach to MOUs: equivalency

It is important to recognise that the purpose of the MOU exercise is not to have the exporting state mirror or replicate US laws, standards and practices regarding seafood production.

Rather, the purpose is to determine if there exists in an exporting country an **equivalent** level of laws, standards and practices regarding seafood production to those existing in the United States. Duplication may be flattering, but it is neither required nor the goal. The idea of equivalence is paramount in the MOU provision in the Seafood HACCP Regulation—the MOU is to document the equivalency of the foreign and US seafood-safety systems.

The FDA has recently indicated the process and criteria it will be applying in determining equivalency and thus whether an exporting state will be able to enter into an MOU with the United States (FDA Statement, 62 F.R. Vol. 107, pp. 30593–30600).

As a matter of process to determine equivalence, the FDA will do a 'paper review' (side-by-side comparison of US system of laws, regulations, standards, regulatory practices and procedures with

that of the exporting country) and an 'on-site verification review' (designed to verify that the foreign regulatory system, including its inspection system, functions as indicated in the paper review).

Regarding the paper review, the test of equivalency involves more than just the written laws, although this is of importance. The food safety law of the United States has the following purposes:

- to prohibit adulterated food entering commerce;
- to establish what constitutes adulterated (or misbranded) food;
- to authorise regulatory agencies to establish standards, to conduct inspections, to issue processing requirements and to take enforcement action.

The FDA has stated that:

In order for equivalency to be achieved, a foreign country needs to have laws applicable to food to be exported to the United States that achieve essentially the same objectives and meet US levels of protection. In addition, ..., the foreign country must have the authority to implement the law... and must be, in fact, doing so (FDA Statement, 62 F.R. Vol. 107, p. 30598).

The US 'levels of protection' relate to the definitions given to 'adulterated' in the Federal Food, Drug, and Cosmetic Act (see generally: Sec. 402(a), 21 U.S.C. 342(a)). The manner of achieving the levels of protection are through outcomes (tolerances and levels of contaminant) and conditions of production (sanitation, CGMP, HACCP).

In addition to the written law there are agencies (FDA) which implement (or enforce) the law.

Essential characteristics of these agencies have been identified by the United States as:

- capacity to identify health problems and to establish 'scientifically-based regulatory standards';
- capacity to undertake mandatory inspections and determine if standards are being met;
- a laboratory infrastructure capable of performing appropriate food-safety tests;
- capacity to enforce the law;
- an internal monitoring system to guard against conflict of interest and to promote ethical behaviour (*see*: FDA Statement, 62 F.R. Vol. 107, p. 30598).

An exporting country must be able to demonstrate that its food-safety implementing agencies have equivalent capacities and infrastructure.

Essential to the equivalency comparison is determining whether there exists 'effective implementation'—paper and good intentions are not enough. As the FDA has carefully noted:

(Whether equivalence exists will be based on a consideration of whether the foreign country's system as a whole... provides the assurances that are provided by the US system (FDA Statement, 62 F.R. Vol. 107, p. 30599).

As a general statement on equivalency, the FDA commented: 'US

standards will not be relaxed to facilitate a finding of equivalence.' [emphasis added] (FDA Statement, 62 F.R. Vol. 107, p. 30596).

MOU flexibility

The US MOU arrangements are designed to be government-to-government and are not to be government (FDA)-to-foreign processor.

This is restricting from a foreign seafood-exporter perspective since it cannot deal directly with the FDA. Under the Seafood HACCP Regulation, it is the US importer which must deal with the FDA rather than the foreign processor interacting with the FDA. The restriction on FDA-to-foreign processor MOUs is also consistent with the FDA's approach to not pre-approving or otherwise certifying a foreign processor's HACCP system.

The FDA does accept that the government-to-government MOUs need not be comprehensive food-safety equivalency agreements. The MOUs can be restricted to specific products (seafood or fish species) and/or specific seafood export processors.

The United States is not seeking to impose its food safety standards on an exporting country, rather the United States is seeking to ensure that the food that is imported into the United States meets the same food-safety standards as domestically-produced food (i.e. equivalency).

This flexibility for an MOU could allow exporting states to focus their regulatory/enforcement at-

tention on specific seafood exports (tuna, mahi mahi, deep-water bottom fish—fresh, chilled, canned, smoked) and also target selected processors (those involved in export, rather than all processors).

This MOU flexibility may be of value to countries not having the capacities to create a full, domestic food-safety programme equivalent to the US system. It is important to recognise, however, that even for limited MOUs, the FDA is seeking equivalence and is unlikely to accept any lessening of standards or process requirements.

A further refinement of an MOU relates specifically to HACCP. It may be possible to have a government-to-government MOU which relates solely to the HACCP and sanitary control aspects of the US Seafood HACCP Regulation. The Regulation allows the importer to avoid the onerous verification procedure (*see*: 'How can an importer verify that seafood has been processed under an appropriate HACCP regime?'), where an MOU exists.

The MOU is to document:

- the equivalency of the US system with that of the foreign exporting country or the compliance of the foreign inspection system with that of the United States, and
- that the MOU 'accurately reflects the current situation' (Sec. 123.12(a)(1)).



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South Pacific Commission, Marine Resources Division, Fisheries Information Section, B.P. D5, 98848 Noumea Cedex, New Caledonia.
Telephone : (687) 262000 – Fax : (687) 263818 – E-mail : cfpinfo@spc.org.nc – Web: http://www.spc.org.nc/